EASE® 4.4 User's Manual

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.

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Introduction

Hardware Configuration

	MINIMUM			RECOMMENDED		
	EASE/EASE JR	EARS/EARS RT	Aura	EASE/EASE JR	EASE/EARS RT	Aura
Processor	600 MHz	600 MHz	600 MHz	Max available	Max available	Max available
RAM	256 MB	256 MB	1 GB	1 GB	1 GB	4 GB
Disk Space Req. (for program)	100MB	100MB	100MB	100MB	100MB	100MB
Disk Space Req. (for database)	1.5 GB	1.5 GB	1.5 GB	1.5 GB	1.5 GB	1.5 GB
Graphics	256 Colors	256 Colors	256 Colors	True Colors (24-Bit)	True Colors (24-Bit)	True Colors (24-Bit)
Screen Resolution	800 x 600	800 x 600	800 x 600	1024 x 768	1024 x 768	1024 x 768
Video Driver	Open GL** compatible	Open GL** compatible	Open GL** compatible	Open GL** compatible	OpenGL** compatible	Open GL** Compatible
Sound Card	16-Bit Stereo	16-Bit Stereo	16-Bit Stereo	16-Bit Stereo	16-bit Stereo***	16-bit Stereo***
Operating System	Windows XP	Windows XP	Windows XP	Windows 7	Windows 7	Windows 7

** To use EASE, the OpenGL driver provided by the 3D graphics card vendor must have the following characteristics:

Full support of OpenGL: Version 1.1 or later.

An OpenGL Installable Client Driver (ICD): The 3D graphics card must provide a full ICD in its OpenGL driver software. The "miniGL" driver provided by some 3D graphics cards is not sufficient for use with EASE.

*** EASE RT requires a full duplex sound card to fully use its online capabilities; DirectX7 or higher must be installed to use the Lake Convolution software.

Installing EASE for Windows

Important: Before you attempt to install EASE on your computer, **make sure you have read the equipment requirements and have sufficient hard disk space**.

Please note that **local Administrator access rights are necessary**.

The program and databases will occupy almost 1.5 GB of hard disk space. Windows also likes to have open hard disk space at least equal to the amount of RAM for use as virtual memory. Thus, you need at least almost 2 GB of hard disk space just to load and operate the program.

Note that if have a previous version of EASE installed on your machine, you must "Uninstall" this previous version before loading the new version. During the installation routine, a dialog will ask if you want to remove or repair the current installation. Select Remove to uninstall all files. Additionally you can enable the option "Reset all installation adjustments to default values", which allows you removing older installations completely and to re-install EASE in a clean and independent manner. However, this does also mean losing all of the user settings. Previous data folders are kept but the program may default to different, recommended paths when opening or saving files.

The Uninstall routine will not remove the EASE40Data folder (the database folder). This gives you the choice of leaving it and writing over it during the installation or deleting or renaming it before installing the new version.

To install EASE:

1. Go to the AFMG Download Portal

   http://downloads.afmg.eu

   and login with the download account data provided to you.

2. In the download area select "Program Setups" and download the setup archive "Complete CD Setup".

3. Make sure that you have the Microsoft .NET 3.5 framework installed:

   http://www.microsoft.com/en-us/download/details.aspx?id=22

4. Make sure that you have the Microsoft .NET 4.0 framework installed:

   http://www.microsoft.com/de-de/download/details.aspx?id=17718

5. After the downloads have succeeded, extract the EASE CD setup and run the Setup.exe file from the "EASE 4.4 Setup" subfolder to start the installation. You can also burn the contents of the EASE CD setup archive on a CD-ROM. Then, after inserting the CD-ROM into your CD drive, the setup should launch automatically. If not, open the Add/Remove Programs applet from the Control Panel and click on the Install button.

6. From the EASE Startup window select the software products you wish to install. The CD contains EASE 4.4 program + database, EASE SpeakerLab 1.1, EASE GLL Viewer 1.1 and the AFMG Licence Manager.

7. If the AFMG Licence Manager is not already installed, it should be automatically selected for installation.

8. Follow the installation instructions as prompted.

9. Installation will copy the EASE program to the hard drive you have selected. You can also install the Example Projects, Speakers, Materials, Textures, Light Sources and Infrared Devices data files at the same time as the program: select the Complete install option when asked.

10. After you have finished with the EASE installation, start EASE by double clicking the EASE icon on your desktop.

NOTE: You will not be able to use the program, except in the Demo mode, until you have registered as a user with AFMG and obtained a License

Registration Instructions

1. After you have installed EASE go to the AFMG Download Portal

   http://downloads.afmg.eu

   and login with the download account data provided to you.

2. In the download area select "Licence Guard Setups" and download the EASE Guard setup archive belonging to your EASE User ID. After the download has succeeded extract the downloaded EASE Guard setup archive and run Setup.exe to install the EASE Guard program.

3. After you have finished with the EASE Guard installation, start EASE by double clicking the EASE icon on your desktop.

4. When the first window opens with the question „EASE is not licenced. Would you like to register it now?", quit with „Yes". This will close EASE and open the EASE Guard program.

5. Follow the instruction in the EASE Guard manual which comes with the EASE Guard setup.

License Policy

User ID

The User ID is a number supplied to you by your EASE distributor. This number is necessary to confirm your previous license and / or your purchase of the new program. Without it you cannot download a licence key, receive a **License File** or request license support.

Online Licensing

To further improve your comfort we have created an EASE licensing web application to run on our web server. It allows – after user registration and receiving a **User ID** - you to easily download an EASE license via internet (being online with EASE computer assumed). That means the software sends the computer's reference information to our web application, which creates a **Licence File** on our server. This file is automatically downloaded and installed. So with a single button push *Download Licence* you can unlock EASE.

By subscribing to the license agreement you are entitled to install the program on one computer or more, depending on the license package purchased. After those installations, additional licenses must be purchased. Please see your distributor for prices

If you intend to uninstall EASE from one or more of the original computers then please upload the license information from that computer by clicking on *Upload Licence*. This will allow you to download this licence again and then unlock EASE on a different computer

Licensing By File

You should only use this option if you are not able to use the online licensing functions.

Reference File

The **Reference File** is a file generated by the EASE Guard program and placed in the EASE *LicenceFiles* folder. This file is different for each installation. If you have more than one computer each will have its own **Reference File.** You can obtain a licence in two ways:

1.) Sending the **Reference File** to AFMG (support@afmg.eu) by E-Mail or regular Mail.

2.) Using the "Licencing by File Online" web site under http://www.ada-acousticdesign.de/EASEOnlineLKG/CreateLicenceFile.aspx

License File

The **License File** is file generated by AFMG, which is linked to the **Reference File**. The **License File** is supplied to the user by E-Mail or regular Mail or can be downloaded from the "Licencing by File Online" web site (see above). Loading this file into the EASE Guard with *Install Licence* unlocks the particular EASE version purchased.

If you intend to uninstall EASE from one or more of the original computers then please remove the license information from that computer before by *Termination*. *Terminate Licence* creates a **Termination File** which you must send to AFMG by E-Mail or regular Mail**.** This will allow you to order a new license for the terminated one and unlock EASE on a different computer or computers.

User Interface Conventions

General Terms

Apply Data

Apply Data is defined as sending any changes made by the module to the other modules for their use. When data is **Applied**, it is written to RAM (computer memory) but it is <u>not</u> saved to the project directory on your hard drive (unless you also use the **Save** command or **Save and Apply** command).

As a precaution against data loss, EASE <u>does</u> write your project data to a temporary backup directory each time you **Apply Data**. These backup files can be loaded using the **Restore Projects** command (on the **File** menu in the **Main EASE** window).

Acquire Data

When you tell EASE to **Acquire Data**, the module you are working in will check with other modules and get any data that has been **Applied** in those modules.

Note that it is possible to have multiple sets of data or conditions loaded into different modules simply by making changes in the **Project Editor** and **Acquiring** them in one computation window but not another.

General Key Conventions

EASE offers a number of function key and keystroke combinations to access functions and manipulate data. Some combinations have different functions depending on the currently open window.

A guideline to the keystroke convention follows:

Alt+underlined letter	Opens Menu
Underlined letter	Selects function after menu is open
F1	Opens the context sensitive Help window
F9	Opens the options window
Tab	Moves the active entry window to next position.
SHFT+Tab	Moves the active entry window to previous position.
Enter	The same as an OK or Yes
Esc	The same as a Cancel or No
Alt+F4	Closes Current Window
Ctrl+Alt+E	Brings the Room Edit Window to the foreground
Ctrl+Alt+A	Brings the Area Mapping Window to the foreground
Ctrl+Alt+R	Brings the Room Mapping Window to the foreground
Ctrl+Alt+T	Brings the Ray Tracing Window to the foreground

Where scrollbars are used:

Left Arrow	Moves the horizontal rotation scrollbar to the left
Right Arrow	Moves the horizontal rotation scrollbar to the right
Up Arrow	Moves the vertical rotation scrollbar upwards
Down Arrow	Moves the vertical rotation scrollbar downwards
PgUp	Moves the Zoom scrollbar up to Zoom-In
PgDn	Moves the Zoom scrollbar down to Zoom-Out

General Mouse Conventions

EASE offers control of the program by mouse. A guideline to the mouse conventions follows:

Left click	Press left mouse button once
LMB	Press left mouse button once
Left double click	Press left mouse button twice quickly.
Right click	Press right mouse button once
RMB	Press right mouse button once
Select	LMB can be clicked either once or twice

depending on window.

General Menu Conventions

EASE offers a number of menus and keystroke combinations to access the menus. Menus contain all the commands that allow manipulation and control of the data under that heading. A guideline to the menus and keystroke conventions follows:

Alt+underlined letter	Opens menu
Underlined letter	Selects function after menu is open
Ctrl+Shift+F10	WINDOWS RM Menus

General Statusbar Conventions

EASE offers a statusbar to display the position, description and status of the project and /or the window.

Overview of EASE

General Description of Items

Vertex/Vertices

A **Vertex** is a point in space defined by x, y and z coordinates. **Vertices** are used to define **Edges** and **Faces**. **Vertices** can be extruded into **Edges** and **Faces**.

Edge/Edges

An **Edge** is a line connecting two **Vertices**. It has no acoustical properties, and it will not affect any calculations. **Edges** can be inserted into the model for visual display purposes. **Edges** can also be extruded to form **Faces**.

Face/Faces

Faces are the basic building blocks that are used to define a room both dimensionally and acoustically. A **Face** is a plane surface whose limits are defined by the interconnection of three or more co-planar **Vertices.** The **Vertices** define its size, shape, and location within the **Room**. The **Face** can keep information about the assigned **Wall Material** and the assigned **Wall Material** will define the Face's acoustic properties.

A **Wall Material** is a file that describes a material's absorption coefficients in one-third octave bands. The EASE database contains files describing a wide variety of **Wall Materials**.

Coat Faces

A **Coat Face** is a **Face** whose area is substituted and/or subtracted from another face that contains the coat face. A **Coat Face** can be coated onto any **Face** that is a part of the room.

A **Coat Face** must be co-planar with the **Face** onto which it is coated, must be completely contained within that **Face**, and must be smaller than that **Face**.

Single-fold Coat Faces are only <u>subtracted</u> from a **Face**. For example, a **Single-fold Coat Face** can be used to remove from the model the part of a floor **Face** that is under a column. The **Coat Face** must be part of a solid object such as a column or a box.

Two-fold Coat Faces allow the <u>substitution</u> of their own area and acoustic properties for the area and acoustic properties of the **Face** onto which they are coated. A common use is adding doors or windows to a wall.

After a **Coat Face** has been defined and coated onto another **Face**, it must be **Aligned**. **Aligning** it moves it a small distance away from the **Face** in the direction of the active side of the **Face** onto which it is coated. This is required for numerical purposes and happens automatically when **Check Data** is executed.

Loudspeaker/Loudspeakers

A **Loudspeaker** is a file that keeps information about the installed **Speaker Model**. This includes the model number, x, y and z position, vertical, horizontal and rotational angles, power and SPL levels in each one-third octave band. A **Loudspeaker** can also include a filter applied to the input signal (for example, a crossover). A **Loudspeaker** can also use a **Speaker Model** that represents an acoustic source (for example, a human talker).

A **Speaker Model** is a file that contains data for the source, such as the directivity, sensitivity, impedance, and power rating of the source. This file is also linked to files that can indicate the size and shape of the loudspeaker case, if applicable

Orientation Angles

The **Loudspeaker** is defined as a source and all movements are referenced to the default position of the **Loudspeaker.** The 0° horizontal reference is a vector drawn through the loudspeaker parallel to the Y-axis and in the direction of the negative Y-axis. The 0° Vertical reference is along the horizontal plane.

Horizontal

When viewed in **Plan View** or from the loudspeaker looking out into the room (**Loudspeaker Aiming View**), an aiming angle moving counter-clockwise is positive and moving clockwise is negative. If a room is modeled using standard EASE conventions with audience areas in the negative y quadrants, a **Loudspeaker** over the stage facing "straight ahead" into the audience will have an orientation of 0°, one facing forward and to the right will have a positive orientation angle between 0° and 90°, and one oriented forward and to the left will have an angle between 0° and -90°.

Vertical

Aiming angles rotating up from horizontal are positive, down are negative.

Rotation

This parameter defines the rotation of a loudspeaker about its reference (aiming) axis. When viewed from within the loudspeaker looking out into the room, positive rotation is clockwise, negative rotation is counter clockwise.

Audience Area/Audience Areas

An **Audience Area** is an imaginary plane at ear level that is used by the **Calculation** modules (**Area Mapping, Room Mapping**) to display the results of various calculations such as direct sound, aiming, timing differences between two loudspeakers, and intelligibility. **Audience Areas** are different from **Faces** in that **Audience Areas** have no effect on the computation itself, but simply display a result. The mapping modules will divide **Audience Areas** into a number of segments chosen by the User, and perform calculations within each of those segments. For each computation the user can set the numbers of segments and their sizes (*resolution*).

Listener Seat/Listener Seats

Listener Seats are single points within a room at which computations can be done. **Listener Seats** are like **Audience Areas** in that they have no acoustic properties, but simply define a point of observation. **Listener Seats** differ from **Audience Areas** in that they define a single point where computation are to be made, and they define a direction for the observation, thus allowing directional computations such as including a head related transfer function (HRTF). **Listener Seats** can also be used as a perspective point for viewing a room.

Orientation Angles

The **Listener Seat** is defined as a receiver and all movements are referenced to the default position of the **Listener Seat.** The 0° horizontal reference is a vector drawn through the listener parallel to the Y-axis and in the direction of the negative Y-axis. The 0° Vertical reference is along the horizontal plane.

Horizontal

When viewed from the **Listener Seat** looking out into the room (**Listener Perspective** view), an aiming angle moving counter-clockwise is positive and moving clockwise is negative. If a room is modeled using standard EASE conventions with audience areas in the negative y quadrants, a listener seat facing "straight ahead" towards the stage will have an orientation of 180 degrees, one rotated to the right will have a negative angle between -90° and -180°, and one rotated to the left (but still toward the axis) would have an angle of less than 180 degrees

Vertical

Aiming angles rotating up from horizontal are positive, down are negative.

Lamps

A **Lamp** is a file that keeps information about the installed **Light Source**. This includes the model number, x, y, z position, vertical, horizontal, rotational angles and illumination level. A **Lamp** can assign a color to the **Light Source**, and can store the intensity level.

Light Source is a file that contains data for the source itself, such as the radiation center, directivity, sensitivity, and power rating of the source.

Objects

An **Object** in EASE is a combination of two or more items that are grouped together and can be operated on together. An object can consist of like **Items** (for example, several **Faces**) or unlike **Items** (a **Loudspeaker** and a **Face**).

In EASE, an Object is simply the names of the items and their locations relative to each other. Items that make up an **Object** retain all the original properties they had before they were grouped together.

Objects can also be saved into a library and reused in other projects.

Cluster

A **Cluster** is a special kind of **Object** that includes two or more **Loudspeakers**. When a **Cluster** is calculated the acoustic performance is computed using a single "resultant" loudspeaker that approximates the combined performance of the **Cluster** in the Far Field.

Ungrouped Clusters

When **a Cluster** is **Ungrouped**, its performance is computed using each of the **Loudspeakers** separately in all computations, as in the normal mode. It is necessary to use an **Ungrouped Cluster** to provide accurate results in the Near Field. Ungrouping a **Cluster does not delete or "ungroup" the underlying Object.** This action does not "explode" the object, it simply tells the computation engine to use each individual **Loudspeaker** in the computation rather than a single "resultant" **Loudspeaker**. This **Object** can still be copied, moved, rotated, etc.

Speaker Model/Speaker Models

A **Speaker Model** is a file that keeps information about a particular sound source. This source can be an electro-acoustic transducer (loudspeaker) or an acoustical source such as a human voice or noisy machinery. This file contains spherical directional data for the source, as well as the sensitivity data for each one-third octave band covered by the source. This file may also contain a link to a drawing file for the source. This data is usually supplied by the loudspeaker manufacturers but it can be entered or edited by the user for other measured data.

A **Speaker Model** can also be symmetrical or asymmetrical. To be symmetrical, a Speaker Model must have both physical (wire-frame and case definitions) and electro-acoustic symmetry. An asymmetrical **Speaker Model** cannot be used in

a symmetrical room. If the cabinet of a symmetrical **Speaker Model** is asymmetrical the room cannot be in the symmetrical mode.

The **DLL** (Dynamic Link Library) is an advanced form of a **Speaker Model** file. It allows the manufacturer that created the DLL, to embed proprietary algorithms as well as a custom user interface by programming a software module. The DLL works like a plug-in for EASE and cannot be modified by the end user.

The **GLL** (Generic Loudspeaker Library) is also an advanced form of a Speaker Model file. It does not have to be programmed but constitutes an object-based description language that goes beyond simple data tables. It allows including data for multiple acoustic sources for a single loudspeaker box, electronic data describing the filter settings and mechanical data that defines the suspension system for a line array or cluster. GLL files are created with EASE SpeakerLab and can also be used in other AFMG software packages such as EASE Address and EASE Focus.

Wall Material/Wall Materials

A **Wall Material** is a file that defines the acoustic properties of surface materials in one-third octave bands. **Wall Material** files can also describe the acoustic properties of an audience, furniture and other environmental items. **Wall Materials** are assigned to **Faces** to give them acoustic properties such as absorption and diffusion.

Wall Materials supplied with the program include absorption data for many standard building materials, furniture, and people. Additional **Wall Materials** can be added by entering their data into the database. You can also enter diffusion factors, that is scattering coefficients, for diffusion calculations when the data is available.

IR Modulator/IR Modulators

An **IR Modulator** is a file describing an **Infrared Modulator** device. An **Infrared Modulator** converts audio into an FM modulated sub-carrier that is used to amplitude-modulate the infrared light output of an **Infrared Radiator**.

 [The optional **InfraRed Module** is not a part of the standard EASE program and must be purchased separately. If you have not purchased the InfraRed option, you will be able to view these files but you will not be able to edit them.]

IR Radiator/IR Radiators

An **IR Radiator** is a file describing an **Infrared Radiator** device. **IR Radiators** have directionality and sensitivity like loudspeakers. They convert the electrical signal produced by an **IR Modulator** device into Infrared Light.

[The optional **InfraRed Module** is not a part of the standard EASE program and must be purchased separately. If you have not purchased the InfraRed option, you will be able to view these files but you will not be able to edit them.]

Light Source/Light Sources

A **Light Source** is a file used by EASE Vision to describe the physical properties of a light fixture used to produce the illumination for a model. Light sources are chosen and placed to provide natural looking shadows that help to provide depth in a perspective view of the model. In EASE, a **Light Source** is to a **Lamp** as a **Speaker Model** is to a **Loudspeaker**.

Texture/Textures

A **Texture** is a .bmp file that can be applied to a surface to produce a more realistic rendering in the EASE Vision module. Theses bitmaps can also be

pictures to provide a view to the outside or another room to improve the reality of the model.

General Description of Coordinates

EASE uses the Cartesian coordinate system to describe the location of points. The following conventions are used:

- The x-y plane is horizontal.

- Positive z and positive vertical angles are upward.

- Horizontal angles increase in the counter-clockwise direction when viewed from above (plan view).

In addition, the following conventions are recommended to simplify and standardize data entry:

- The y-axis should be the major axis of symmetry for the stage and the audience (if there is symmetry).

- The negative y-axis should be in the direction of the audience.

- The origin (0,0,0) should generally be chosen on the major axis of symmetry, at the elevation of either a stage or the main seating floor, and at either a proscenium wall, the upstage wall, or some other comparable point.

The above conventions means that for most rooms, all audience points will have a negative y-value, and positive x-values will be on the "audience right" side of the model (that is, the right side of the room as viewed from the audience).

- If there is more than one axis of symmetry in a room (as, for example, in a stadium or gymnasium), it is generally useful to place the origin (0,0,0) such that the model is also symmetrical about both axes of symmetry.

Coordinates can be entered and displayed in EASE in three ways.

- **Absolute Cartesian Coordinates:** These are x, y and z values referenced to the origin (0,0,0) of the **Room**.

- **Relative Cartesian Coordinates:** These are x, y and z (delta) Δ values referenced to another point. For example, when entering a line or a new data point, each point can be defined as being x, y and z distant from a previous point, taking into account the algebraic signs of each coordinate.

- **Polar:** Horizontal Angle, Vertical Angle and Distance. Polar coordinates can be used in EASE to enter the location of a new point relative to another point.

Getting started…

The following information is provided for a general overview of EASE.

Rooms

A **Room** defines the geometry and acoustics of a space where EASE can perform computations. Rooms do not have to be enclosed – in fact, direct sound from loudspeakers can be computed with only audience areas and/or seats, and by inserting and by orienting the loudspeaker(s) at the desired location in the **Room**. A **Room** can be outside and cover many thousands of meters or feet.

A **Room** can include **Vertices**, **Faces**, **Edges**.

To compute the behavior of a sound source, you must define the source by inserting one or more **Loudspeakers** and **Speaker Models**, and you must define one or more **Listener Seats** and/or **Audience Areas**. If you also want to study the interaction of one or more loudspeakers with a room's boundaries, you must define one or more **Faces** to describe that boundary and assign a **Wall Material** to those **Faces**. After the room's properties are set the room can be excited by the energy from the **Loudspeakers**. A **Loudspeaker** can be an acoustic source (a human talker or a noisy machine) as well as an electro-acoustic source.

Many computations (volume, surface area, reverberation, reflected sound, etc.) require that a room be **Closed**. A **Closed** room is one whose boundaries are completely and uniquely enclosed by a collection of **Faces** – i.e., there are no "holes" through which sound can escape, and the side of the **Face** containing the **Wall Material** is on the side of the **Face** that is inside the room.

Calculations

Calculations can be performed using the Area Mapping module, the Room Mapping module, the optional Probe module and by the optional advanced acoustics module, AURA. If you have purchased EASE JR, you will be able to use only Area Mapping and limited Room Mapping. Full EASE adds the Probe module, but not AURA.

Examinations

Use the Probe and Raytracing to receive position specific computed data as well as generalized reflection information.

Databases

EASE includes large databases of **Speaker Models, Wall Materials, Infrared Radiators, Infrared Modulators, Light Sources** and **Textures** for use in your projects. Datum for specific manufactured products are provided by the manufacturers. Datum for generic **Wall Materials**, and for acoustic sources (for example, human voices), are collected from Sound System Engineering by Don and Carolyn Davis, the Klark-Teknik Audio System Designer by Peter Mapp and the NIOSH Compendium of Materials for Noise Control from the US Government (now sold by Renkus-Heinz). To expand your capabilities, you can create new **Speaker Models, Wall Materials, Light Sources** and **Textures** that will describe desired or actually existing conditions exactly, or that can describe new products.

Overall Program Structure

EASE is a modular program. Each module performs certain functions, and to do its job, must interchange data with the other modules.
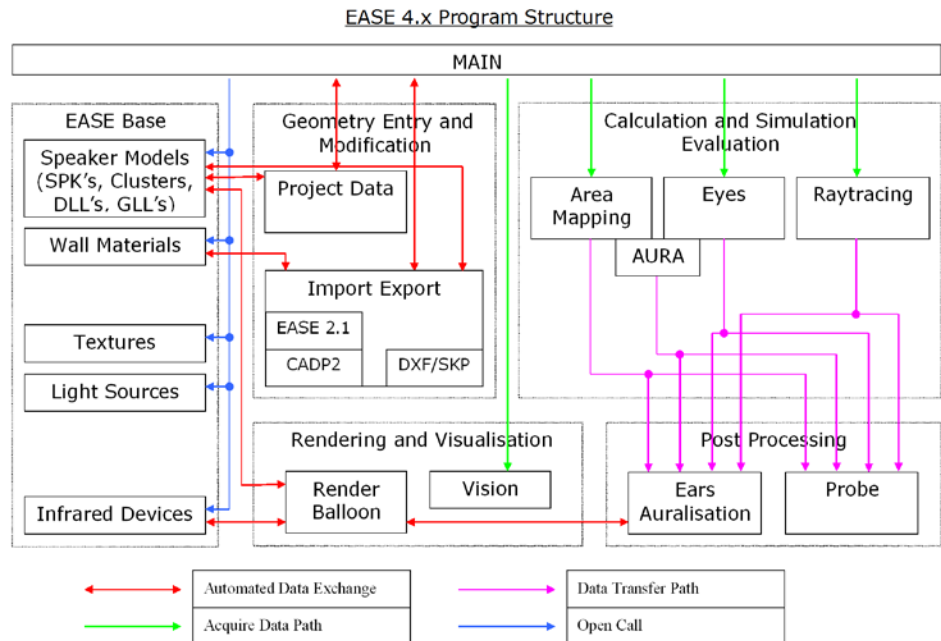
EASE Main

When you start EASE, the Main EASE program loads and displays the Main EASE Window. This Window ties together all of the other modules that make up the EASE program. Some of those other modules are visible to you, while others run in the background.

If you are upgrading from EASE 3.0, you will be happy to learn that EASE Main now includes a powerful new Desktop that allows you to quickly and easily navigate from module to module.

Edit Room (Project Data)

This module is the one that allows you to define the characteristics of your room. It allows you to enter the **Faces** and **Vertices** that define the **Room**, the **Edges** that help show details visually, the **Loudspeakers** that are used to excite the **Room**, the **Wall Materials** that define its acoustic properties and the **Audience Areas** and **Listener Seats** where computations are to be displayed.

Edit Room also performs certain checks on your data for validity so that computations can be done without errors. For example, if you have told EASE that the room is **Closed**, **Edit Room** will check to see that a set of **Faces** completely encloses the **Room** without any "holes" that would result in an undefined surface area or volume.

Area Mapping

The **Area Mapping** module performs calculations that model the behavior of **Loudspeakers** in the room and display the result on a map of one or more **Listener Seats** and/or **Audience Areas** that you have defined.

Area Mapping can compute and display Direct SPL, Total SPL (i.e., Direct plus reverberant), Loudspeaker Overlap, Critical Distance, Direct/Reverberant Ratio, First Arrival Time for one or more selected loudspeakers, the difference in

arrival times between two selected loudspeakers, C7, C50, C80, CT, L7, L50, LT, ALCONS, Privacy Index and STI.

Room Mapping (Eyes)

The **Room Mapping** module provides all of the computational functions of **Area Mapping**, but displays them on a three-dimensional rendering of the **Room**. **Room Mapping** also allows the computation and display of direct sound onto **Faces** (for example, how much SPL is hitting the back wall or a balcony face).

Room Mapping can compute and display Direct SPL, Total SPL (i.e., Direct plus reverberant), Loudspeaker Overlap, Critical Distance, Direct/Reverberant Ratio, First Arrival Time for one or more selected loudspeakers, the difference in arrival times between two selected loudspeakers, C7, C50, C80, CT, L7, L50, LT, ALCONS, Privacy Index and STI.

Probe

The **Probe** can be used to perform detailed studies of sound system performance at any point within an **Audience Area**. [Note: The **Probe** module is <u>not</u> included with **EASE Jr.**] To use the Probe module, select **Invoke Probe** from the **Tools** menu within **Area Mapping** or **Room Mapping.**

The **Probe** can compute the Impulse Response, the Energy-Time Curve, Waterfall response, Frequency Response, Direction and Relative Strength (3D Hedgehog), and the Modulation Transfer Function. The **Probe** can also display direct, reverberant, and total SPL, as well as Clarity and Intelligibility functions.

AURA

AURA is a module that allows the calculation and display of general acoustical parameters that are normally used in room acoustics. These parameters are EDT, T-10, T-20, T-30, Echo Criteria, STI and others used in the study of acoustics. A new algorithm for ray tracing can be used here to speed up the calculations. For more details about the module see the chapters on any **Mappings.**

If you have purchased **AURA**, you will have access to this advanced Acoustics analysis program based on **CAESAR** developed at the Aachen University in Germany. [**AURA** is an extra cost option, and is not included in the basic version of EASE or EASE JR.]

Auralisation (EARS)

If you have purchased **EARS**, you will have the ability to convolve impulse response files with .WAV files and/or "real time sound", and listen (through your computer's sound card) to the resulting predictions of system performance in your model. [**EARS RT** is an added cost option for EASE, and is not included in the basic version of EASE.]

Speaker Base

Speaker Base allows you to view **Speaker Model** data in a wide variety of presentations, edit that data, and enter new data for **Speaker Models** not included in the EASE database.

For viewing and editing conventional SPK files the EASE SpeakerBase program is used. For creating GLL files the EASE SpeakerLab software is employed. The GLL Viewer, a free program for any user, can be distributed to view GLLs without having EASE.

Material Base

Material Base allows you to view and edit **Wall Material** files, and enter new data for **Wall Materials** not included in the EASE database.

Light Source Base

Light Source Base allows you to view and edit **Light Source** files, and enter new data for **Light Sources** not included in the EASE database.

Texture Base

Texture Base allows you to view and edit **Texture** files, and enter new data for **Textures** not included in the EASE database.

Infrared Radiator/Modulator Base

IR Radiator/Modulator Base program allows you to view and edit **IR Modulator** and **IR Radiator** files, and enter new data for **IR Modulators** and **IR Radiators** not included in the EASE database.

[**EASE InfraRed** is an extra cost option. If you have not purchased **EASE IR**, you will be able to **View** these files, but you will not be able to **Edit** them.]

Infrared Receiver Base

The **Infrared Receiver Editor** program allows you to view and edit **Infrared Receiver** files, and enter new data for **Infrared Receivers** not included in the EASE database.

[**EASE InfraRed** is an extra cost option. If you have not purchased **EASE IR**, you will be able to **View** these files, but you will not be able to **Edit** them.]

Vision

Vision allows you to view the 3D room model just like it is rendered in **Eyes,** but in a high resolution way. This module is also called Architectural Rendering. It allows the addition of textures and light effects to the rendering.

[**EASE Vision** comes with all EASE versions.]

EASE Versions Volume

	Junior	Standard	Standard + Adds
Drawing and Rendering Tools			
Ease Viewer (OpenGL)	Yes	Yes	Yes
Project Data	Yes	Yes	Yes
Standard Rendering	Yes	Yes	Yes
Architectural Rendering	Yes	Yes	Yes
Material Base	Yes	Yes	Yes
Acoustic Tools			
Area Mapping	Yes restricted [1]	Yes	Yes
Room Mapping	Yes restricted [2]	Yes	Yes
Ray Tracing	Yes restricted [3]	Yes	Yes
Probe Post Processing	No	Yes	Yes
AURA	No	No	Yes
Ears/Lake RT	No	No	Yes
Speaker Base	Yes	Yes	Yes
Generic Loudspeaker Libraries	Yes	Yes	Yes

[1] no advanced functions: LDT, Standard & Reflections
[2] On faces only DSPL, no advanced functions: LDT, Standard & Reflections, Local Raytracing
[3] Only Raytracing with 1000 Rays and 3th order

Main EASE

This is the section that holds several standalone programs together so that data can be transferred from one to another.

Key Conventions

F1	Help
F5	Check Data
F9	Options
Home	Moves the selection bar to the beginning of the list
End	Moves the selection bar to the end of the list
Up Arrow	Moves the selection bar upwards
Down Arrow	Moves the selection bar downwards
Tab	Moves the selection bar to next section which section
SHFT+Tab	Moves the selection bar to previous section which section
Ctrl+O	Open Project
Ctrl+N	New Project
Ctrl+S	Save Project
Ctrl+A	Save Project As
Ctrl+Alt+E	Brings Edit Project window in foreground
Ctrl+Alt+R	Brings Room Mapping window in foreground
Ctrl+Alt+A	Brings Standard Mapping window in foreground
Ctrl+Alt+T	Brings Raytracing window in foreground

Mouse Conventions

Left or **right click** on a selection in the left section of the window will display its contents in the right section. **Left double clicking** on a selection in the right section will display or open a window with information about the item.

Status bar Conventions

The bar displays the current path of the project.

Chapter I: EASE Main

EASE Main Window

EASE Main is the first window that loads when you start EASE, and it continues running as long as you are working in EASE. The **EASE Main** window is the nerve center for all of EASE. From it, you can load an existing project or start the **Edit Project** module to create a new project. Once EASE has a project (with valid data) to work on, you can call the Calculation modules to compute and display a wide range of acoustic and sound system performance criteria. Once that data has been computed and saved, **EARS** can be used (if you have purchased it) to auralize (convolve and listen to) the predicted sound of one or more **Sources** or **Loudspeakers** in your acoustic room model. This window allows viewing and printing of project data directly as well as access to all of the main functions of EASE.

Desktop

This area gives the user a choice of interface with the EASE program. You may choose between the Standard Menu Structure of pull down menus, the Tool Bar Icons and the new Graphical Desktop Structure.

The EASE Main Window opens in the EASE 4.4 Mode allowing direct access to the most used functions (Picture #1). This includes all of the main functions of the menus.
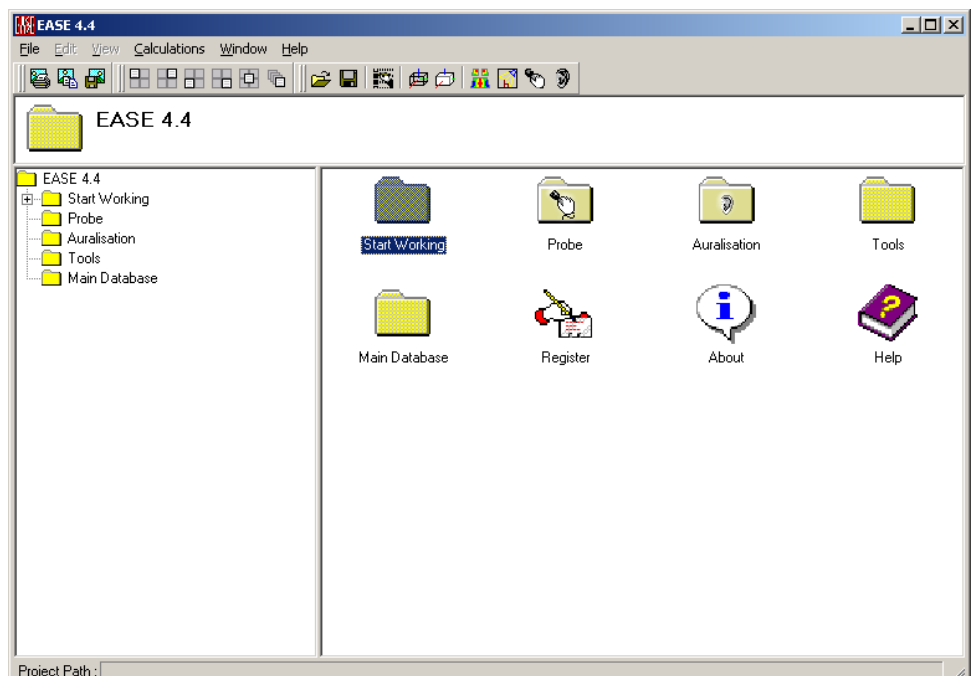
{Picture #1}

The basic window is divided up into three sections. The top section shows the current open folder as well as the tool tips and short help description of each icon as you hover over it. The left section shows the tree view of the program and after loading or creation of a project the project tree as well. The right section shows the icons in that selected folder. By right clicking on them you may copy any one of these into the General Desktop, the Project Desktop or both to allow you to customize the interfaces for your individual working style. The Project Desktop is stored with the Project data and the General Desktop is stored with your EASE initialization file.

If you select the "Start Working" folder then the tree will open up and the right window will show the icons of Picture#2.
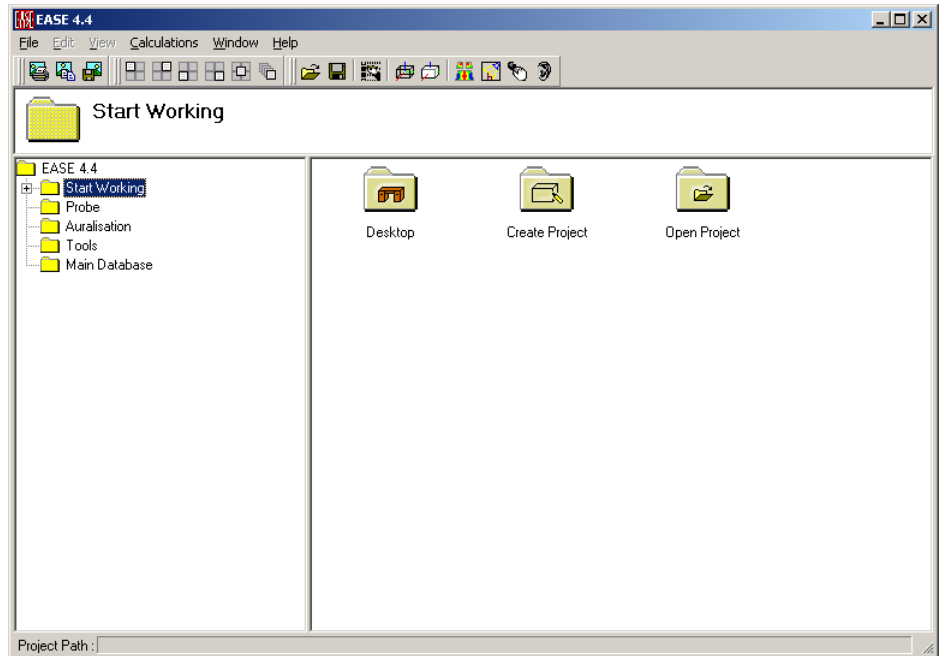
{Picture #2}

The three icons showing now are: "Desktop", "Create Project" and "Open Project". The "Desktop" icon opens the new General Desktop Window on the Right side. This is where you can store only the icons that you may want to use for your normal working style as per Picture #3.
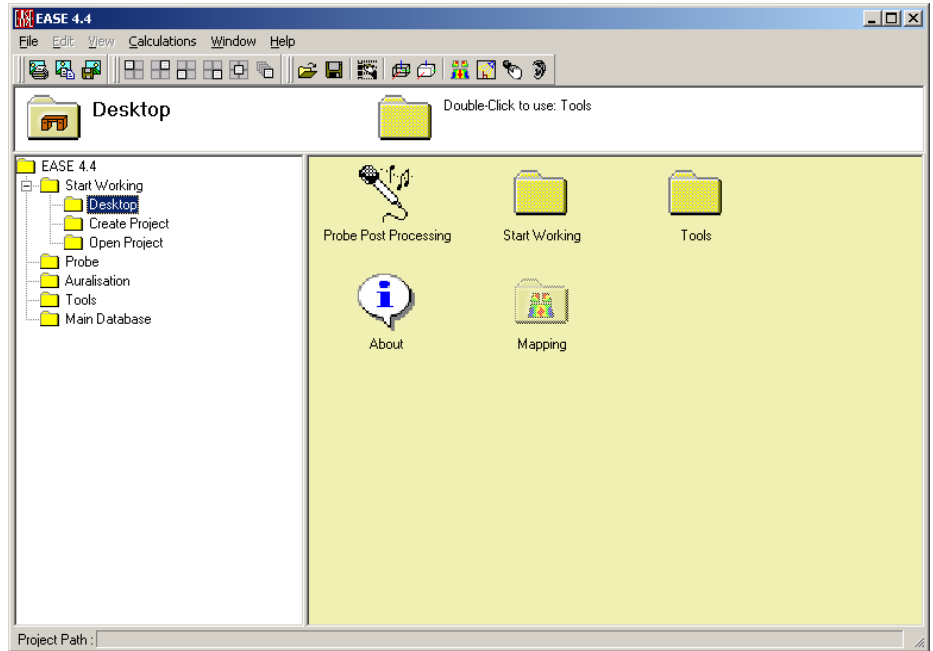
{Picture #3}

This desktop is saved automatically with the EASE startup files and is then your default basic setup. It is a blueprint for the way you normally work and what functions you would normally use when doing design work.

If you were to actuate the "Open Project" icon on Picture #2 then it would open a window listing the last projects opened allowing you to choose the one you might want to open as in Picture #4.
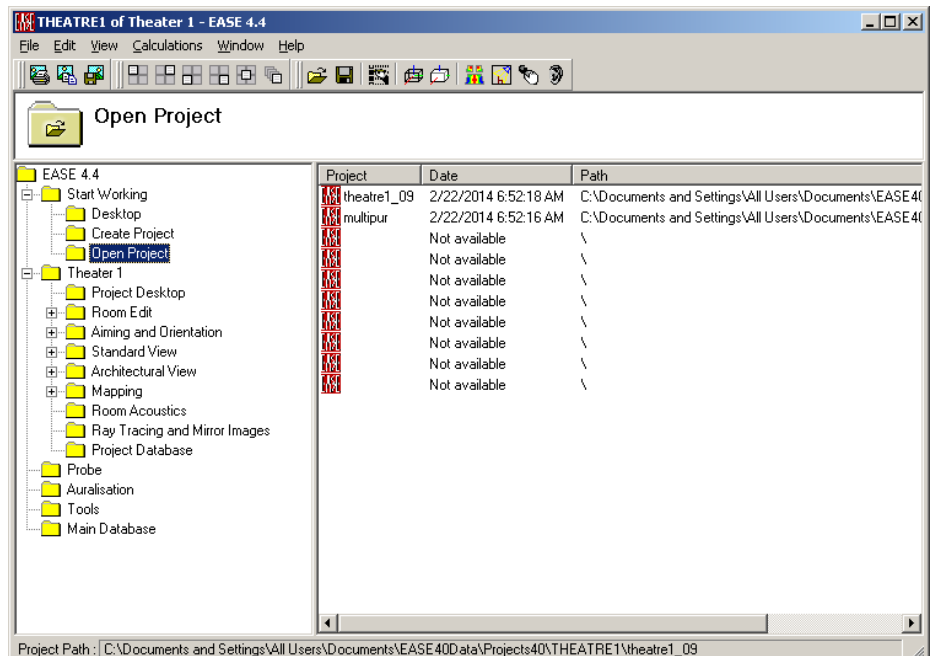
{Picture #4}

To select the project just double–click on the name of the room or project name in the right hand panel. This will load the data of the selected project into memory. After you have opened the project then the window shown in Picture #5 will be opened.
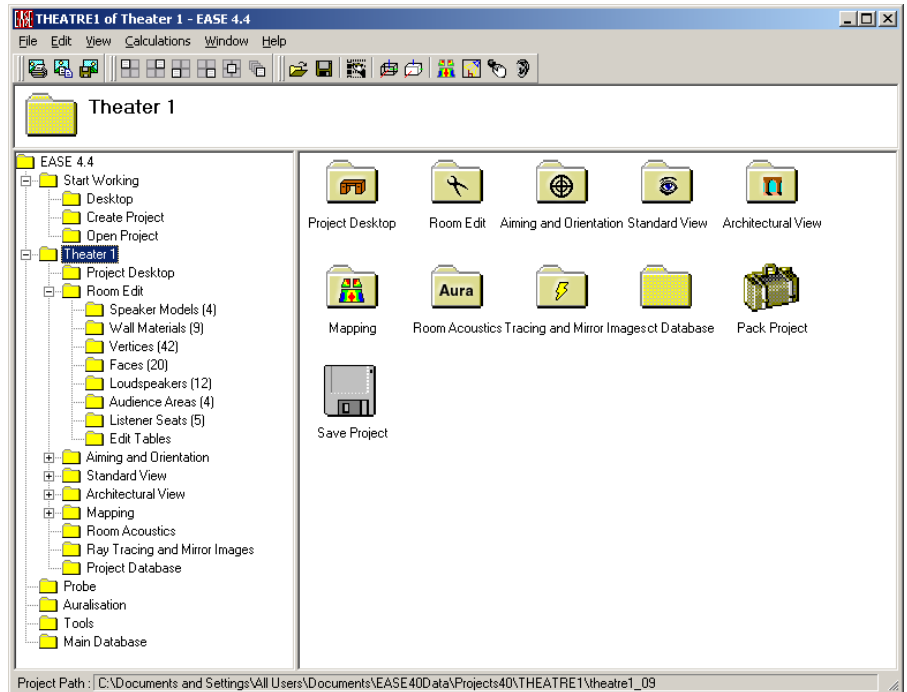
{Picture #5}

The left section now displays a tree with all of the information about this particular project. It allows the listing and the viewing of data such as Faces, Vertices, Loudspeakers, etc. and also allows selection of operations upon such data as aiming of speakers, viewing of the project, mapping of sound fields and ray tracing as well as auralization of the project.

There are many additional functions also here that just take exploring of this desktop function to help EASE your way through the program.

File Menu

This menu gives access to file management functions and program settings.

New Project

This opens the EASE Project Options Window for insertion of new project files to store new project data.

Shortcut: Ctrl+N

To use this command:

1. Left Click on **New Project**.

2. This will open the Project Options Window to enter the hall name and project path and select project paths.

3. Left click on the **OK** button.

See also Project Options Window.

Open Project

This allows opening of EASE 4.x, EASE 3.0, EASE 2.1, CADP2 and packed EASE 3.0/4.x files (.ppj, .zip) for use in calculations. Opening a packed file opens an Install Window. See Install Packed Project Window.

Shortcut: Ctrl+O

To use this command for EASE 4.x data:

1. Left click on **Open Project**.
2. This will open the Open File Window.
3. Using the **Look In** portion of the window find the folder holding the project file.
4. Left click on the project file name.
5. Left click on the **Open** button.
6. A timer window will appear and show when it is loaded.

Close Project

This closes the open EASE project file without exiting the program.

Restore Projects

Each time **Project Data** is **Applied**, EASE automatically saves the data files for your project to a temporary directory. If EASE has not been shut down properly (i.e., in the event of a power failure or program crash), these files can be used to recover from that failure. The **Restore Projects** command opens that temporary file and in most cases will allow you to continue working from the point when data was last applied.

To use this command:

1. Left click on **Restore Projects**.
2. Left click on the File name you want to open
3. Left click on the **OK** button

Note that each project listed also includes information like its temporary path, the name you have given it (hall), the date and time the last temporary file was generated, and the quantity of vertices, edges, faces, loudspeakers, audience areas and listener seats.

EASE places its temporary files in sequentially numbered sub-directories (lower numbers are older) in the directory set by the EASE System Path dialog box in the Disk window of EASE Main's Options Window. Once EASE has been installed, this location should not be modified.

EASE Viewer

This opens the EASE Viewer Window for use in viewing all EASE Open GL files. This viewer can be used separately and given to clients to help them view project information including wire frames, rendered 3D views, and mapped information. Information on how to do this is included in the help file for EASE Viewer.

See also EASE Viewer Window

Project Options

This opens the Project Options Window, which allows viewing and editing project names and folders with corresponding path information.

Import / Export

This opens the import/export module of the EASE program. This module allows importing/exporting of all relevant data e.g. project, speaker and material information from other programs and file types such as EASE3.0, EASE 2.1, CADP2, DXF, and ASCII.

Note: If you have old EASE 2.1 projects or even CADP2 projects that you want to work with or use in EASE, you can import that data using the **Import / Export** module.

Save Project

This saves the current EASE project immediately to the existing .FRD file. The file contains pointers to all database information needed by the project as well as all relevant room construction data.

Shortcut: Ctrl+S

Save Project As

This saves the current EASE project to a different file name using the .FRD suffix. This allows different versions of the same project, such as, different speakers or different room treatments without having to rebuild the room each time.

Shortcut: Ctrl+A

To use the command:

1. Left click on **Save Project As.**
2. This opens a Save File Window.
3. Using the **Save In** window select the folder to save the project to.
4. Enter the name of the new file in the **File** window.
5. Left Click on the **Save** button.

Tip: As you work with EASE, you may find yourself creating several versions of a room model in order to compare various acoustic solutions and/or loudspeaker choices. Most EASE users find it convenient to keep those different versions together in a project directory created for that purpose. If you follow the default settings during the installation of your software, your projects are automatically saved to **…\EASE40Data\Projects40\(Your Project Name)\(Your Room Name).** You can create a new subdirectory for your projects at any time nested inside that **Projects** directory.

Pack Project

This saves Project Data including all databases as a .PPJ file. It will also compress the .PPJ file into a .ZIP file.

To use this command:

1. Left click on **Pack Project**.
2. This opens the Save File Window.
3. Using the **Save In** window select the folder to save the project to.
4. Enter the name of the new file in the **File** window.
5. Left Click on the **Save** button.
6. This opens a window labeled "Create Packed File".
7. Place check marks next to **Minimize All Base Files, Include Cluster Components**, and **Compress Packed File** as needed

    See also Pack Project Window.
8. Left click on the **OK** button.

NOTE: It is VERY important that you **Pack** a project before moving it from one computer to another, or even to another directory on the same computer. That is because EASE uses and stores the full path of all of the data files it uses for a

given project. If those files are not found at those locations, EASE will try to substitute other files for some of them (especially **Speaker Model**s and **Wall Materials**), and it can take considerable effort to untangle the resulting mess.

Main Data Bases

This sub-menu allows you to view and edit the EASE databases of **Speaker Models**, **Wall Materials**, **Light Sources**, **Textures**, and **IR Sources**.

Speaker Models

Speaker Base (SPK, DLL Files)

This opens the **Speaker Base** module of the EASE program in standalone mode. This allows viewing and editing of **Speaker Models** or natural sources that are part of the existing EASE database, and the addition of new **Speaker Models** for which you have data.

SpeakerLab (GLL Files)

This opens the **SpeakerLab** module of the EASE program in standalone mode. This allows viewing, editing and creating of Generic Loudspeaker Library (GLL) files.

GLL Viewer

This opens the **GLL Viewer** module of the EASE program in standalone mode. This allows viewing of Generic Loudspeaker Library (GLL) files.

Material Base

This opens the **Material Base** module of the EASE program in standalone mode. This allows viewing and editing of **Wall Materials** that are part of the existing EASE database, and the addition of new **Wall Materials** for which you have data.

Light Source Base

This opens the **Light Source Base** module of the EASE program in standalone mode. This allows viewing and editing of **Light Sources** that are part of the existing EASE database, and the addition of new **Light Sources** for which you have data.

Texture Base

This opens the **Texture Base** module of the EASE program in standalone mode. This allows viewing and editing of **Textures** that are part of the existing EASE database, and the addition of new **Textures** for which you have data.

IR Source Base

This opens the **IR Source Base** module of the EASE program in standalone mode. This allows viewing and editing of **IR Modulators** and **Radiators** that are part of the existing EASE database, and adding new **IR Modulators** and **Radiators** for which you have data.

Send Picture To

This sub-menu allows the selection of the destination to which a picture of the currently displayed main window is sent.

Clipboard

This copies the picture to the clipboard for use in other applications

File

This saves the picture to a file. The files can be saved in many formats, including:

Windows Bitmap……………………………*.BMP

JPEG…………………………………………*.JPEG

CompuServe GIF……………………………*.GIF

Portable Network Graphics……………….*.PNG

Tagged File Format………………………..*.TIF

LuRa Tech Wavelet…………………………*.LWF

Zsoft Paintbrush……………………………*.PCX

Windows Icon……………………………….*.ICO

Enhanced Windows Metafile………………*.EMF

Truevision Targa…………………………….*.TGA.

EASE Page Designer

This opens the EASE Page Designer Window. This window allows the layout of printed reports and pictures for use in presentations. This window also allows text additions, multiple picture layouts and editing of the page layout format.

Options

This opens the Options Window to allow setting of general EASE parameters.

Shortcut: F9

See also Options Window

Modify Toolbar

This command opens a window allowing modification and construction of the toolbars. Buttons and commands maybe added or subtracted as needed, and may be made smaller or larger.

[Fast Open]

This area of the menu stores the paths of the 10 most recently opened projects. A left click will open the selected project directly.

Exit

This exits the window and/or the program.

Edit Menu

This menu allows manipulation of all project data in either graphic or tabular form. For example, the placement of a vertex can be moved graphically in the Edit Projects window, or by data entry in the Property sheet for that vertex.

Project Data

This opens the Edit Project module. This module allows building of the project room and the addition of all pertinent data for use in calculations.

Check Data

Check Data checks the integrity of the project data that you have entered to make certain that there are no errors, ambiguities, or other conflicts that might

cause an error in the calculations. If your room has been set to **Open,** (set in the **Room Data** menu under **Edit** in the **Edit Project** module), **Check Data** tests for the orientation of the faces and for **Faces** that are non-planar.

If the model has been set to **Closed,** (set in the **Room Data** menu under **Edit** in the **Edit Project** module), **Check Data** will also check to make sure that Faces have been defined so that they completely and unambiguously define an enclosed space, check for Vertices not included in a plane, and for other important parameters.

When the sign ✓ appears to the left of the command Check Data, it means then that the data is checked and calculations can be carried out. The absence of such a sign means calculations cannot be continued before the data is checked.

Shortcut: **F5**

View Menu

This menu allows access to all viewing options in EASE (Graphic, Tabular or Listed).

Room Info

Data

This opens the Room Data Window in viewing mode, allowing viewing of basic room information such as surface area, volume, and statistical reverberation parameters. If the room is **Closed**, these values will be computed from the data you have entered.

Draw RT

This opens the "Draw Reverberation Time" window, showing the reverberation time graphically and as a table.

Standard Rendering

This opens EYES, the 3D-rendering module of EASE, in **External View**. This allows rendering or solidifying of all surfaces in the model for use in visualizing the project. **External View** provides a perspective view from outside the model. Once in **Standard Rendering**, you may use the **View Menu** to view the room from many points both outside and inside the model.

Architectural Rendering

This opens the Architectural 3D-rendering module **Vision**. This module uses virtual lighting and complex ray tracing algorithms to simulate shadows and shading and can provide a very realistic view of the room.

Calculations Menu

This menu is the gateway to the many calculations that can be done with EASE.

Area Mapping

The **Area-Mapping** module, (in previous versions of EASE this was called **Standard Mapping**), plots the results of its calculations as a map on **Audience Areas** that you have defined. For any **Loudspeaker** or combination of **Loudspeakers**, **Area Mapping** can compute and display direct sound, total sound (direct plus reverberant), energy ratios, clarity ratios, arrival times, articulation loss, Privacy Index and STI. **Area Mapping** can also calculate and display all of these metrics for selected **Listener Seats**. Results of calculated

data can be saved as OpenGL mapping files and viewed later, both in the full EASE program and in the EASE Viewer that can be provided to a client.

Room Mapping

Room Mapping, (in previous versions of EASE this was called **Render Mapping**), displays the results of its calculations in a 3D rendering of the room. Calculations can be performed for, and mapped onto, selected **Listener Seats**, **Audience Areas**, and **Faces**. For any Sound Source (e.g. **Loudspeaker**) or combination of Sound Sources (e.g. **Loudspeakers**), **Room Mapping** can compute and display direct sound, total sound (direct plus reverberant), energy ratios, clarity ratios, arrival times, articulation loss, Privacy Index and STI. Results of calculated data can be saved as mapping files and viewed later, both in the full EASE program and in the EASE Viewer that can be provided to a client.

Note that in EASE JR, only Direct SPL mapping is available under Room Mapping.

Ray Tracing

The **Ray Tracing** module allows the use of sound "rays" to plot reflections, reverberation time and save a calculation for display as an EASE **Movie** and for use in the **Ears** module to auralize the room.

The **Movie** feature of the **Ray Tracing** module provides a sequential series of screen shots in slow motion that show how sound rays move about in the modeled room. You will find it helpful when tracing problematic reflections and illustrating key design choices to your clients.

Note: In EASE JR. the Ray Tracing is just till the 3th order possible.

Probe Post Processing

The **Probe** module allows detailed acoustic investigations for any selected Sound Sources (e.g. **Loudspeakers**) at any selected point within an **Audience Area** or at any **Listener Seat**. The investigations can include directionality of direct energy and/or reflections, magnitude and phase for direct energy and/or reflections and frequency and timing parameters. The **Probe Post Processing** function works with a response file for a set of calculations (maps) you have previously saved. All of the functions in **Probe Post Processing** are also available for current mapped data by selecting **Probe** from the Tools menu in **Area Mapping** and **Room Mapping**. The **Probe** module can also compute data on its own without a map having already been computed by **Area Mapping** or **Room Mapping**.

Invoke Ears

This opens the Auralization module of EASE called **EARS**. The auralization process allows you and your client to listen to a simulation of what the room will sound like at any selected seat by mathematically combining (convolving) the room response of your EASE model with a sound file that is stored on your hard drive, played from a compact disc, or otherwise routed to EASE by the computer. For accurate results, the sound file should be relatively dry (anechoic).

Note that **EARS** can provide a reasonably accurate overall impression of the acoustic performance of a loudspeaker system in your acoustic room model, but it will <u>not</u> accurately model performance parameters such as loudspeaker distortion, which cannot be extracted from the loudspeaker polar data.

The RT (real time) version of EARS now allows selection of the EARS convolution method or the Lake Real-time convolution method.

Auralize File

This allows the convolution of existing filter files (including measured filter files) with any sample files and playing back the corresponding result files.

Note that this is not EARS; it is only the player from EARS! The player cannot create the filter files. It can only play them.

Window Menu

This menu allows access to different commands that affect the open window.

Screen Quarter

This allows placement of the active window into any of 5 positions.

Center

This places the open window in the center of the screen.

Upper Left

This places the open window in the upper left corner of the screen.

Upper Right

This places the open window in the upper right corner of the screen.

Lower Left

This places the open window in the lower left corner of the screen.

Lower Right

This places the open window in the lower right corner of the screen.

Cascade Windows

This makes all open windows appear in a stacked format.

Help Menu

This menu allows access to all forms of help.

Help Topics

This offers a list of commonly asked help subjects. We have made a concerted effort to develop the Help files and the manual together. If you need an answer as to what a particular command does go to the help files. You will likely find your answer there.

About

This displays information about your EASE program.

Register

This option allows registering your specific EASE version.

See also EASE Guard.

Create Status Report

This creates an EASE status report ("Ease40Info.zip") needed for EASE problem support.

EASE Update

This option allows you to download the latest program updates for your specific EASE version.

Database Update

This option allows you to download the latest data updates for your EASE material- and speaker- base.

Memory Used

This submenu displays the computer memory actually used.

Options Window

This allows setting of general program parameters.
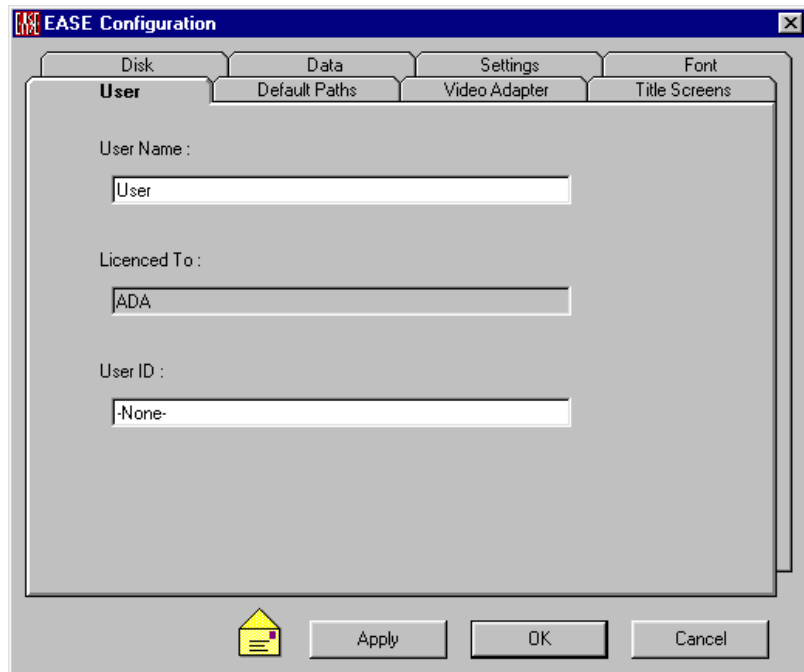
Yellow Envelope Icon

This indicates changes have been made but have not been applied.

Apply

Applies changes and keeps window open.

OK
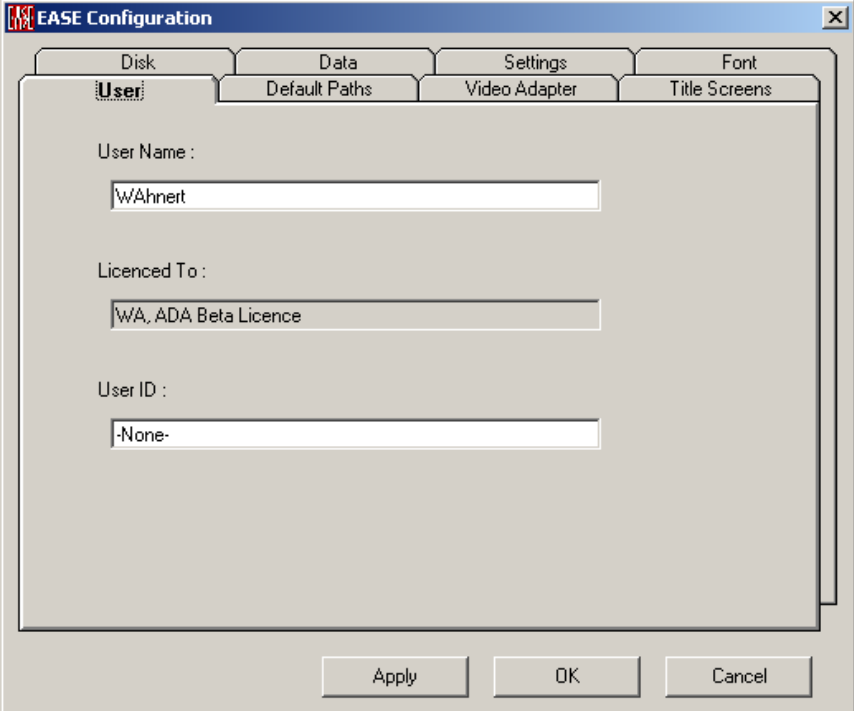
Applies changes and closes window.

Cancel

Discards changes and closes window.

User Tab

This allows viewing and modifying of user data such as **User Name, Licence Owner** and **User ID**.

User Name

This window allows entry of the name of the person who is using the program.

Licenced To

This window shows the name of the owner or the company the program is licenced to.

User ID

This window allows entry of the user ID number supplied by the company distributing the EASE program to authenticate the user of the program.

Default Paths Tab

This allows setting and viewing of default EASE paths for opening, storing and working with all database files.
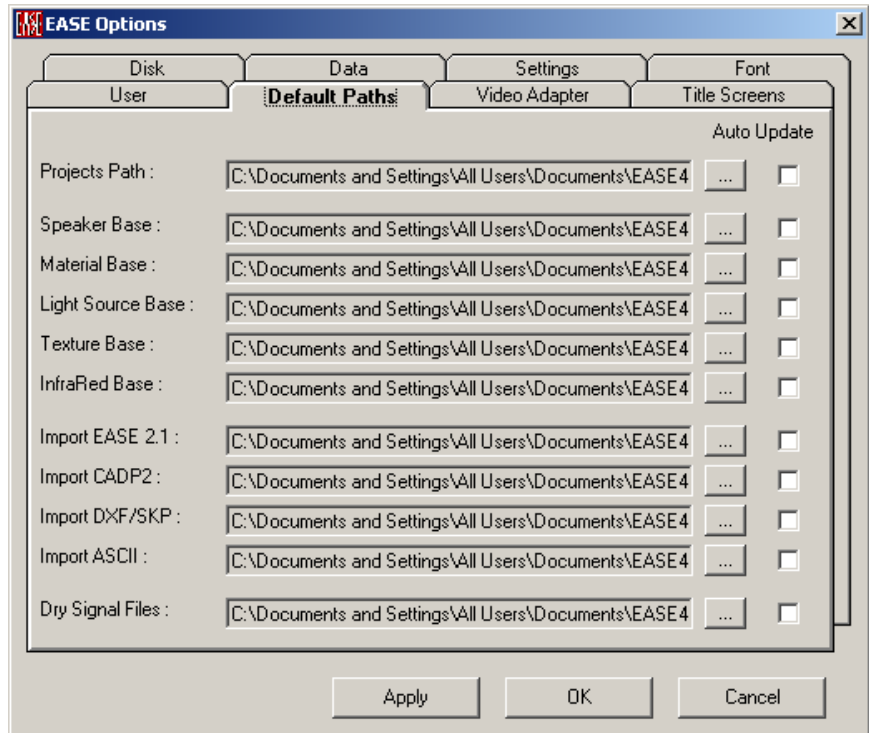
Project Path

This area of the tab allows the selection of the project default path

Auto Update

A checkmark here will allow the program to "remember" the last path set as the return default next time it is used.

Speaker Base

This area of the tab allows the selection of the speaker base default paths.

Auto Update

A checkmark here will allow the program to "remember" the last path set as the return default next time it is used.

Material Base

This area of the tab allows the selection of the material base default paths.

Auto Update

A checkmark here will allow the program to "remember" the last path set as the return default next time it is used.

Light Source Base

This area of the tab allows the selection of the light source base default paths.

Auto Update

A checkmark here will allow the program to "remember" the last path set as the return default next time it is used.

Texture Base

This area of the tab allows the selection of the texture base default paths.

Auto Update

A checkmark here will allow the program to "remember" the last path set as the return default next time it is used.

InfraRed Base

This area of the tab allows the selection of the infrared base default paths. [Only needed if you have the Infrared module.]

Auto Update

A checkmark here will allow the program to "remember" the last path set as the return default next time it is used.

Import EASE 2.1

This area of the tab allows the selection of the default paths for importing EASE 2.1 files.

Auto Update

A checkmark here will allow the program to "remember" the last path set as the return default next time it is used.

Import CADP2

This area of the tab allows the selection of the default paths for importing CADP2 files.

Auto Update

A checkmark here will allow the program to "remember" the last path set as the return default next time it is used.

Import DXF/SKP

This area of the tab allows the selection of the default paths for importing DXF or Google SketchUp files.

Auto Update

A checkmark here will allow the program to "remember" the last path set as the return default next time it is used.

Import ASCII

This area of the tab allows the selection of the default paths for importing ASCII files.

Auto Update

A checkmark here will allow the program to "remember" the last path set as the return default next time it is used.

Dry Signal Files

This area of the tab allows the selection of the default paths for loading dry wave files, for example in any of the convolution windows of EARS.

Auto Update

A checkmark here will allow the program to "remember" the last path set as the return default next time it is used.

Video Adapter Tab

This tab allows testing of your video card and will display the results of those tests. This test is used to confirm that your video card is capable of supporting

the advanced graphics usage of the EASE. It also gives you access to a database holding information about already pre-checked configurations for comparison.
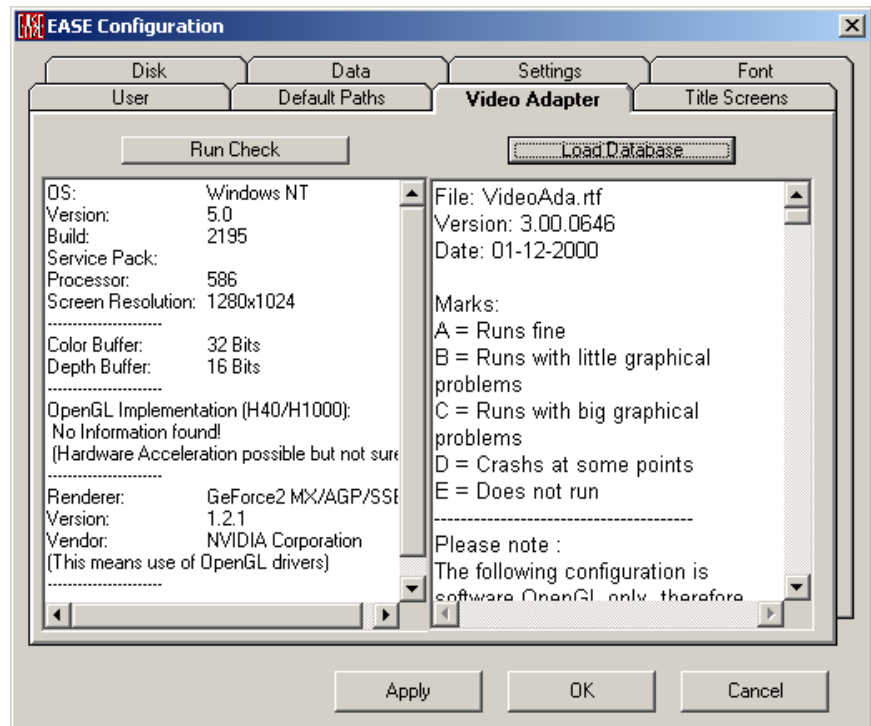
Run Check

This button runs the check video check routine

Video Display Window

This window allows display of data pertaining to the video card, the type of acceleration and the operating system.

Load Database

This button loads a database list of checked video cards that allow full use of the features of the EASE rendering software

Video Display Window

This window displays a list of video cards as well as the details of the software and hardware functions available on that card.

Title Screens

This tab allows the setting of defaults allowing the display of the EASE Splash screens.
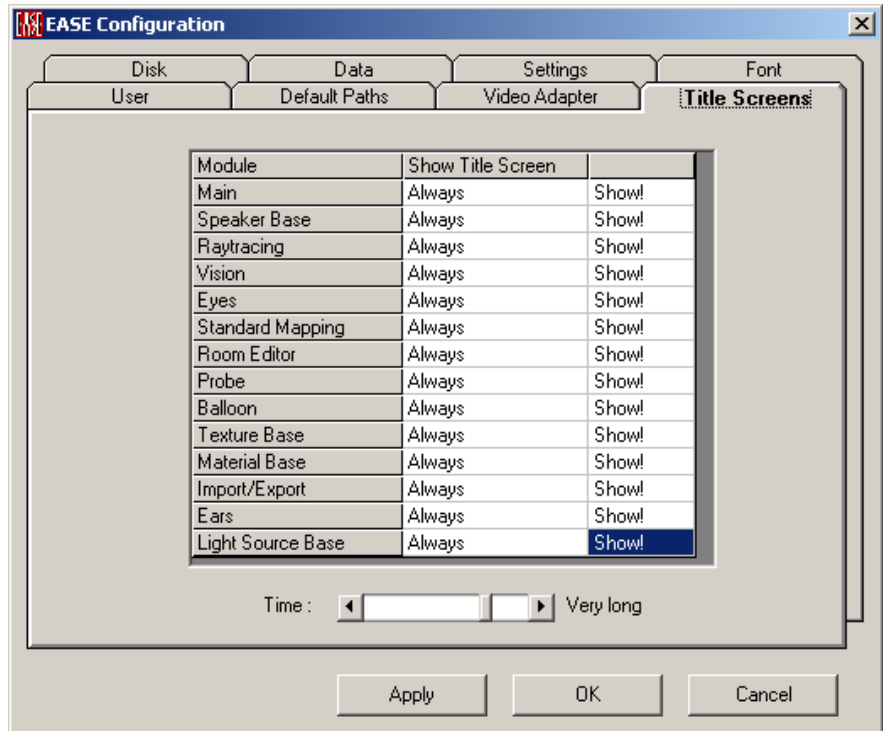
Module

This shows a list of software modules included in your version of EASE.

Show Title Screen

This is where you set the program defaults to display the start splash screen. This can be Always, Once or Never. The column next to it says **Show** and if pressed displays the splash screen immediately.

Time Slider

This slider sets the time that the splash screen is displayed when activated.

Disk Tab

This allows viewing of EASE paths for running the program and opening, storing and working with a particular project.
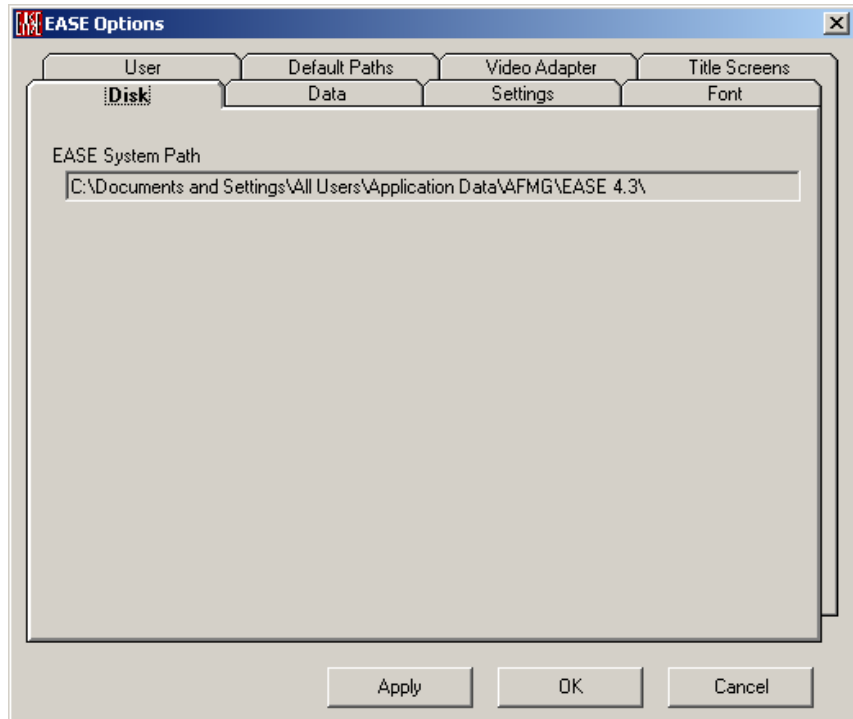
EASE System Path

This area holds the windows allowing the viewing of the default path to the program and Temporary File storage.

Data Tab

This allows setting of preferences for checking the data as well as for transferring information between windows (called applying and acquiring).
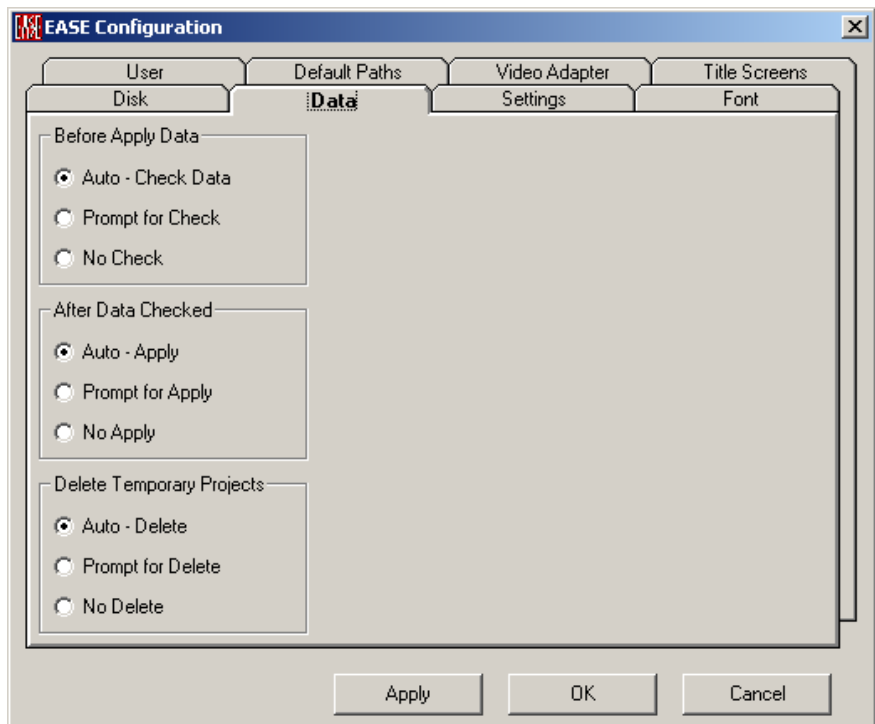
Before Apply Data

Auto-Check Data

Check this box to allow the program to automatically check any new data before it applies that data to the other open modules.

Prompt for Apply

Check this box to have the program ask you if you want to check any new data before it applies that data to the other open modules.

No Check

A check mark in this box means that the check data procedure has to be done manually by the user.

After Data Checked

Auto-Apply

Check this box to automatically apply the data to the parent module after the check data process is finished.

Prompt for Apply

Check this box to have the program ask you if you want to apply the data to the parent module after the check data process is finished.

No Apply

A check mark in this box means that an apply data command will not follow the check data process.

Delete Temporary Projects

Auto-Delete

Check this box to have the program automatically remove temporarily created paths and projects

Prompt for Delete

Check this box to have the program prompt you before removing temporarily created path and projects.

No Delete

A check mark in this box means that no temporarily created paths or projects will be deleted.

Settings Tab

This allows setting preferences for the entire program that are global in nature (i.e., they apply throughout the entire EASE program).
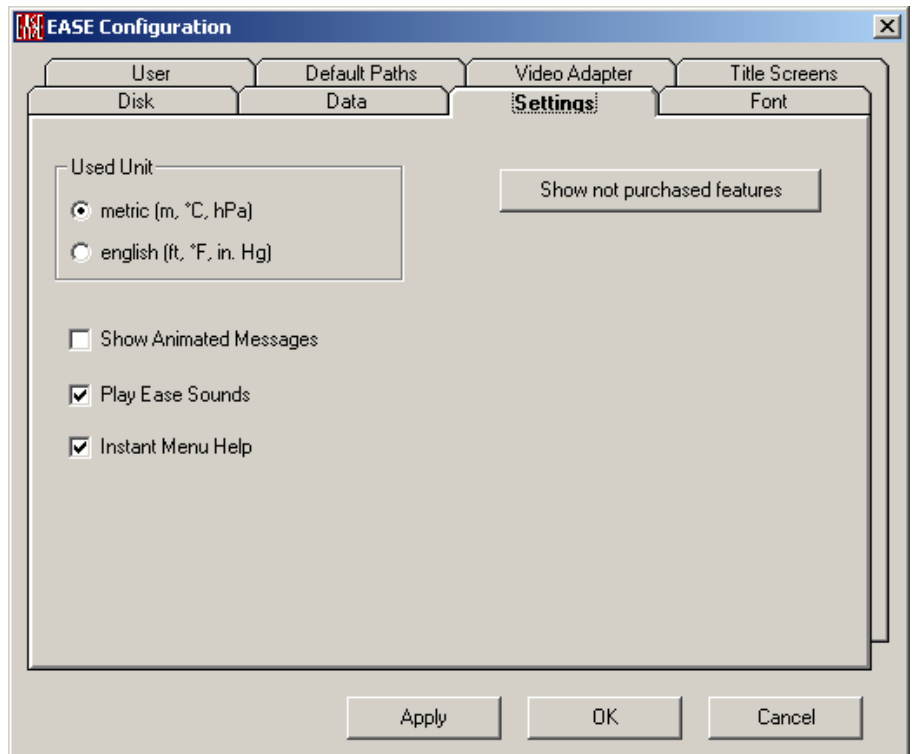
Used Unit

This area allows selection of the units of measurement used in the program.

Metric (m, C, Pa)

A selection here will set the program to use the metric style of measurement, such as meter, Centigrade and Pascal.

English (ft, F, Hg)

A selection here will set the program to use the English style of measurement, such as Feet, Fahrenheit and inches of Mercury.

Show Animated Messages

A selection here will activate the animations that go along with messages to the user from the program. Try them and see!

Play EASE Sounds

A selection here will play the sounds assigned to actions in EASE.

Instant Menu Helps

A selection here will activate the window caption help messages of the program. These messages are shown in the top line of the window and change by scrolling through the menu buttons.

Show not purchased features

This allows setting user preferences for non-accessible features. This button allows the viewing or shading of non-purchased features. This is to simplify the menu structure of new users as well as simplifying it for advanced users of EASE JR.

Font Tab

This allows changing of the font and size of type used in the program.
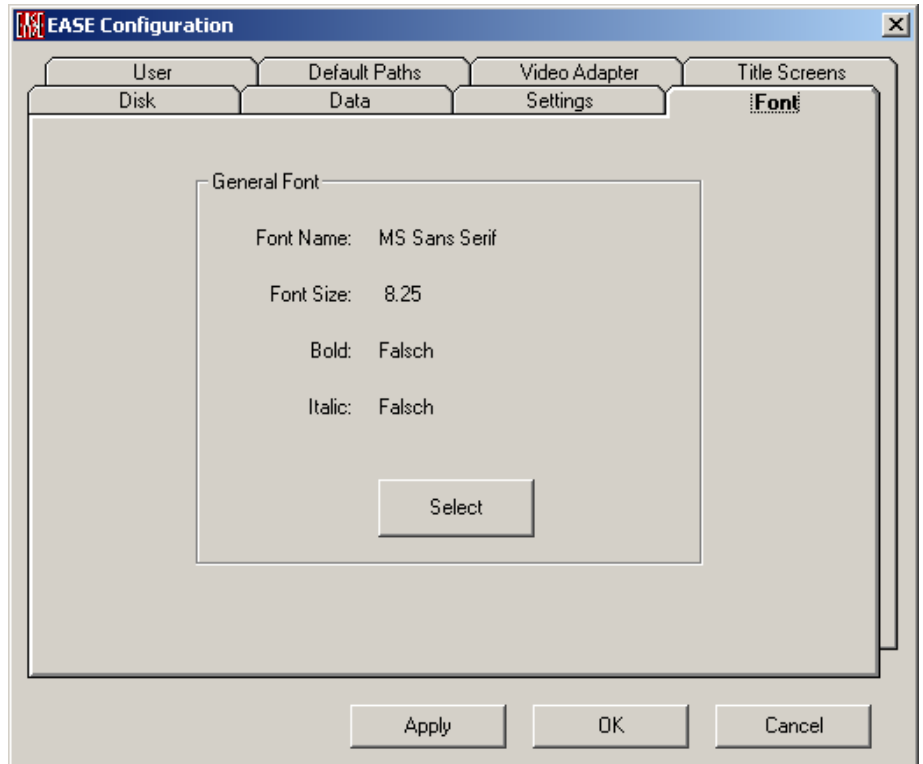
General Font Area

This area displays the font settings of the General Program used in Menus and Windows.

Select

Pressing this button opens the Windows dialog for selection of Fonts in General windows used in the program.

EASE Viewer Window

This window allows also in Demo mode the viewing of provided or just produced EASE OpenGL files.
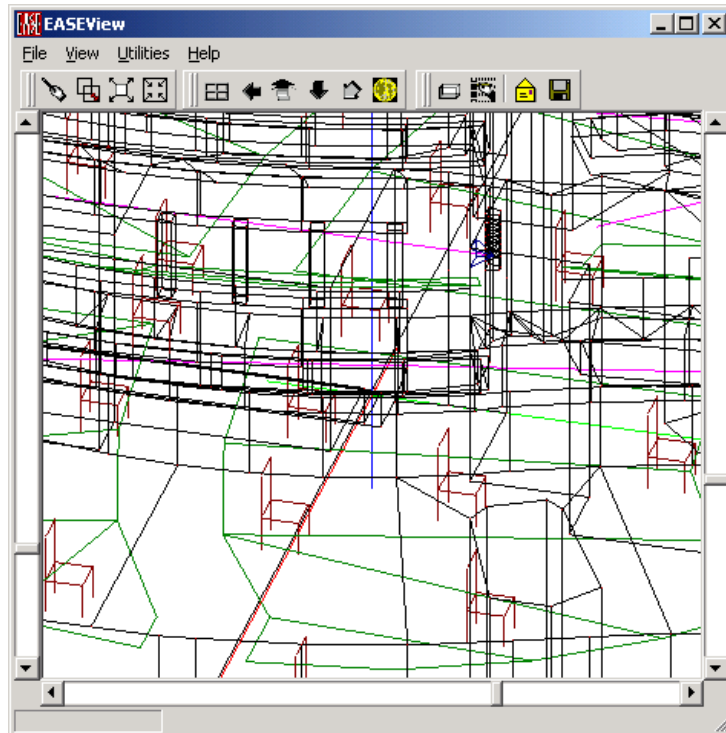
File Menu

This menu gives access to file management functions.

Open EASE OpenGL file

This allows opening of EASE viewer files for viewing previously saved OpenGL files.

This module works in Demo mode too.

Exit

This exits the EASE Viewer.

View Menu

This menu allows access to all viewing tools, and also sets the screen display for editing windows.

3D Perspective

This command has four preset angles, e.g. (60 deg x –30 deg). This displays the object isometrically.

Shortcut: **3**

Side View (x)

This displays a side view of the object in the YZ- Plane. This is otherwise known as the X-View. This view is a variation of the 3-D mode.

Shortcut: **x**

End View (y)

This displays an elevation view of the object in the XZ- Plane. This is otherwise known as the Y-View. This view is a variation of the 3-D mode.

Shortcut: **y**

Plan View (z)

This displays a plan view of the object in the XY- Plane. This is otherwise known as the Z-View. This view is a variation of the 3-D mode.

Shortcut: **z**

Redraw

This forces a drawing update.

Full View

This forces the drawing to fit the window to a fixed tolerance and causes immediate redraw.

Zoom In

This increases the zoom percentage.

Shortcut: **PgUp** or **F11**

Zoom Out

This decreases the zoom percentage.

Shortcut: **PgDn** or **F12**

Utilities Menu

This menu holds tools useful in manipulation and viewing of window displays.

Lights On

This enables light sources to support the 3D impression of the rendering.

Show File Axes

This displays the axis length as selected in the Edit Project module.

Show File Grids

This displays the grids as selected in the Edit Project module.

Spin

This activates the spinning function.

Help Menu

This menu allows access to all forms of help.

About

This displays information about your EASE program.

Project Options Window

This window allows viewing and editing project names and folders with corresponding path information.
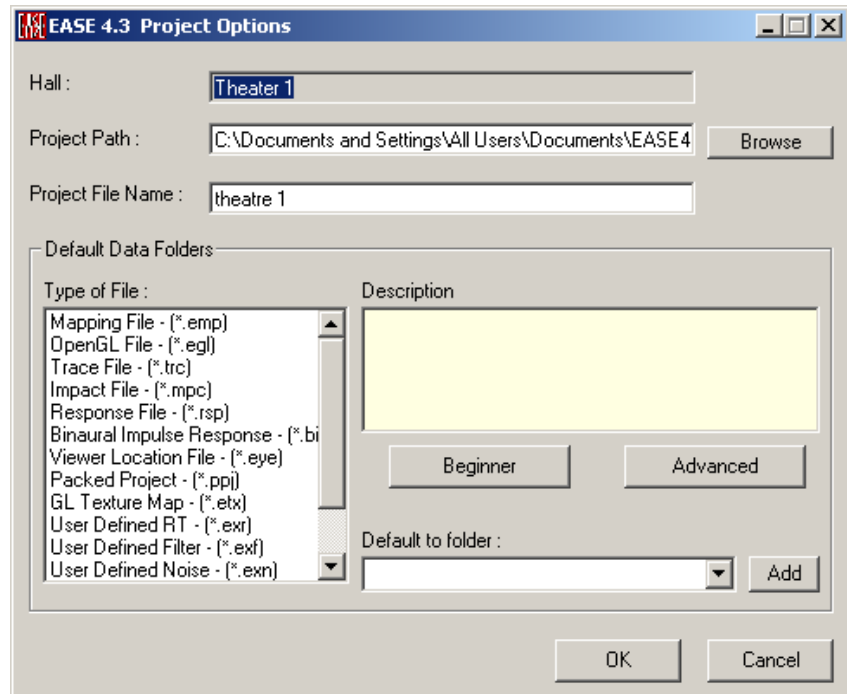
OK (Create)

Shows, accepts and creates entries, folders and new names and closes window. "OK" is visible if default folder structure exists, "Create" is visible after the New Project command.

Cancel

Discards changes and closes window.

Hall

Allows entering or viewing the project name. It is only editable after the New Project command.

Project Path

This area allows the selection of the project save path

Browse

Selects the save path for the project using a standard Windows dialog.

Project File name

This area allows the selection of a specific file name for the project

Default Data Folders

This area of the tab allows the selection of the data default paths

Type of File

Here the most important types of data and mapping files of EASE are listed. A click to one of them shows under description a short report about the nature of the file and shows default folder settings below.

Description

Gives a short description of the selected file.

Default to folder

Shows the selected folder name.

Beginner

Proposes only a few of default folder names.

Advanced

Proposes a detailed structure of default folder names.

Add

Allows editing the detailed structure of default folder names and to create new ones.

Install packed Project Window

This allows installing packed EASE 3.0/4.x projects.
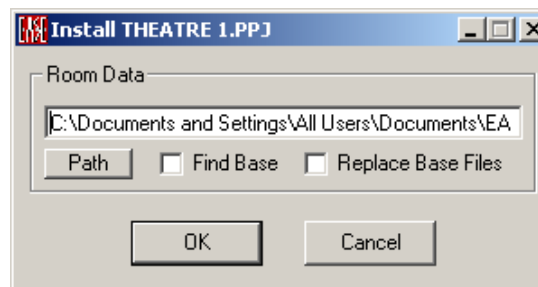
OK

Applies install and closes window.

Cancel

Discards install and closes window.

Room Data

This area shows the folder in which the new project will be installed.

Project Path Window

Shows the selected project path.

Path

Allows changing the selected project path.

Find Base

A checkmark here will allow the program to search for needed base files not shipped with the project.

Replace Base Files

A checkmark here will allow the program to replace the shipped base files by base files stored under …EASA40DATA (Global directory).

Pack Project Window

This allows selecting options for packing projects.
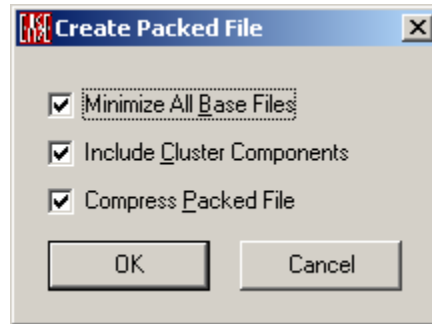
Minimize All Base Files

A checkmark here will allow the program to pack only the base files used in the project, otherwise all project base files (used or unused) are packed.

Include Cluster Components

A checkmark here will allow the program to also include into the shipped file the components of a cluster; otherwise only the cluster data is shipped.

Compress Packed File

A checkmark here will allow the program to replace the shipped *.PPJ file by a zipped *.ZIP file.

OK

Confirms options and closes window.

Cancel

Discards packing and closes window.

Registration Window
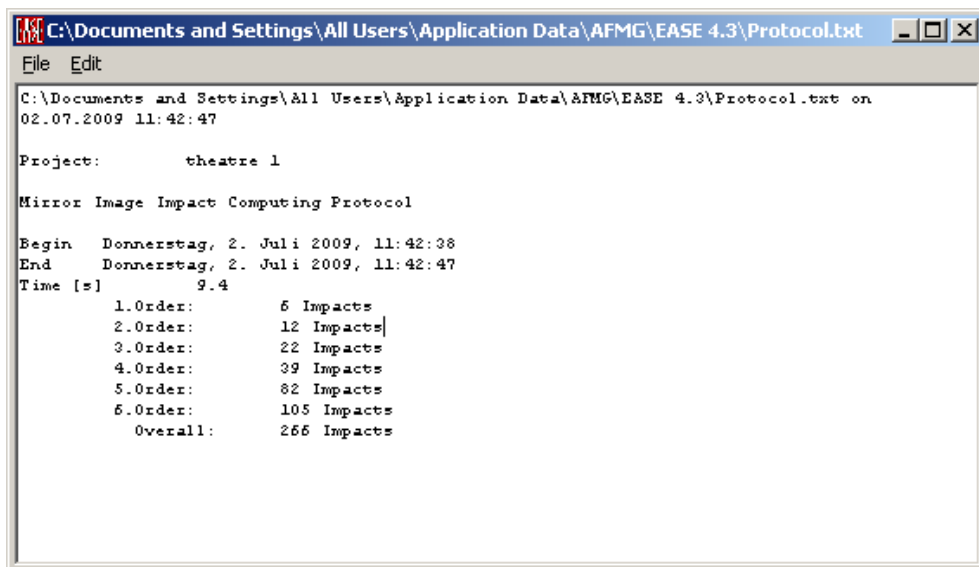
This indicates the transfer to the licensing application EASE Guard that allows you unlocking EASE and managing user licenses.
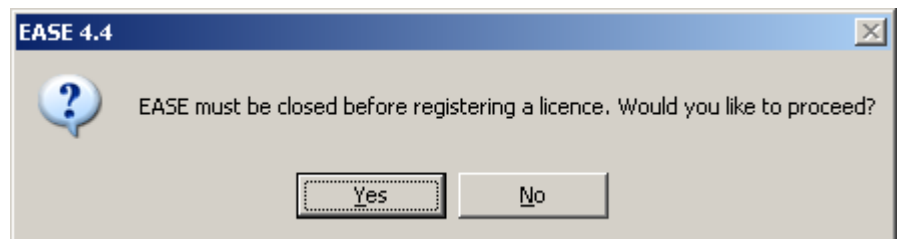
After closing EASE the separate EASE Guard routine will open to allow you downloading an EASE License Key.

View Protocol File Window

This displays basic information about how the most recent calculation was made or other textual information created by EASE.

File Menu

This accesses Printing and File Management functions.

Save As

This **Saves** the current Protocol data to an ASCII file (.TXT). To use this command:

1. Left click on Save As to open a file save window.

2. Choose the desired directory and enter a file name.

Print Selected Text

This **Prints Selected Text.**

Print File Ctrl + P

This **Prints** the open window without the window frame, e.g. without the command buttons and scroll bars.

Exit

This closes the **View Protocol File** window.

Edit Menu

This accesses File Editing functions.

Copy Ctrl + C

This copies Selected Text.

Select All   Ctrl + A

This selects all the text for copying and pasting into other documents.

Chapter II: EASE Project Data / Case Data / Cluster Data

EASE Project Editor

The **Project Editor** is the principal means of entering project data into EASE. Other methods used involve importing data from other programs and files. The **Project Editor** is used to enter **Items** that are needed to build a **Room**. These **Items** are **Vertices, Edges,** and **Faces. Loudspeakers, IR Modulators, IR Radiators,** and **Lamps** are needed to excite the **Room** and **Audience Areas** and **Listener Seats** are **used** to analyze it. Once these **Items** have been entered into the **Room**, the **Project Editor** can be used to change the **Items** properties as needed.

The Project Editor must check all data, including imported data, before EASE can use it. The **Check Data** function checks for problems with the data that could cause math errors that might slow down computations or lead to inaccurate answers.

Project Main Window

The scrollbar on the left serves as zoom, at the bottom as horizontal turn, at the right as vertical turn.

Key Conventions

F1	Help
F2	Assign Item
F3	Show all items with the same assignment
F4	Property sheet
F5	Check Data
F6	Apply and Save Project Data
F7	Grid/Display settings
F8	Activates the selected item
F9	Options
F10	Status bar settings
F11	Zoom In w/o the scroll bars with no limit
F12	Zoom Out w/o the scroll bars with no limit

x	Changes to x-View and changes the selected editing plane to the y-z plane
y	Changes to y-View and changes the selected editing plane to the x-z plane
z	Changes to z-View and changes the selected editing plane to the x-y plane
3	3D-View
Home	Full View
o	Toggles the Omniview mode
Del	Deletes selected item
Ins	Duplicates an item and inserts it into the drawing
k	Keep item to measure distance between two selected items
p	Activates the Pick Function Mouse mode
d	Activates the Drag Function Mouse mode
c	Set the point selected with LMB at center of the display
n	Activates the Spin Function
V	Activates Insert Vertex Mouse Mode
E	Activates Insert Edge Mouse Mode
F	Activates Insert Face Mouse Mode
L	Activates Insert Loudspeaker Mouse Mode
A	Activates Insert Audience Area Mouse Mode
S	Activates Insert Listener Seat Mouse Mode
H	Check Holes
T	Activates Turn Mouse Mode
Left Arrow	Moves the horizontal rotation scrollbar to the left
Right Arrow	Moves the horizontal rotation scrollbar to the right
Up Arrow	Moves the vertical rotation scrollbar upwards
Down Arrow	Moves the vertical rotation scrollbar downwards
PgUp	Moves the Zoom scrollbar up to Zoom-In
PgDn	Moves the Zoom scrollbar down to Zoom-Out
Space	Set the point selected with LMB at center of the display

Ctrl+

	Changes Pick and Turn Mouse Mode to Drag Mouse Mode
F2	Change Color

F3	Global Assign items with the same properties
F8	Deactivates all Items
F12	Delete Stacked Vertices
F	Find item
N	New Project (stand-alone mode)
O	Open Project or Acquire Project Data (stand-alone mode)
S	Save Project or Apply Project Data (stand-alone mode)
A	Save Project As (stand-alone mode)
Z	Undo
Y	Redo
Left Arrow	Move viewpoint to the left
Right Arrow	Move viewpoint to the right
Up Arrow	Move viewpoint upwards
Down Arrow	Move viewpoint downwards
PgUp	Move the selected frequency +1
PgDn	Move the selected frequency –1

Shift+

	Changes Pick and Drag Mouse Mode to Turn Mouse Mode
F2	Change Rear Material
F3	Show all faces with the same Rear Material
F11	Pick next item of the project
F12	Pick previous item of the project
0 or k	Show distance between two selected items
Left Arrow	Move item selected in the -X
Right Arrow	Move item selected in the +X
Up Arrow	Move item selected in the +Y
Down Arrow	Move item selected in the -Y
PgUp	Move item selected in the +Z
PgDn	Move item selected in the –Z
c	Activates Fixed Center Mouse Mode
d	Displace selected item
t	Activates Fixed Cut Mouse Mode
x	Changes to x-View, changes the selected editing plane to the y-z plane and opens the Options Window to allow editing of the plane value
y	Changes to y-View, changes the selected editing plane to the x-z plane and opens the Options Window to allow editing of the plane value

z	Changes to z-View, changes the selected editing plane to the x-y plane and opens the Options Window to allow editing of the plane value

Shift+Ctrl+

F2	Change Rear Color
F3	Change All Same Rear Materials
F10	RMB (RM Menus)
F12	Deletes Unattached Vertices
V	Opens Vertices table
E	Opens Edges table
F	Opens Faces table
L	Opens Loudspeakers table
A	Opens Audience areas table
S	Opens Listener Seats table
I	Opens IR Emitters table
M	Opens Lamps table
O	Opens Objects table
W	Opens Wall Material table

Mouse Conventions

Mouse Modes

Pick	This allows selection of the object pointed at by the mouse cursor.
Activate	This allows the selected item to be activated
Location	Allows showing and marking of the cursor location. Coordinates shown are dependent on the window view. Example: X view will allow the coordinates shown to be y and z, etc.
Center	This allows picking of a spot and centering that spot on the screen.
Drag	This allows moving the model around on the background. Click on the part of the screen you want to move and hold the LMB and move the mouse to where you want the point to be. RMB aborts current action.
Turn	This allows rotating the viewpoint of the model around on the background. Click on the part of the screen you want to rotate and hold the LMB and move the mouse to where you want the point to be. With holding down the RMB you can Zoom In and Out.
Zoom In	This allows a graphic zoom-in function. Click on the part of the screen you want the zoom window to start and hold the LMB while dragging the window around the area to be

| | zoomed to. When the LMB is released the zoom will activate. RMB aborts current action. |
| Zoom Out | This allows a graphic zoom-out function. Click on the part of the screen that you want the box to start and hold the LMB while dragging the frame to cover the area of the screen that you want the present picture to cover. When the LMB is released the zoom will activate. RMB aborts current action. |

Mouse Mode Pick

LMB on item	This allows picking (selection) of item
LMB on background	This will unpick any item
RMB with picked item	This will open an operations menu for the selected item
RMB (nothing picked)	This will open an operation menu for general window adjustments

Mouse Mode Center

| LMB on picture | This will center the selected spot of the picture. |

Mouse Mode Turn

| LMB on picture | This allows rotating the viewpoint of the model around on the background |
| RMB on picture | This allows zooming in and out |

Mouse Wheel

Mouse wheel spinning allows zooming in and out.

Status Bar Conventions

The bar displays data for the project or window such as:

Item	This displays the Item label and material or speaker model number.
Picked Location	This displays the location, in x, y, and z coordinates, of the point picked on a Face or Area. It will also display the coordinates of an item that is defined as a single point, such as a Vertex, Loudspeaker or Listener Seat.
Mouse Mode	This displays the operational mode of the mouse. This can be Pick, Drag, Zoom In, Zoom Out, Center, Location or e.g. Insert Vertex. In the case of an insertion mouse mode a number sign shows that the Hold function is active.
Horizontal Angle	This displays the horizontal viewing angle of the window.
Vertical Angle	This displays the vertical viewing angle of the window.
Cursor	This displays the current x, y, and z coordinates

	of the selected plane. In the case of an insertion mouse mode this is where a Vertex etc. is inserted.
Checked	This displays the condition of the building closure or face position with a **True** or **False**.

File Menu (Normal or child mode)

This menu gives access to file management functions and program settings.

Combine Project

This allows a second Project to be combined with this Project. A prompt will allow entry of the point in this project to which the point of origin of the second project will be referenced.

Save Project Data F6

This command is a combined function command. This command sends the data to the parent window and saves the current EASE project immediately to the existing .FRD file.

Export ASCII File

This exports item files in a comma and quote-delimited format.

Edges

See …\EASE 4.4\Easepath\Examples_ASCII\Edges\SHOEBOX.xed for Format

Faces

See …\EASE 4.4\Easepath\Examples_ASCII\Faces\SHOEBOX.xfc for Format

Loudspeakers

See …\EASE 4.4\Easepath\Examples_ASCII\Speakers\SHOEBOX.xld for Format

Audience Areas

See …\EASE 4.4\Easepath\Examples_ASCII\Areas\SHOEBOX.xar for Format

Listener Seats

See …\EASE 4.4\Easepath\Examples_ASCII\Seats\SHOEBOX.xst for Format

IR Emitters

See …\EASE 4.4\Easepath\Examples_ASCII\IR\SHOEBOX.xdi for Format

Lamps

See …\EASE 4.4\Easepath\Examples_ASCII\Lamps\SHOEBOX.xlm for Format

Save OpenGL File

This saves an EASE Viewer file (.egl) for use in viewing in the EASE Viewer Window under EASE Main. This EASE viewer file in OpenGL format can be used separately and given to clients to help them view project information including wire frames, rendered 3D views, and mapped information.

Send Picture To

This allows the current active picture to be sent to the Clipboard, a File, or EASE Page Designer.

Clipboard

This copies the picture to the clipboard for use in other applications

File

This saves the picture to a file. The files can be saved in many formats, including:

Windows Bitmap…………………………*.BMP

JPEG…………………………………*.JPG

CompuServe GIF……………………….*.GIF

Portable Network Graphics…………………*.PNG

Tagged File Format…………………….*.TIF

LuRa Tech Wavelet……………………*.LWF

Zsoft Paintbrush……………………….*.PCX

Windows Icon……………………………*.ICO

Enhanced Windows Metafile………………*.EMF

Truevision Targa……………………..*.TGA.

EASE Page Designer

This opens the current active picture in the **EASE Page Designer** module, allowing modifications to and annotations of the picture before printing.

Print

This prints the open window, pixel for pixel, without the window frame, e.g. without the command buttons and scroll bars. For better print quality, use **Print HiRes.**

Print HiRes

Like **Print**, except that **Print HiRes** uses the full resolution of the printer, greatly reducing "jaggies" that occur with diagonal lines. The "standard" **Print** function prints the display, pixel by pixel.

Options

This opens the Options Window to allow setting of parameters for use in the **Project Editor**.

Shortcut: F9

Modify Toolbar

This command opens a window allowing modification and construction of the toolbars. Buttons and commands maybe added or subtracted as needed, and may be made smaller or larger.

Exit

This exits the **EASE Room Editor**

File Menu (standalone mode)

This menu gives access to file management functions and program settings.

New Project

This opens the EASE file system for insertion of new project files to store new project data.

Shortcut: Ctrl+N

To use this command:

1. Left Click on **New Project**.
2. This will open a window asking for a new project name. Enter new name in blank spot on window.
3. Left click on the **OK** button.

Open Project

This allows opening of Ease 4.x project files for viewing and editing project data.

Shortcut: Ctrl+O

To use this command:

1. Left click on **Open Project**.
2. This will open the **Open File** window.
3. Use the **Look In** portion of the window to find the folder holding the project file.
4. Left click on the project file name.
5. Left click on the **Open** button.

Combine Project

This allows a second project to be combined with this project. A prompt will allow entry of the point in this project to which the point of origin of the second project will be referenced.

Import EASE 2.1 Project

This allows importing EASE2.1 project files for viewing, editing and analysis.

Save Project

This saves the current EASE project immediately to the existing .FRD file. The file contains pointers to the **Speaker Models** database and **Wall Material** database information as well as to other databases and all relevant room construction data.

Shortcut: Ctrl+S

Save Project As

This saves current EASE project to a different file name using the .FRD suffix. This allows different versions of the same project, such as, different speakers or different room treatments without having to rebuild the room each time.

Shortcut: Ctrl+A

To use the command:

1. Left click on **Save Project As**
2. This opens a Save File Window
3. Using the **Save In** window select the folder to save the project to.
4. Enter the name of the new file in the **File** window
5. Left Click on the **Save** button

Import ASCII File

This imports item files in a comma and quote-delimited format.

Edges

See …\EASE 4.4\Easepath\Examples_ASCII\Edges\SHOEBOX.xed for Format

Faces

See …\EASE 4.4\Easepath\Examples_ASCII\Faces\SHOEBOX.xfc for Format

Loudspeakers

See …\EASE 4.4\Easepath\Examples_ASCII\Speakers\SHOEBOX.xld for Format

Audience Areas

See …\EASE 4.4\Easepath\Examples_ASCII\Areas\SHOEBOX.xar for Format

Listener Seats

See …\EASE 4.4\Easepath\Examples_ASCII\Seats\SHOEBOX.xst for Format

IR Emitters

See …\EASE 4.4\Easepath\Examples_ASCII\IR\SHOEBOX.xdi for Format

Lamps

See …\EASE 4.4\Easepath\Examples_ASCII\Lamps\SHOEBOX.xlm for Format

Export ASCII File

This exports item files in a comma and quote-delimited format.

Edges

See …\EASE 4.4\Easepath\Examples_ASCII\Edges\SHOEBOX.xed for Format

Faces

See …\EASE 4.4\Easepath\Examples_ASCII\Faces\SHOEBOX.xfc for Format

Loudspeakers

See …\EASE 4.4\Easepath\Examples_ASCII\Speakers\SHOEBOX.xld for Format

Audience Areas

See …\EASE 4.4\Easepath\Examples_ASCII\Areas\SHOEBOX.xar for Format

Listener Seats

See …\EASE 4.4\Easepath\Examples_ASCII\Seats\SHOEBOX.xst for Format

IR Emitters

See …\EASE 4.4\Easepath\Examples_ASCII\IR\SHOEBOX.xdi for Format

Lamps

See …\EASE 4.4\Easepath\Examples_ASCII\Lamps\SHOEBOX.xlm for Format

Save OpenGL File

This saves an EASE Viewer file (.egl) for use in viewing in the EASE Viewer Window under EASE Main. This EASE viewer file in OpenGL format can be used separately and given to clients to help them view project information including wire frames, rendered 3D views, and mapped information.

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This allows the current active picture to be sent to the Clipboard, a File, or EASE Page Designer.

Clipboard

This copies the picture to the clipboard for use in other applications

File

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    Windows Bitmap……………………………*.BMP
    JPEG…………………………………………*.JPG
    CompuServe GIF……………………………*.GIF
    Portable Network Graphics…………………*.PNG
    Tagged File Format…………………………*.TIF
    LuRa Tech Wavelet…………………………*.LWF
    Zsoft Paintbrush……………………………*.PCX
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    Truevision Targa……………………………*.TGA.

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Options

This opens the Options Window to allow setting of parameters for use in the **Project Editor**.

Shortcut: F9

Modify Toolbar

This command opens a window allowing modification and construction of the toolbars. Buttons and commands maybe added or subtracted as needed, and may be made smaller or larger.

Exit

This exits the **EASE Room Editor**.

File Menu (case mode)

This menu gives access to file management functions and program settings when editing **Loudspeaker Cases.**

Load DXF Case Data

This allows the loading of DXF formatted case information from other drawing programs such as AutoCAD.

Export ASCII File

This exports item files in a comma and quote-delimited format.

Edges

See …\EASE 4.4\Easepath\Examples_ASCII\Edges\SHOEBOX.xed for Format

Faces

See …\EASE 4.4\Easepath\Examples_ASCII\Faces\SHOEBOX.xfc for Format

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Tagged File Format…………………………*.TIF

LuRa Tech Wavelet…………………………*.LWF

Zsoft Paintbrush……………………………*.PCX

Windows Icon……………………………….*.ICO

Enhanced Windows Metafile………………*.EMF

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Print HiRes

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Options

This opens the Options Window to allow setting of parameters for use in the **Project Editor**.

Shortcut: F9

Modify Toolbar

This command opens a window allowing modification and construction of the toolbars. Buttons and commands maybe added or subtracted as needed, and may be made smaller or larger

Exit

This exits the **EASE Case Editor**.

Item Menu

This menu controls which items can be visible and which can be invisible in the Edit Project module. It controls also the activation of items, and whether activated items are highlighted or not.

Vertices

A check here makes **Vertices** visible. A change causes a redraw.

Edges

A check here makes **Edges** visible. A change causes a redraw.

Faces

A check here makes **Faces** visible. A change causes a redraw.

Loudspeakers

A check here makes **Loudspeakers** visible. A change causes a redraw.

Audience Areas

A check here makes **Audience Areas** visible. A change causes a redraw.

Listener Seats

A check here makes **Listener Seats** visible. A change causes a redraw.

IR Emitters

A check here makes **IR Emitters** visible. A change causes a redraw.

Lamps

A check here makes **Lamps** visible. A change causes a redraw.

Objects

A check here makes **Objects** visible. A change causes a redraw.

Select Active Items

Shows lists of **Active Items** allowing you to add or remove **Items** from list. Active items can be used to create Objects or Clusters.

Vertices

This lists **Active Vertices**, and allows addition or removal of **Vertices** from the list.

To use this command:

1. Left click on **Select Active Items**, then **Vertices.** This opens a window displaying all **Vertices** that have been defined, and highlights the **Active** ones.

2. Select **Vertices** using the LMB. Right click on **OK** selects all or on **Cancel** deselects all.

3. Left click on **OK**.

Edges

This lists **Active Edges**, and allows addition or removal of **Edges** from the list.

To use this command:

1. Left click on **Select Active Items**, then **Edges.** This opens a window displaying all **Edges** that have been defined, and highlights the **Active** ones.

2. Select **Edges** using the LMB. Right click on **OK** selects all or on **Cancel** deselects all.

3. Left click on **OK**.

Faces

This lists **Active Faces**, and allows addition or removal of **Faces** from the list.

To use this command:

1. Left click on **Select Active Items**, then **Faces.** This opens a window displaying all **Faces** that have been defined, and highlights the **Active** ones.

2. Select **Faces** using the LMB. Right click on **OK** selects all or on **Cancel** deselects all.

3. Left click on **OK**.

Loudspeakers

This lists **Active Loudspeakers**, and allows addition or removal of **Loudspeakers** from the list.

To use this command:

1. Left click on **Select Active Items**, then **Loudspeakers.** This opens a window displaying all **Loudspeakers** that have been defined, and highlights the **Active** ones.

2. Select **Loudspeakers** using the LMB. Right click on **OK** selects all or on **Cancel** deselects all.

3. Left click on **OK**.

Audience Areas

This lists **Active Audience Areas**, and allows addition or removal of **Audience Areas** from the list.

To use this command:

1. Left click on **Select Active Items**, then **Audience Areas.** This opens a window displaying all **Audience Areas** that have been defined, and highlights the **Active** ones.

2. Select **Audience Areas** using the LMB. Right click on **OK** selects all or on **Cancel** deselects all.

3. Left click on **OK**.

Listener Seats

This lists **Active Listener Seats**, and allows addition or removal of **Listener Seats** from the list.

To use this command:

1. Left click on **Select Active Items**, then **Listener Seats.** This opens a window displaying all **Listener Seats** that have been defined, and highlights the **Active** ones.

2. Select **Listener Seats** using the LMB. Right click on **OK** selects all or on **Cancel** deselects all.

3. Left click on **OK**

IR Emitters

This lists **Active IR Emitters**, and allows addition or removal of **IR Emitters** from the list.

To use this command:

1. Left click on **Select Active Items**, then **IR Emitters.** This opens a window displaying all **IR Emitters** that have been defined, and highlights the **Active** ones.

2. Select **IR Emitters** using the LMB. Right click on **OK** selects all or on **Cancel** deselects all.

3. Left click on **OK**

Lamps

This lists **Active Lamps**, and allows addition or removal of **Lamps** from the list.

To use this command:

1. Left click on **Select Active Items**, then **Lamps.** This opens a window displaying all **Lamps** that have been defined, and highlights the **Active** ones.

2. Select **Lamps** using the LMB. Right click on **OK** selects all or on **Cancel** deselects all.

3. Left click on **OK**

Show Active Items

Defines if active items are shown highlighted.

Vertices

A check here highlights all active **Vertices**. A change causes a redraw.

Edges

A check here highlights all active **Edges**. A change causes a redraw.

Faces

A check here highlights all active **Faces**. A change causes a redraw.

Loudspeakers

A check here highlights all active **Loudspeakers**. A change causes a redraw.

Audience Areas

A check here highlights all active **Audience Areas**. A change causes a redraw.

Listener Seats

A check here highlights all active **Listener Seats**. A change causes a redraw.

IR Emitters

A check here highlights all active **IR Emitters**. A change causes a redraw.

Lamps

A check here highlights all active **Lamps**. A change causes a redraw.

Edit Menu

This menu allows manipulation of all project data in either graphic or tabular form.

Undo

This command reverses the previous action performed. The command Save Project Data cannot be undone.

Shortcut: **Ctrl+Z**

Undo All

This command restores the model to its condition before all of the previous actions performed since the last Save Project Data command.

Redo

This command reverses the last **Undo** action.

Shortcut: **Ctrl+Y**

Redo All

This command reverses all **Undo** actions performed since the last Save Project Data command.

New Item

This command inserts a new item in the project.

To use this command:

1. Left click on **New Item**.
2. This will open a window labeled **Select Item**.
3. After selection a message window will appear asking "**New (ITEM NAME)?**".
4. Click on **OK**.
5. A Properties window will open for the selected item.
6. See Properties window for instruction in data entry.
7. Left click on **OK**.

Duplicate

This command allows multiple duplication of a **selected item** in place or displaced depending on option settings.

Shortcut: **Insert**

To use this command:

1. Pick the item to be duplicated
2. Left click on **Duplicate**
3. This will open a **Displacement** window.
4. If you wish to move the new item to a new spot insert the correct delta coordinates (or **polar** coordinates) and the number of duplications (under **Repeated**) and click **OK**. If you click **Cancel** the program will assume you want to use the current position coordinates to create the new item.

---

5. A Properties window will open for insertion of the new item parameters (only for **Repeated** =1)

Delete

This command will remove the picked item from the project.

Shortcut: **Delete**

Properties

This command will open a **Properties Window** for the selected item.

Shortcut: **F4**

Area Layout

This will open the **Area Layout Window** to modify the area shift parameters and to insert or move **Listener Seats** on **Audience Areas**. Shifting an Area using this command would have an effect only on viewing the Areas in Area Mapping module but will not change the Area coordinates in the room model.

Select Project Database

Select Speaker Models

This opens Select Project Database Window, allowing **Speaker Models** to be added to or removed from the **Project**.

Select Wall Materials

This opens Select Project Database Window, allowing **Wall Materials** to be added to or removed from the **Project.**

Select Light Sources

This opens the Select Project Database Window, allowing **Light Sources** to be added to or removed from the **Project.**

Select Textures

This opens Select Project Database Window, allowing **Textures** to be added to or removed from the **Project.**

Select IR Radiators

This opens Select Project Database Window, allowing **IR Radiators** to be added to or removed from the **Project.**

Select IR Modulators

This opens the Select Project Database Window, allowing **IR Modulators** to be added to or removed from the **Project.**

Room Data

This opens the Room Data Window for entry and display of **Room Parameters**, and for the calculation and display of room statistical parameters such as volume, surface area, absorption and reverberation.

Recompute Room Data

This forces a recalculation of statistical **Room Data** (volume, surface area, reverberation time) from the model and opens the Room Data Window where the result can be viewed (but not edited). To edit data displayed in this window, use **Room Data** from the **Edit** menu.

Tables

This allows editing of all items in a tabular form so that modifications can be done quickly and easily.

Vertices

This will open the Vertex Table Window in edit mode.

Shortcut: **Ctrl**+**Shift**+**V**

Edges

This will open the Edge Table Window in edit mode.

Shortcut: **Ctrl**+**Shift**+**E**

Faces

This will open the Face Table Window in edit mode.

Shortcut: **Ctrl**+**Shift**+**F**

Loudspeakers

This will open the Loudspeaker Table Window in edit mode.

Shortcut: **Ctrl**+**Shift**+**L**

Audience Areas

This will open the Audience Area Table Window in edit mode.

Shortcut: **Ctrl**+**Shift**+**A**

Listener Seats

This will open the Listener Seat Table Window in edit mode.

Shortcut: **Ctrl**+**Shift**+**S**

IR Emitters

This will open the IR Emitter Table Window in edit mode.

Shortcut: **Ctrl**+**Shift**+**I**

Lamps

This will open the Lamp Table Window in edit mode.

Shortcut: **Ctrl**+**Shift**+**M**

Objects

This will open the Object Table Window in edit mode.

Shortcut: **Ctrl**+**Shift**+**O**

Check Data

Check Data checks the integrity of the project data that you have entered to make certain there are no errors, ambiguities, or other conflicts that might cause an error in the calculations. If your room is **Open, Check Data** tests for the orientation of the faces and for **Faces** and **Audience Areas** that are non-planar.

If your model has been set to **Closed,** so that you can compute and model reverberation, **Check Data** will also check to make sure that **Faces** have been defined to completely and unambiguously define an enclosed space, for **Vertices** that are not included in a plane, and other important parameters.

Shortcut: **F5**

View Menu

This menu allows access to all viewing tools, and also sets the screen display for editing windows.

Omniview

This command allows the program to display x, y, z and 3-D views at the same time. **X, Y** and **Z views** are single view windows not variations of the 3-D view. To set grids see Options Window, Grid Tab. Room editing can take place in any of the view windows simultaneously. This command causes an immediate redraw.

3D Perspective

This command has four preset angles, e.g. (60 deg x –30 deg). This displays the object isometrically.

Shortcut: **3**

Side View (x)

This displays a side view of the object in the YZ- Plane. This is otherwise known as the X-View. This view is a variation of the 3-D mode.

Shortcut: **x**

End View (y)

This displays an elevation view of the object in the XZ- Plane. This is otherwise known as the Y-View. This view is a variation of the 3-D mode.

Shortcut: **y**

Plan View (z)

This displays a plan view of the object in the XY- Plane. This is otherwise known as the Z-View. This view is a variation of the 3-D mode.

Shortcut: **z**

Redraw

This forces a drawing update.

Full View

This forces the drawing to fit the window to a fixed tolerance and causes immediate redraw.

Zoom In

This increases the zoom percentage.

Shortcut: **PgUp** or **F11**

Zoom Out

This decreases the zoom percentage.

Shortcut: **PgDn** or **F12**

Item View

This opens, after picking an item, the Item View Window and allows the viewing of the room from the perspective of any picked **Vertex, Edge, Face, Loudspeaker, Audience Area, Listener Seat, IR Emitter** or **Lamp**.

Room RT

This displays the statistically calculated or user-defined **Reverberation Time** as a function of frequency, both graphically and as a table.

See also Reverberation Time Window**.**

Tables

This command allows viewing, but not editing, of the item tables. To **Edit Tables**, use the **Edit Menu** functions.

Wall Materials

This command opens the Wall Materials Table for Viewing (but not Editing). With a Short Cut F3 you will be able to see the faces having the picked wall material highlighted. An option allows setting these highlighted faces to the active mode.

Vertices

This command opens the Vertex Table Window for Viewing (but not Editing). To **Edit Vertex Tables**, use **Edit | Tables | Vertices**.

Edges

This command opens the Edge Table Window for Viewing (but not Editing). To **Edit Edge Tables**, use **Edit | Tables | Edges**.

Faces

This command will open the Face Table Window for Viewing (but not Editing). To **Edit Face Tables**, use **Edit | Tables | Faces**.

Loudspeakers

This command will open the Loudspeaker Table Window for Viewing (but not Editing). To **Edit Loudspeaker Tables**, use **Edit | Tables | Loudspeakers**.

Audience Areas

This command will open the Audience Area Table Window for Viewing (but not Editing). To **Edit Audience Areas Tables**, use **Edit | Tables | Audience Areas**.

Listener Seats

This command will open the Listener Seat Table Window for Viewing (but not Editing). To **Edit Listener Seat Tables**, use **Edit | Tables | Listener Seats**.

IR Emitters

This command will open the IR Emitter Table Window for Viewing (but not Editing). To **Edit IR Emitter Tables**, use **Edit | Tables | IR Emitters**.

Lamps

This command will open the Lamp Table Window for Viewing (but not Editing). To **Edit Lamp Tables**, use **Edit | Tables | Lamps**.

Objects

This command will open the Object Table Window for Viewing (but not Editing). To **Edit Object Tables**, use **Edit | Tables | Objects**.

Insert Menu

This Menu allows insertion and/or creation of new items for use in your project. Use the mouse to define the position of each new item. Note that it is not necessary to be precise in initial placement. The exact coordinates can be entered in the properties windows for the related item. Also, the **Snap Resolution** can be edited under **Options/Grid** to fix a position.

Note: If you follow a particular procedure below and the item you placed does not appear on the screen, check the **Show Item section of the Tool Bar** to make sure that items of that type are set to be displayed. Items to be displayed on the screen will have under **Item Menu** a check mark next to them.

Vertex

This command allows direct insertion of **Vertices** into the drawing.

To use this command:

1. Left click on **Vertex**.

2. This will allow the use of the mouse to select a position for the new **Vertex**. It is not necessary to be exact. The **Snap Resolution** can be edited under **Options/Grid** to fix a position.

3. Left click at that position.

4. This will open the **Vertex Properties Window**.

5. Enter the exact x, y and z coordinates.

6. Left click on **OK.**

Shortcut: **v**

Edge

This command allows direct insertion of **Edges** into the drawing using existing **Vertices**.

To use this command:

1. Left click on **Edge**.

2. This will allow the use of the mouse to select two **Vertices**. These two **Vertices** will define the position of the new edge.

3. Left click to pick the first **Vertex**.

4. Using the mouse stretch the line to the next **Vertex** and pick it with the LMB.

5. This will open the **Edge Properties Window**.

6. Left click on **OK.**

Shortcut: **e**

Note: If after starting an Edge you decide that you don't want to continue that process simply right click anywhere on the screen. The **Insert Edge** command will still be active should you want to start over.

Face

This command allows direct insertion of **Faces** into the drawing.

To use this command:

1. Left click on **Face**.

2. This will allow the use of the mouse to select **Vertices**. These **Vertices** will define the new **Face**.

3. Left click to pick or create the first **Vertex**.

4. Using the mouse stretch the line to the next **Vertex** and pick or create it with the LMB. Continue this action until you return to the original **Vertex**.

5. This will open the **Face Properties Window**.

6. Enter any data into the **Face Properties Window**.

7. Left click on **OK.**

Shortcut: **f**

Loudspeaker

This command allows direct insertion of **Loudspeakers** into the drawing.

To use this command:

1. Left click on **Loudspeaker**.

2. This will allow the use of the mouse to select a position for the new **Loudspeaker**. It is not necessary to be exact. The **Snap Resolution** can be edited under **Options/Grid** to fix a position. Left click at that position.

3. This will open the **Loudspeaker Properties Window**.

4. Enter data into the **Loudspeaker Properties Window**.

5. Left click on **OK.**

Shortcut: **l**

Audience Area

This command allows direct insertion of **Audience Areas** into the drawing.

To use this command:

1. Left click on **Audience Area**.

2. This will allow the use of the mouse to select a position for the new **Audience Area**. It is not necessary to be exact The **Snap Resolution** can be edited under **Options/Grid** to fix a position.

3. Left click at the first, second, third and fourth positions.

4. This will open the **Audience Area Properties Window**.

5. Enter the exact x, y and z coordinates for each of the four points.

6. Left click on **OK.**

Shortcut: **a**

Listener Seat

This command allows direct insertion of **Listener Seats** into the drawing.

To use this command:

1. Left click on **Listener Seat**.

2. This will allow the use of the mouse to select a position for the new Listener Seat. It is not necessary to be exact. The **Snap Resolution** can be edited under **Options/Grid** to fix a position.

3. Left click at that position.

4. This will open the **Listener Seat Properties Window**.

5. Enter the exact x, y and z coordinates.

6. Left click on **OK.**

Shortcut: **s**

IR Emitters

This command allows direct insertion of **IR Emitters** into the drawing.

To use this command:

1. Left click on **IR Emitters**.

2. This will allow the use of the mouse to select a position for the new **IR Emitter**. It is not necessary to be exact. The **Snap Resolution** can be edited under **Options/Grid** to fix a position.

3. Left click at that position.

4. This will open the **IR Emitter Properties Window**.

5. Enter the exact x, y and z coordinates.

6. Left click on **OK.**

Lamps

This command allows direct insertion of **Lamps** into the drawing.

To use this command:

1. Left click on **Lamp**.

2. This will allow the use of the mouse to select a position for the new **Lamp**. It is not necessary to be exact. The **Snap Resolution** can be edited under **Options/Grid** to fix a position.

3. Left click at that position.

4. This will open the **Lamp Properties Window**.

5. Enter the exact x, y and z coordinates.

6. Left click on **OK.**

Object

This command allows direct insertion of **Objects** into the drawing.

To use this command:

1. Left click on **Object**.

2. A dialog box will open asking for the file of the **Object** you want to insert.

3. A prompt will allow entry of the point in this project to which the point of origin of the **Object** will be referenced.

4. Left click on **OK**

Loudspeaker Array

This command allows direct insertion of **Loudspeaker Arrays** into the drawing.

To use this command:

1. Left click on **Loudspeaker Array**.

2. A dialog box will open asking for the file of the **Loudspeaker Array** you want to insert.

3. A prompt will allow entry of the point in this project to which the point of origin of the **Loudspeaker Array** will be referenced.

4. Left click on **OK.**

Create Object

This allows creation of an **Object** from any combination of items.

To use this command:

1. Left click on **Create Object**.

2. A dialog box will open asking "Assign Active Items to New Object?". **Yes** will automatically add all items currently active to the **Object** created. **No** will let you start with an empty **Object** without references. **Cancel** will stop creating object.

3. This will open the **Object Properties Window**.

4. Modify data as necessary.

5. Left click on **OK.**

Create Shape 2D

This command allows direct insertion of **Faces** having selected shapes into the drawing.

Square

This command allows direct insertion of a square shaped **Face** into the drawing. Each two opposite edges of the **Face** have to be parallel to one of the Editing Plane axes.

To use this command:

1. Left click on **Square**. This will allow the use of the mouse to define the area of the new **Face**.

2. Left click to pick the first **Vertex** or position.

3. Using the mouse, stretch the square to the next **Vertex** or position and pick it with the LMB. This will create the new **Face**.

4. Use **F2** to assign a **Wall Material** to the **Face**, This opens the **Choose Material Window.**

5. Select each **Vertex** and use **F4** to reassign the exact x, y and z coordinates.

Rectangle

This command allows direct insertion of a rectangular **Face** into the drawing. Each two opposite edges of the **Face** have to be parallel to one of the Editing plane axes.

To use this command:

1. Left click on **Rectangle**. This will allow the use of the mouse to define the area of the new **Face**.

2. Left click to pick the first **Vertex** or position.

3. Using the mouse, stretch the rectangle to the next **Vertex** or position and pick it with the LMB. This will create the new **Face**.

4. Use F2 to assign a **Wall Material** to the **Face**. This opens the **Choose Material Window.**

5. Select each **Vertex** and use F4 to reassign the exact x, y and z coordinates.

Polygon

This command allows direct insertion of an irregular-shaped **Face** into the drawing.

To use this command:

1. Left click on **Polygon**.

2. This will allow the use of the mouse to select positions. These positions will define the new **Face**.

3. Left click to pick the first **Vertex** or position.

4. Using the mouse, stretch the line to the next position and pick it with the LMB. Continue this action until you created the desired shape except for the last edge.

5. Right click will create the last edge and finish the **Face**.

6. Use F2 to assign a **Wall Material** to the **Face**. This opens the **Choose Material Window**.

7. Select each **Vertex** and use F4 to reassign the exact x, y and z coordinates.

Regular Polygon

This command allows direct insertion of a regular **Face** with equal-length edges into the drawing. This command will allow insertion of a square at any angle.

To use this command:

1. Left click on **Regular Polygon**.

2. This will open an Insert Regular Polygon window allowing selection of the way to create the **Face**.

3. Left click on **OK**

   For further details see **Insert Regular Polygon Window**

   Use **F2** to assign a **Wall Material** to the **Face**. This opens the **Choose Material Window**

4. Select each **Vertex** and hit **F4** to reassign the exact x, y and z coordinates.

Create Shape 3D

This command allows the insertion of selected three-dimensional shapes into the drawing and these shapes are oriented vertically and cannot be oriented horizontally. You can turn it and move it in any direction by manipulating the associated **Object** afterwards.

To use this command:

1. Left click on **Create Shape 3D**. This will open the Create Shape 3D Window.

2. Left click on **OK** after settings to create the **Object**.

For further details see Create Shape 3D Window.

Cuboid
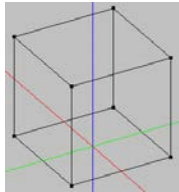
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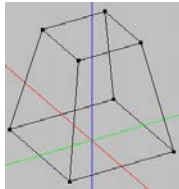
Cupola
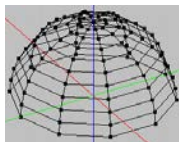
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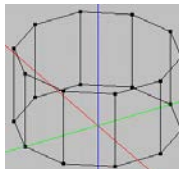
Cone
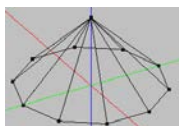
Load Prototype

This command allows insertion of a complete building with **Loudspeakers**, **Audience Areas** and **Listener Seats** into the drawing. The prototype can be used for simple investigations or as a starting point for completion of a similar more complex building. This building can be selected and modified by using the Load Prototype Window. Thirty-Three different prototypes are available for your use in the **Load Prototype Window**.

Amphitheater
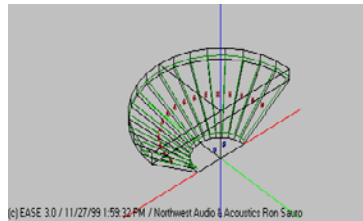
Basilica
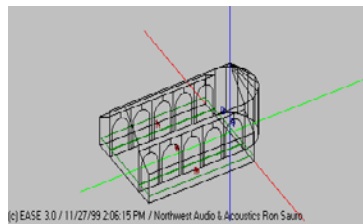
Church
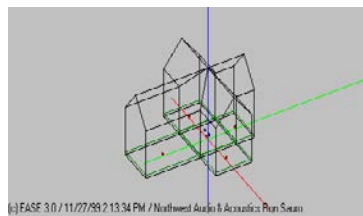
Church (A)

Colosseum

Gothic Dome

(c) EASE 3.0 / 11/27/99 2:25:06 PM / Northwest Audio & Acoustics Ron Sauro

Multipurpose

(c) EASE 3.0 / 11/27/99 2:35:10 PM / Northwest Audio & Acoustics Ron Sauro

Octagon

(c) EASE 3.0 / 11/27/99 2:40:09 PM / Northwest Audio & Acoustics Ron Sauro

Opera

(c) EASE 3.0 / 11/27/99 2:45:51 PM / Northwest Audio & Acoustics Ron Sauro

Redoubt

(c) EASE 3.0 / 11/27/99 2:53:01 PM / Northwest Audio & Acoustics Ron Sauro

Shell

(c) EASE 3.0 / 11/27/99 4:10:25 PM / Northwest Audio & Acoustics Ron Sauro

Sporting Hall

(c) EASE 3.0 / 11/27/99 4:12:27 PM / Northwest Audio & Acoustics Ron Sauro

Stadium

(c) EASE 3.0 / 11/27/99 4:14:32 PM / Northwest Audio & Acoustics Ron Sauro

Stadium 2

(c) EASE 3.0 / 11/27/99 4:17:53 PM / Northwest Audio & Acoustics Ron Sauro

Station

(c) EASE 3.0 / 11/27/99 4:20:24 PM / Northwest Audio & Acoustics Ron Sauro

Theater

(c) EASE 3.0 / 11/27/99 4:22:16 PM / Northwest Audio & Acoustics Ron Sauro

Tri-Cube

(c) EASE 3.0 / 11/27/99 4:24:19 PM / Northwest Audio & Acoustics Ron Sauro

Aud-Sloping Floor

Aud-Slanting Walls
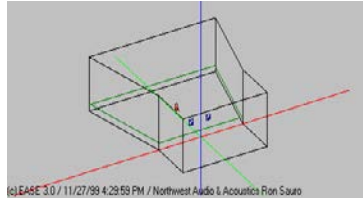
Aud-Peaked Roof
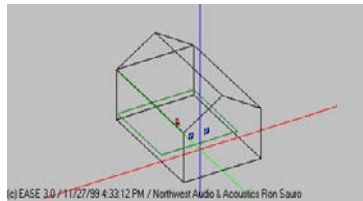
Aud-Balcony
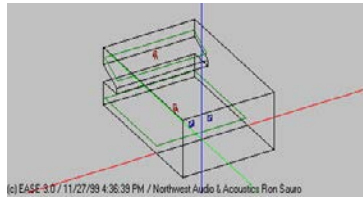
Aud-Slope Floor-Slant Walls
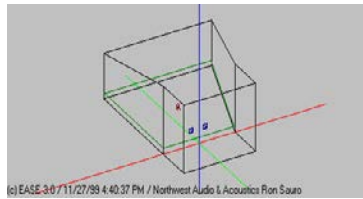
Aud-Sloped Floor-Peaked Roof
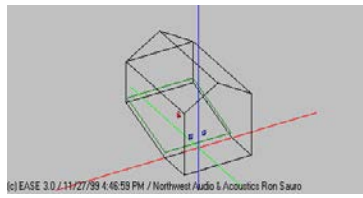
Aud- Sloped Floor-Balcony
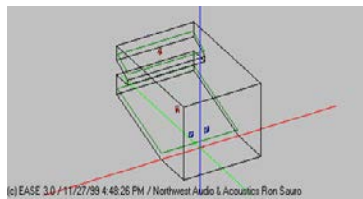
Aud-Slanted Walls-Peaked Roof
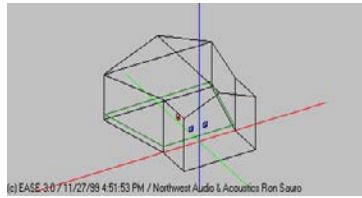
Aud-Slanted Walls-Balcony
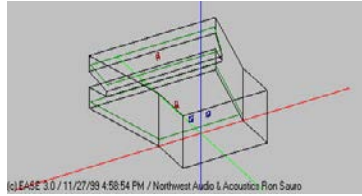
Aud-Peaked Roof-Balcony
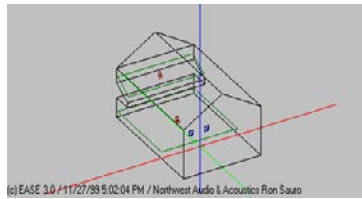
Aud-Sloped Floor-Slanted Walls- Peaked Roof
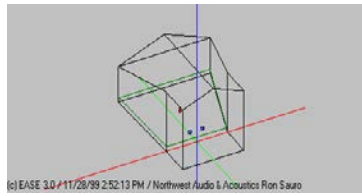
Aud-Sloped Floor-Slanted Walls-Balcony
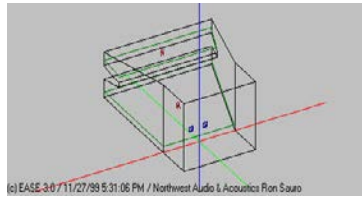
Aud-Sloped Floor-Peaked Roof-Balcony
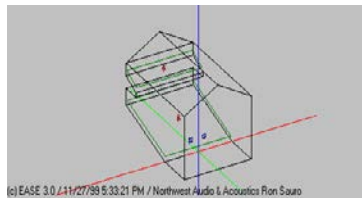
Aud-Slanted Walls-Peaked Roof-Slanted Walls-Balcony
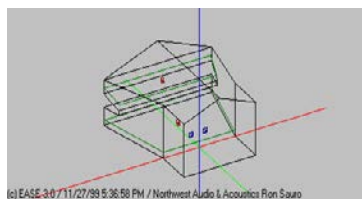
Aud-Sloped Floor-Peaked Roof-Balcony
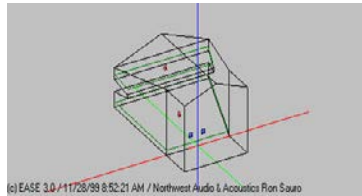
Auditory
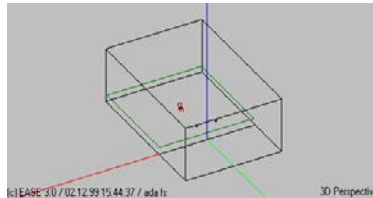
Linear Array

This command will insert a series of equally spaced items along a straight line. The entry of a starting and an ending coordinate will define the line orientation. In addition the number of items has to be entered.

Vertices
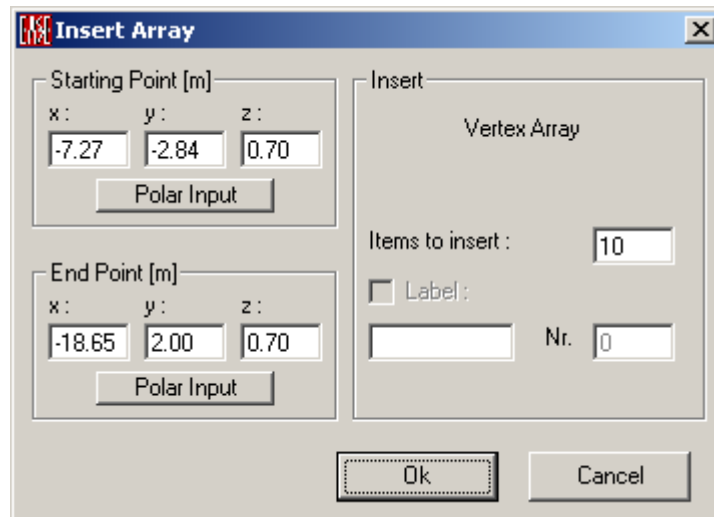
This command will insert a series of **Vertices** along a straight line.

To use this command:

1. Left click on **Vertices**.

2. Left click on a starting position. It is not necessary to be exact.

3. Using the mouse, stretch the line to the second position and pick it with the LMB. This will open a window labeled **"Insert Array"**.

4. **Items to insert**: Enter the number of vertices.

5. **Starting Point / Ending Point:** Enter the x, y and z coordinates. (If using polar coordinates then enter **Starting Point** using x, y and z coordinates and then click **Polar Input** to define horizontal and vertical angles and distance of the ending point. Remember that θ is zero for the +x-axis and that positive angles are measured counterclockwise)

6. Left click on **OK** to create the array.

(Label option is not active, the **Vertices** get their labels automatically).

Loudspeakers

This command will insert a series of **Loudspeakers** along a straight line.

To use this command:

1. Left click on **Loudspeakers.**

2. Left click on a starting position. It is not necessary to be exact.

3. Using the mouse, stretch the line to the second position and pick it with the LMB. This will open a window labeled **"Insert Array".**

4. **Items to insert**: Enter the number of **Loudspeakers**.

5. **Label**: The **Loudspeakers** can be labeled automatically by selecting **Label** with the LMB. Enter desired label and starting number.

6. **Starting Point / Ending Point:** Enter the x, y and z coordinates. (If using polar coordinates then enter **Starting Point** using x, y and z coordinates and then click **Polar Input** to define horizontal and vertical angles and distance of the ending point. Remember that θ is zero for the +x-axis and that positive angles are measured counterclockwise)

7. Left click on **OK** to create the array.

Listener Seats

This command will insert a series of **Listener Seats** along a straight line.

To use this command:

1. Left click on **Listener Seats.**

2. Left click on a starting position. It is not necessary to be exact.

3. Using the mouse, stretch the line to the second position and pick it with the LMB. This will open a window labeled **"Insert Array".**

4. **Items to insert**: Enter the number of **Listener Seats**.

5. **Label**: The **Listener Seats** can be labeled automatically by selecting **Label** with the LMB. Enter desired label and starting number.

6. **Starting Point / Ending Point:** Enter the x, y and z coordinates. (If using polar coordinates then enter **Starting Point** using x, y and z coordinates and then click **Polar Input** to define horizontal and vertical angles and distance of the ending point. Remember that θ is zero for the +x-axis and that positive angles are measured counterclockwise)

7. Left click on **OK** to create the array.

IR Emitters

This command will insert a series of IR Emitters along a straight line.

To use this command:

1. Left click on **IR Emitters.**

2. Left click on a starting position. It is not necessary to be exact.

3. Using the mouse, stretch the line to the second position and pick it with the LMB. This will open a window labeled **"Insert Array".**

4. **Items to insert**: Enter the number of IR Emitters.

5. **Label**: The IR Emitters can be labeled automatically by selecting **Label** with the LMB. Enter desired label and starting number.

6. **Starting Point / Ending Point:** Enter the x, y and z coordinates. (If using polar coordinates then enter **Starting Point** using x, y and z coordinates and then click **Polar Input** to define horizontal and vertical angles and distance of the ending point. Remember that θ is zero for the +x-axis and that positive angles are measured counterclockwise)

7. Left click on **OK** to create the array.

Lamps

This command will insert a series of **Lamps** along a straight line.

To use this command:

1. Left click on **Lamps.**

2. Left click on a starting position. It is not necessary to be exact.

3. Using the mouse, stretch the line to the second position and pick it with the LMB. This will open a window labeled **"Insert Array".**

4. **Items to insert**: Enter the number of **Lamps**.

5. **Label**: The **Lamps** can be labeled automatically by selecting **Label** with the LMB. Enter desired label and starting number.

6. **Starting Point / Ending Point:** Enter the x, y and z coordinates. (If using polar coordinates then enter **Starting Point** using x, y and z coordinates and then click **Polar Input** to define horizontal and vertical angles and distance of the ending point. Remember that θ is zero for the +x-axis and that positive angles are measured counterclockwise)

7. Left click on **OK** to create the array.

Circular Array

This command will insert a series of Items along a circular line.

Vertices

This command will insert a series of **Vertices** along a curved line.

To use this command:

1. Left click on **Vertices**.

2. Left click on a starting position. It is not necessary to be exact.

3. Using the mouse, stretch the line to the second position and pick it with the LMB. This will open a window labeled **"Insert Array".**

4. **Items to insert**: Enter the number of **Vertices**.

5. **Starting Point / Ending Point / Point on Arc:** Enter the x, y and z coordinates. (If using polar coordinates then enter **Starting Point** using x, y and z coordinates and then click **Polar Input** to define horizontal and vertical angles and distance of the ending point. Remember that θ is zero for the +x-axis and that positive angles are measured counterclockwise)

6. Left click on **OK** to create the array.

(Label option is not active, the **Vertices** get the labels automatically).

Loudspeakers

This command will insert a series of **Loudspeakers** along a curved line.

To use this command:

1. Left click on **Loudspeakers**.

2. Left click on a starting position. It is not necessary to be exact.

3. Using the mouse, stretch the line to the second position and pick it with the LMB. This will open a window labeled **"Insert Array".**

4. **Items to insert**: Enter the number of **Loudspeakers**.

5. **Label**: The **Loudspeakers** can be labeled automatically by selecting **Label** with the LMB. Enter desired label and starting number.

6. **Starting Point / Ending Point / Point on Arc:** Enter the x, y and z coordinates. (If using polar coordinates then enter **Starting Point** using x, y and z coordinates and then click **Polar Input** to define horizontal and vertical angles and distance of the ending point. Remember that θ is zero for the +x-axis and that positive angles are measured counterclockwise)

7. Left click on **OK** to create the array.

Listener Seats

This command will insert a series of **Listener Seats** along a curved line.

To use this command:

1. Left click on **Listener Seats.**

2. Left click on a starting position. It is not necessary to be exact.

3. Using the mouse, stretch the line to the second position and pick it with the LMB. This will open a window labeled **"Insert Array".**

4. **Items to insert**: Enter the number of **Listener Seats**.

5. **Label**: The **Listener Seats** can be labeled automatically by selecting **Label** with the LMB. Enter desired label and starting number.

6. **Starting Point / Ending Point / Point on Arc:** Enter the x, y and z coordinates. (If using polar coordinates then enter **Starting Point** using x, y and z coordinates and then click **Polar Input** to define horizontal and vertical angles and distance of the ending point. Remember that θ is zero for the +x-axis and that positive angles are measured counterclockwise)

7. Left click on **OK** to create the array.

IR Emitters

This command will insert a series of **IR Emitters** along a curved line.

To use this command:

1. Left click on **IR Emitters.**

2. Left click on a starting position. It is not necessary to be exact.

3. Using the mouse, stretch the line to the second position and pick it with the LMB. This will open a window labeled **"Insert Array".**

4. **Items to insert**: Enter the number of **IR Emitters**.

5. **Label**: The **IR Emitters** can be labeled automatically by selecting **Label** with the LMB. Enter desired label and starting number.

6. **Starting Point / Ending Point / Point on Arc:** Enter the x, y and z coordinates. (If using polar coordinates then enter **Starting Point** using x, y and z coordinates and then click **Polar Input** to define horizontal and vertical angles and distance of the ending point. Remember that θ is zero for the +x-axis and that positive angles are measured counterclockwise)

7. Left click on **OK** to create the array.

Lamps

This command will insert a series of **Lamps** along a curved line.

To use this command:

1. Left click on **Lamps.**

2. Left click on a starting position. It is not necessary to be exact.

3. Using the mouse, stretch the line to the second position and pick it with the LMB. This will open a window labeled **"Insert Array".**

4. **Items to insert**: Enter the number of **Lamps**.

5. **Label**: The **Lamps** can be labeled automatically by selecting **Label** with the LMB. Enter desired label and starting number.

6. **Starting Point / Ending Point / Point on Arc:** Enter the x, y and z coordinates. (If using polar coordinates then enter **Starting Point** using x, y and z coordinates and then click **Polar Input** to define horizontal and vertical angles and distance of the ending point. Remember that θ is zero for the +x-axis and that positive angles are measured counterclockwise)

7. Left click on **OK** to create the array.

Sequence

This command will allow input of an irregular sequence of items or positions using polar, relative and absolute coordinates.
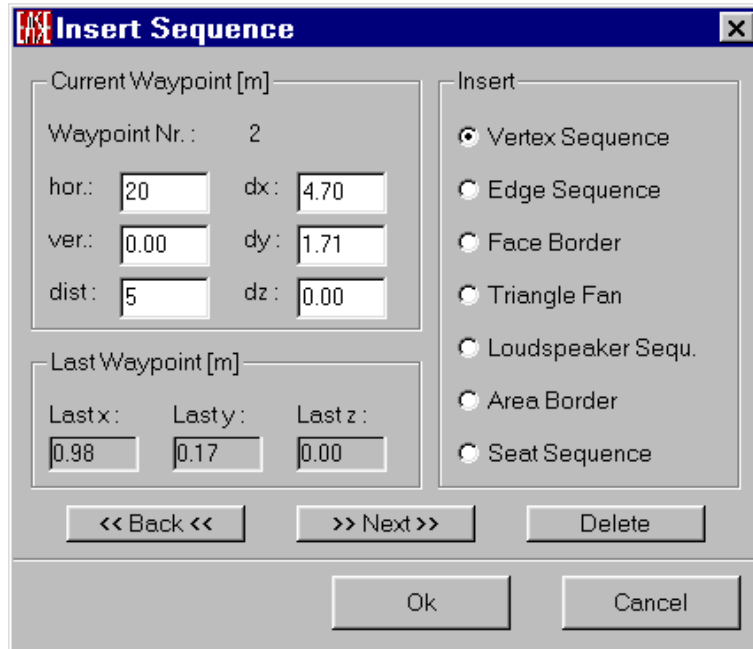
These sequence items can be:

Vertex Sequence	This inserts a series of **Vertices**.
Edge Sequence	This inserts a series of **Edges** connected together.
Face Border	This inserts a series of **Vertices** describing the area of a **Face**.
Triangle Fan	This inserts a series of **Vertices** describing a series of triangular **Faces** with the starting point common to all triangles.
Loudspeaker Sequence	This inserts a series of **Loudspeakers**.
Area Border	This inserts the four points describing an **Audience Area**.
Seat Sequence	This inserts a series of **Listener Seats**.

To use this command:

1. Left click on **Sequence.**

2. This will open a window labeled **"Insert Sequence".**

3. Choose one of the sequences listed above.

4. Insert the first position using polar, relative or absolute coordinates referenced to the building origin (0,0,0).

5. Left click on **Next**.

6. All subsequent positions are described as relative to the previous position except the absolute coordinates.

7. The previous position is shown in the upper left of the window.

8. To move back in the list left click on **Back**.

9. To remove a single position from the list left click on **Delete**.

10. To finish the sequence repeat steps 5 and 6.

11. Left click on **OK**.

Calculate Cluster

When a **Project** contains two or more **Loudspeakers**, those **Loudspeakers** can be replaced by a **Cluster**. When **Loudspeakers** are combined into a **Cluster**, the **Speaker Base** module calculates the balloon for the new **Cluster** loudspeaker whose balloon is equivalent to the combined behavior of the original **Loudspeakers** in the Far Field. When computing the model, EASE will replace the selected **Loudspeakers** with the new **Cluster**. This can significantly speed up calculations in a complex model.

Note: In EASE, a **Cluster** is an approximation that can be quite good in the Far Field but that generally has poor validity in the Near Field. In general, **Loudspeakers** should be combined into a **Cluster** only when their performance in the Near Field is not important (i.e., when they will not be near listeners). If Near Field performance is important, the single loudspeaker components used to create the **Cluster** should be used in the calculations.

To use this command:

1. Make sure data is checked using **Check Data** in the **Edit Menu**.

2. Left click on **Calculate Cluster.** This opens the **Cluster Options** window**.**
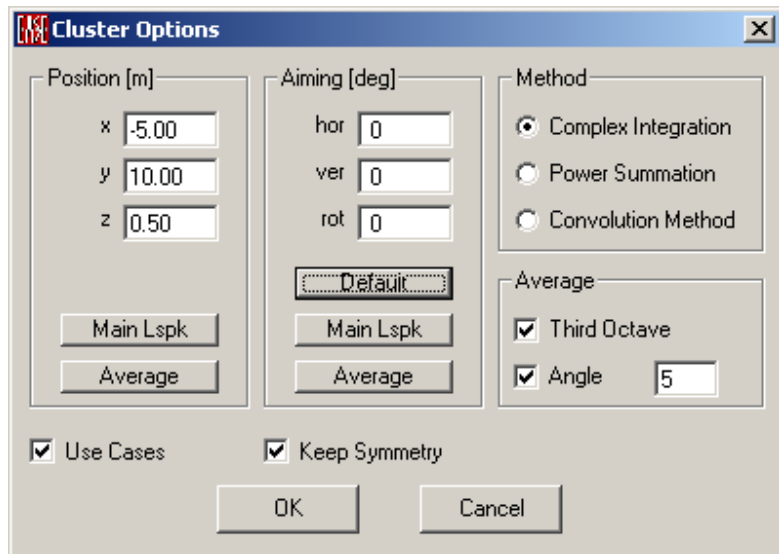
3. The **Position** is the desired resultant reference point of the **Cluster**.

   a. If **Main Lspk** is selected, a window will open allowing the selection of a **Loudspeaker**. The reference point **Position** is then set to the position of the chosen **Loudspeaker**.

   b. If **Average** is selected, **Position** shows the average location of the reference points of the **Active Loudspeakers**.

4. **Aiming** is the resultant direction selected for the cluster.

   a. If **Default** is selected, **Aiming** shows the default direction of loudspeakers (0,0,0).

   b. If **Main Lspk** is selected, a window will open allowing the selection of a loudspeaker. The Aiming direction is then set to the direction of the chosen **Loudspeaker**.

   c. If **Average** is selected, **Aiming** shows the average direction of the active loudspeakers.

5. **Method:** Select the formula used to calculate the cluster balloon:

a. **Complex Integration**: This uses running time complex interference to calculate the new directivity balloon.

b. **Power Summation**: This uses simple energy addition to calculate the cluster balloon. Additions and cancellations due to different phase differences will not be considered.

c. **Convolution Method**: This is a simplified approximation using the formulae developed by Mark Ureda.

6. **Average**: This allows selection of the method that mathematically smoothes the cluster balloon:

a. **Third Octave** averages the energy over the frequency bandwidth of 1/3 octave.

b. **Angle** averages the energy over the angle chosen.

7. **Use Cases**: This command allows the use of the **Active Loudspeaker Cases** to construct the **Case** of the new **Cluster Speaker Model**. When used in the room the **Cluster Case** will appear as all of the individual **Loudspeaker Cases** but the single **Cluster Loudspeaker** will be used to compute acoustic performance.

8. **Keep Symmetry**: This command allows the symmetry of the cluster balloon and case data to be kept, if the active loudspeakers are arranged symmetrically and the speaker models (cases, balloons) are symmetric.

9. Left click on **OK**.

10. This will open a **Save File** window. Select path and filename for new cluster speaker model. Left click on **Save**.

11. The **Busy** window will open and indicate it is calculating the balloon of the new cluster.

12. The next window will ask **"Replace Active Loudspeakers?"**

13. Left click on **Yes** will allow the replacement of the active loudspeakers by the new cluster loudspeaker.

14. The next window will ask **"Show Balloon?"**

15. Left click on **Yes** will open the Speaker Base module and show a 3D view of the computed cluster.

Recompute Cluster (Edit Cluster only)

This command performs a grouping function on selected loudspeakers. This function is used to calculate, under the speaker base, the cluster balloon.

To use his command:

1. Make sure data is checked using **Check Data** in the **Edit Menu**.

2. Make sure that at least two loudspeakers are activated.

3. Left click on **Recompute Cluster**.

4. This will open a window labeled **"Cluster Options".**

5. The **Position** is the desired resultant reference point of the **Cluster**.

a. If **Main Lspk** is selected, a window will open allowing the selection of a **Loudspeaker**. The reference point **Position** is then set to the position of the chosen **Loudspeaker**.

b. If **Average** is selected, **Position** shows the average location of the reference points of the **Active Loudspeakers**.

6. **Aiming** is the resultant direction selected for the cluster.

   a. If **Default** is selected, **Aiming** shows the default direction of loudspeakers (0,0,0).

   c. If **Main Lspk** is selected, a window will open allowing the selection of a loudspeaker. The Aiming direction is then set to the direction of the chosen **Loudspeaker**.

   c. If **Average** is selected, **Aiming** shows the average direction of the active loudspeakers.

7. **Method:** Allows selection of the formulae used to calculate the cluster balloon:

   a. **Complex Integration**: This uses running time complex interference to calculate the directivity balloon.

   b. **Power Summation**: This uses simple energy addition to calculate the cluster balloon.

   c. **Convolution Method**: This is using the formulae developed by Mark Ureda.

8. **Average**: This allows selection of the method mathematically smoothing the cluster balloon:

   a. **Third Octave** averages the energy over the frequency bandwidth of 1/3 octave.

   b. **Angle** averages the energy over the angle chosen.

9. **Use Cases**: This command allows the use of the active loudspeaker cases to construct the case of the new cluster speaker model. When used in the room the cluster case will appear as the individual loudspeaker cases but will act as a single loudspeaker.

10. **Keep Symmetry**: This command allows the symmetry of the cluster balloon and case data to be kept, if the active loudspeakers are arranged symmetrically and the speaker models (cases, balloons) are symmetric.

11. Left click on **OK.**

Explode Cluster

This replaces a **Cluster Loudspeaker** by its component **Loudspeakers**.

Note: The **Explode** function allows the component **Loudspeakers** to remain a group if they compose a group -- they can still be manipulated and moved as a single group using the command Tools | Move Loudspeaker Group -- but their contributions to the EASE model will be computed using each of the individual **Loudspeakers** rather than the "resultant" **Cluster Loudspeaker**. This means that computations will take longer to complete, but their results in the Near Field will be valid. To use this command:

1. Pick cluster loudspeaker.

2. Left click on **Ungroup Cluster**.

3. A window will ask **"Replace Picked Loudspeaker?"**

4. Left click on **"Yes"** will replace the picked cluster loudspeaker with its component loudspeakers.

Tools Menu

This menu holds the tools that manipulate the items selected. This can include cutting, moving and deleting specific items. There are also tools for adjusting the acoustics of the room.

Fixed Cut

This command will split a **Face** into two parts by picking two **Vertices** that belong to the **Face**. Remember that all **Vertices** selected have to be included in the selected **Face** definition.

To use this command:

1. **Left click** on **Fixed Cut.**
2. **Pick** first **Vertex**.
3. **Pick** second **Vertex**.
4. This will complete the cut of the **Face** into two **Faces**.

Shortcut: **Shift+t**

Move Item

This command enables the move mode. Use **Omniview** to move exactly using snap functions.

To use this command:

1. **Left click** on **Move Item.**
2. **Pick** the item to move.
3. Use the mouse to drag the Item to a new location.
4. **Left click** to place the item.

Note: Right click will escape from function.

Move Loudspeaker Group

This command allows the selection of one or more **Loudspeakers** to be moved or aimed as a group.

To use this command:

1. Left click on **Move Loudspeaker Group.** This will open a window allowing selection of the **Loudspeakers** to be moved.
2. Select **Loudspeakers** using the LMB. Right click on **OK** selects all or on **Cancel** deselects all.
3. Left click on **OK**. This opens a "**Move Active Items**" window. The window is in two sections. There is **Move** (ft, meters) and **Aim** (degrees).
4. The arrows in the **Move** section allow movement in the X, Y and Z directions. The windows show the distances to be moved when actuated.
5. The **Step** window allows setting the distance moved with each button press.
6. The arrows in the **Aim** section allow orientation in the **Hor**izontal, **Ver**tical and **Rot**ational domains. The windows show the angles to be rotated when actuated.
7. The **Step** window allows setting the degrees-radians rotated with each button press.

8. The **Details** button opens another section of the window describing the moving center point. This can be the average position of the group or it can be a specific Loudspeaker's reference point.

9. The **Aiming Axis** area shows the total change of the group.

10. The **Main Lspk** button allows selection of a single **Loudspeaker** whose axis is the moving point axis.

11. **Close** will exit from the window
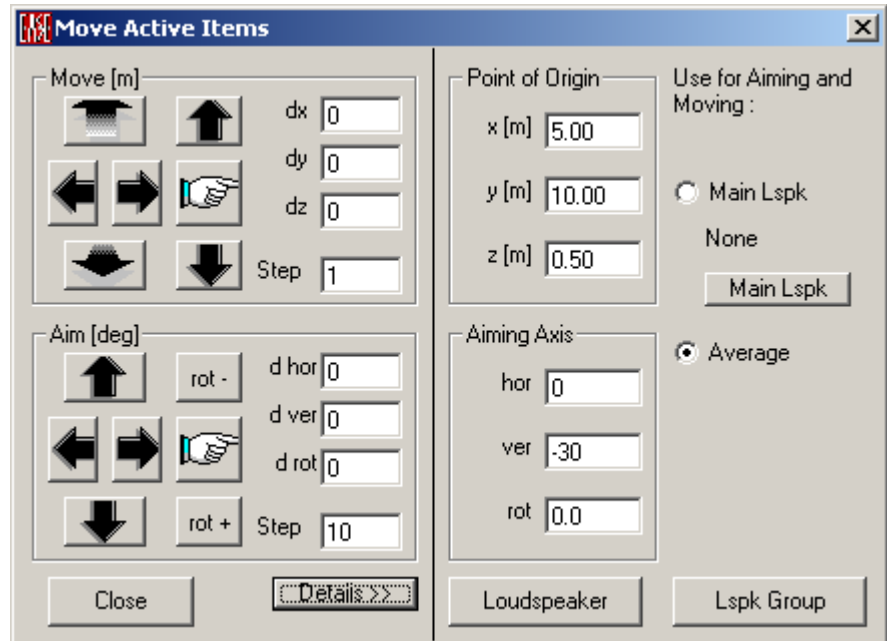
Move Object

This command allows the selection of an **Object** to be moved or aimed.

To use this command:

1. Select the **Object** to be moved by picking the **Object** axes position.

2. All movements will around the "zero" position of the **Object Axes**

3. Left click on **Move Object**

4. This opens a **Move Object Window**.

5. The window is separated into two sections. There is **Move** (ft, meters) and **Aim** (degrees).

6. The arrows in the **Move** section allow movement in the X, Y and Z directions. The windows show the distances to be moved when actuated.

7. The **Step** window allows setting the distance moved with each button press.

8. The arrows in the **Aim** section allow orientation in the **Hor**izontal, **Ver**tical and **Rot**ational domains. The windows show the angles to be rotated when actuated.

9. The **Step** window allows setting the degrees-radians rotated with each button press.

10. The **Details** button opens another section of the window describing the moving center point and aiming axis.

11. The **Aiming Axis** area shows the total change of the **Object**.

12. **Close** will exit from the window
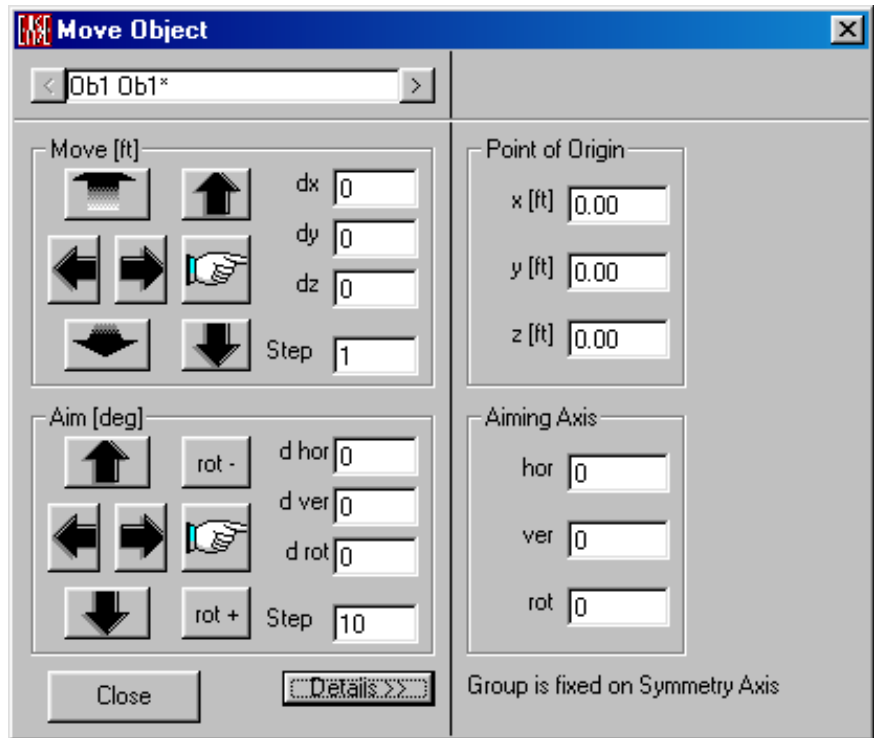
Delete Unattached Vertices

This command will delete all **Vertices** that are not used by **Faces** or **Edges**.

Shortcut: **Shift+ Ctrl+F12**

Delete Stacked Vertices

Multiple **Vertices** at the same point are called **Stacked Vertices. Stacked Vertices** are not needed in EASE. This command will delete all **Vertices** that occupy the same coordinates except one **Vertex**. It will also merge or combine all **Stacked Vertices** attached to **Faces** or **Edges** automatically.

Shortcut: **Ctrl+F12**

Check Holes

This command checks the integrity of the project. If the room is closed, it will be checked for **Vertices** not included in adjoining **Faces** and for the orientation of **Faces**. If the **Room** is **Open**, it is only checked for the **Faces** orientation. If holes are found, this command will locate them in the model by listing their coordinates and highlighting such locations graphically. It can also fix these holes in many cases. See also Check Holes Window.

Optimize RT

This command allows entering a desired material characteristic/reverberation time curve and searching the project material base for a **Wall Material** that most closely approximates the desired absorption.

 Note: Data must be Checked before using this option.

This command will open the Optimize RT Window**.**

Mirror Insertion

This command activates the mirror insertion of selected items. This command cannot be used in symmetric projects.

To use this command:

1. Determine the mirror axis you want to use
2. Left Click on **Mirror Insertion**.
3. Check **Auto Mirror Insertion**
4. Check the Items you want to use.
5. To change axis left click on **Change Axis**.
6. Left click on **OK** to close Options window
7. Left Click on **Insert** (**Vertex**, **Edge**, **Face**, **Loudspeaker**, **Audience Area**, etc.)
8. Left Click on screen to place first item and the mirrored one.
9. Repeat this process for each item.
10. To switch off Mirror Insertion left click on **Mirror Insertion**.
11. Uncheck **Auto Mirror Insertion**
12. Next Item is handled non-symmetrically.

Move Room Origin

This command will allow resetting the point of origin of the project.

To use this command:

1. Left click **Move Room Origin**.
2. This opens a window labeled **"Insert Coordinates".**
3. Enter x, y and z delta coordinates.
4. Left click on **OK** to move the room origin.

Move Point of Reference (Edit Case only)

This command will allow resetting the point of origin of the case of a Loudspeaker.

To use this command:

1. Left click **Move Point of Reference**.
2. This opens a window labeled **"Insert Coordinates".**
3. Enter x, y and z delta coordinates.
4. Left click on **OK** to move the new Reference Point.

Rescale Room

This command is used to rescale the project. It allows you, for example, to double, triple or half the size of the project in the measures used in the room.

1. Left Click on **Rescale Room.** This opens an input window
2. Type the upscale or downscale factor, for example 2 for twice, 3 for triple and .5 for half size.
3. Click **OK** to apply or **Cancel** to not apply

Rescale Case (Edit Case only)

This command is used to rescale the case of a Loudspeaker. It allows you, for example, to double, triple or half the size of the case in the measures used in the project.

To use this command:

1. Left Click on **Rescale Case.** This opens an input window
2. Type the upscale or downscale factor, for example 2 for twice, 3 for triple and .5 for half size.
3. Click **OK** to apply or **Cancel** to not apply

Rotate Room

Use this command to rotate the room about the z-axis. In symmetric projects only a 180-degree rotation is permitted. For non-symmetric projects any rotation angle is permitted about the z-axis.

To use this command in asymmetric Projects:

1. Left Click on **Rotate Room.** This opens an input window
2. Type the Rotation angle for example 10, 90, 180, -20 etc.
3. Click **OK** to apply or **Cancel** to not apply

Rotate Case (Edit Case only)

Use this command to rotate a Loudspeaker Case about the z-axis. In symmetric projects only a 180-degree rotation is permitted. For non-symmetric Cases any rotation angle is permitted about the z-axis.

To use this command in asymmetrical cases:

1. Left Click on **Rotate Case.** This opens an input window
2. Type the Rotation angle for example 10. 90, 180, -20 etc.
3. Click **OK** to apply or **Cancel** to not apply

Utilities Menu

This menu holds tools useful in manipulation, labeling and saving of window displays.

Insert Parameter

This inserts information into the main picture for printing and presentations. This information can consist of things like:

- Name of the project
- Frequency of investigation
- Viewpoint (only for perspective view), vertical and horizontal view angles.

Find Item

This command allows entering an item label and searches the model for it. If found the item will be highlighted.

To use this command:

1. Left click on **Find Item**

2. This will open a window allowing insertion of the item label to be found.

3. Enter item label, e.g. "P1", "f2", "S2"

4. Left click on **OK**

5. If found the item will be highlighted

Shortcut: **Ctrl+F**

Spin

This command is an equivalent to the **Turn** and **Full** commands given one after another at high speed. The turning resolution and speed of redraw is set in **Options**. The speed is controlled by the computer capabilities. If the speed is set too high the computer will redraw at its maximum rate, whatever that is. If an item or spot is picked on the model then spinning will happen around the **Pick**ed item or spot.

Mouse Menu

This menu switches the mouse between six operating modes, and allows zooming the graphics display.

Pick

Sets the mouse to **Pick** mode, allowing the selection of **Vertices, Faces, Audience Areas, Edges, Loudspeakers, Lamps, IR Emitters,** and **Listener Seats**. The mouse can also be used to select points on the surface of **Faces**, along an **Edge** and in the plane of an **Audience Area**. The picked position can be used as a viewpoint in a perspective view function. **Pick** mode also enables the Right Mouse Button (RMB) to access the **RMB Menu.**

Shortcut: **P**

Activate Items

This switches the mouse to **Activate Items** Mode. In this mode, the mouse will **Activate** all **Items** it touches with **Left Click**, and all **Items** that it encloses or touches with a **LMB** drag across them. The mouse will remain in **Activate Items** mode until changed to another mode. Deactivation will be done with the RMB drag across the activated items.

Note: **Activate Mode** will activate items even though they may not be checked on the **Item | Show Active** Menu. To see all items that are activated, make sure that their types are checked on **Show Active Items** in the **Item** Menu.

Activate Mode

This switches the mouse to Activate Mode. **Left Click** selects an Item and **Right Click** activates the same Item. If Items lie close to each other, repeated **Left Clicks** can be used until the desired **Item** is selected.

Location

This command enables the cursor to select a position and to show the appropriate x, y or z cursor coordinates. This function is most usable in the x, y or z single view mode.

To use this command:

1. Left click on Location.

2. Move the mouse cursor to the position of interest.

3. Left click to view but not insert.

4. Right click to view and insert.

Center

In this mode, the display will be panned to place the point selected with LMB at center of the display.

Shortcut: **c**

Drag

This allows moving the viewpoint of the model around on the background. Click on the part of the screen you want to move and hold the LMB and move the mouse to where you want the point to be.

Turn

This allows rotating the viewpoint of the model around on the background. Click on the part of the screen you want to rotate and hold the LMB and move the mouse to where you want the point to be. With holding down the RMB you can Zoom In and Out.

Shortcut: **t**

Zoom In

This allows a graphic zoom-in function. Click on the part of the screen you want the zoom window to start and hold the LMB while dragging the window around the area to be zoomed to. When the LMB is released the zoom will activate.

Zoom Out

This allows a graphic zoom-out function. Click on the part of the screen that you want the box to start and hold the LMB while dragging the frame to cover the area of the screen that you want the present picture to cover. When the LMB is released the zoom will activate.

Share Menu

This function allows multiple open windows to share parameters and to act upon that information immediately. For example, a Mapping window could share parameters with Loudspeaker Aiming and the Speaker Model's Balloon. In general, most parameters that can be placed on the Status Bar can be Shared (even though their display on the Status Bar may be switched off in Options).

Frequency

This toggles the frequency on or off as a common investigation parameter.

Horizontal Angle

This toggles the horizontal angle on or off as a common viewing parameter.

Vertical Angle

This toggles the vertical angle on or off as a common viewing parameter.

Zoom Angle

This toggles the Zoom or Scope angle on or off as a common viewing parameter.

Settings

This opens a window asking which setting(s) the current window wants to share with other windows such as those for ALCons, Interference and Bandwidth.

Window Menu

This menu sets the position of the current window.

Screen Quarter

This allows placement of the active window into any of 5 positions.

Center

This places the open window in the center of the screen.

Upper Left

This places the open window in the upper left corner of the screen.

Upper Right

This places the open window in the upper right corner of the screen.

Lower Left

This places the open window in the lower left corner of the screen.

Lower Right

This places the open window in the lower right corner of the screen.

Cascade Windows

This makes all open windows appear in a stacked format.

Help Menu

This menu allows access to all forms of help.

Help Topics

This offers a list of commonly asked help subjects. We have made a concerted effort to develop the Help files and the manual together. If you need an answer as to what a particular command does go to the help files. You will likely find your answer there.

About

This displays information about your EASE program.

About OpenGL

Information about OpenGL

Memory Used

This submenu displays the computer memory actually used.

RMB Menu - Nothing Picked

Room Data

This command opens the Room Data Window for entry of **Room Parameters**.

Deactivate All Items

This command deactivates all items.

Shortcut: **Ctrl+ F8**

Background Color

This opens the **Color Window** to allow setting of the background color used in the project data window.

Grids

This command opens the Options Window Grid Tab to allow setting the grids and the snap resolution.

Stepwidth

This command opens the Options Window Editing Tab to view and set the **Step Width** resolution. **Step Width** defines the increment for all movement controlled by keystrokes.

(….)- Plane Value

This command opens the Options Window Editing Tab to define an **Editing Plane** perpendicular to any one of the axes where all insertions will take place. The **Plane Value** is the displacement of this **Plane** from the origin. For example, a horizontal plane 4 ft above the origin is defined by z = +4 ft.

Options

This opens the Options Window to allow setting of parameters for use in that part of the program.

RMB Menu - Picked Vertex

Activate/Deactivate

This command toggles the activity status, **Activate** / **Deactivate**, of any **Vertex**.

Duplicate

This command allows duplication of a selected **Vertex** in place or displaced depending on option settings.

To use this command:

1. Left click on **Duplicate**.

2. This will open the **Displacement Window**.

3. If you wish to move the new **Vertex** to a new spot insert the correct delta coordinates and click **OK**. If you click **Cancel** the program

will assume you want to use the current position coordinates to create the new **Vertex**.

4. A **Properties** window will open for insertion of the new **Vertex** parameters.

5. Left click on **OK**

Shortcut: **Ins**

Delete

This command will remove the picked **Vertex** from the project if not attached to a **Face** or **Edge**.

Shortcut: **Del**

Displace

This command opens the **Displacement Window** for the **Vertex**. If you wish to move the **Vertex** to a new spot insert the correct delta coordinates for the move and click **OK.** If you click **Cancel,** the program will exit without changes.

Shortcut: **Shift+d**

Mirror Item

This command mirrors the selected **Vertex** around the axis plane defined under **Options | Mirror**.

See also Mirror Tab in Options Window

Center

This pans the display to **Center** the selected **Vertex** in the window.

Shortcut: **Enter**

Keep for Distance

This command makes the selected **Vertex** the reference to which the distance of subsequently selected items will be attributed when the **Show Distance** command is selected.

Shortcut: **k**

Show Distance

This command will allow showing the actual distance between two picked locations. When this command is first used in any Edit Project session, unpreceded by the command **Keep for Distance**, it will show the distance relative to the origin.

Shortcut: **Shift+0 or k**

To use this command:

1. Pick first location or item. This can be any place or item.

2. Right click to open context menu

3. Left click on **Keep for Distance**.

4. Pick second location or item.

5. Left click on **Show Distance**.

6. This will open a window showing delta x, y, z distances, linear distance and sound travel time.

7. Left click on **OK** will close the window.

Extrude

This command extrudes a **Vertex** along x, y, and z-axes to create an **Edge**, a **Face**, or a **Cuboid**. The **Displacement Window** will open where the displacement of the new **Vertex** or **Vertices** from the first can be entered in rectangular or polar coordinates. If displacement along only one axis is entered, an **Edge** will be created; if along two axes, a **Face** will be created; and if along three axes, a **Cuboid** (with six **Faces**) will be created.

Color

This command is used to change the color of the selected **Vertex** when used in other program modules, such as rendering.

To use this command:

1. Left click on **Color.**

2. This opens the **Color** window to allow setting of the Vertex color.

3. Left click on **OK.**

Shortcut: **Ctrl+F2**

Pick Radius

This opens the **Options Menu** for setting the **Pick Radius**. The **Pick Radius** is the side length in pixels of the square the mouse will search to find an **Item** .

Item View

This command will allow a **Perspective View** of the room from any picked **Vertex**. This command opens the Item View Window.

Properties

This command will open the Vertex Properties Window for the selected **Vertex**.

Shortcut: **F4**

RMB Menu - Picked Edge

Activate/Deactivate

This command toggles the activity status, **Activate** / **Deactivate**, of any **Edge**.

Duplicate

This command allows duplication of a selected **Edge** in place or displaced depending on option settings.

 To use this command:

1. Left click on **Duplicate**.

2. This will open the **Displacement Window**.

3. If you wish to move the new **Edge** to a new spot insert the correct delta coordinates for the move and click **OK**. If you click **Cancel** the program will assume you want to use the current position coordinates to create the new **Edge**.

4. A **Properties** window will open for insertion of the new **Edge** parameters.

5. Left click on **OK.**

Shortcut: **Ins**

Delete

This command will remove the picked **Edge** from the project.

Shortcut: **Del**

Displace

This command opens the **Displacement Window** for the **Edge**. If you wish to move the **Edge** to a new spot insert the correct delta coordinates for the move and click **OK**. If you click **Cancel** the program will exit without changes.

Shortcut: **Shift+d**

Mirror Item

This command mirrors the selected **Edge** around the axis plane defined under **Options | Mirror**.

See also Mirror Tab in Options Window

Center

This pans the display to **Center** the selected **Edge** in the window.

Shortcut: **Enter**

Keep for Distance

This command makes the selected **Edge** the reference to which the distance of subsequently selected items will be attributed when the **Show Distance** command is selected.

Shortcut: **k**

Show Distance

This command will allow showing the actual distance between two picked locations. When this command is first used in any Edit Project session, unpreceded by the command **Keep for Distance**, it will show the distance relative to the origin.

Shortcut: **Shift+0 or k**

To use this command:

1. Pick first location or item. This can be any place or item.
2. Right click to open context menu.
3. Left click on **Keep for Distance**.
4. Pick second location or item.
5. Left click on **Show Distance**.
6. This will open a window showing delta x, y, z distances, linear distance and sound travel time.
7. Left click on **OK** will close the window.

Extrude

This command extrudes an **Edge** along x, y, and z-axes to create a **Face**. The **Displacement Window** will open where the displacement of the new **Edge** from the first can be entered in rectangular or polar coordinates. If displacement along the axis of the **Edge** is entered, a longer or shorter overlay **Face** (looks like **Edges**) will result (**Don't use this command this way**). Otherwise the resulting **Face** will depend on the extrusion direction and the angles the original **Edge** has with the coordinate axes.

Color

This command is used to change the color of the selected **Edge** when used in other program modules, such as rendering.

To use this command:

1. Left click on **Color.**

2. This opens the **Color** window to allow setting of the **Edge** color.

3. Left click on **OK.**

Shortcut: **Ctrl+F2**

Item View

This command will allow a **Perspective View** of the room from any picked **Edge**. This command opens the **Item View Window**.

Properties

This command will open the Edge Properties Window for the selected **Edge**.

Shortcut: **F4**

RMB Menu - Picked Face

Activate/Deactivate

This command toggles the activity status, **Activate** / **Deactivate**, of any **Face**.

Duplicate

This command allows duplication of a selected **Face** in place or displaced depending on option settings.

To use this command:

1. Left click on **Duplicate.**

2. This will open the **Displacement Window**.

3. If you wish to move the new **Face** to a new spot insert the correct delta coordinates and click **OK**. If you click **Cancel** the program will assume you want to use the current position coordinates to create the new **Face**.

4. A **Properties** window will open for insertion of the new **Face** parameters.

5. Left click on **OK.**

Shortcut: **Ins**

Delete

This command will remove the picked **Face** from the project.

Shortcut: **Del**

Displace

This command opens the **Displacement Window** for the **Face**. If you wish to move the **Face** to a new spot insert the correct delta coordinates for the move and click **OK**. If you click **Cancel** the program will exit without changes.

Shortcut: **Shift+d**

Mirror Item

This command mirrors the selected face around the axis plane defined under **Options | Mirror**.

See also Mirror Tab in Options Window.

Center

This pans the display to **Center** the selected **Face** in the window.

Shortcut: **Enter**

Keep for Distance

This command makes the selected **Face** the reference to which the distance of subsequently selected items will be attributed when the **Show Distance** command is selected.

Shortcut: **k**

Show Distance

This command will allow showing the actual distance between two picked locations. When this command is first used in any Edit Project session, unpreceded by the command **Keep for Distance**, it will show the distance relative to the origin.

Shortcut: **Shift+0 or k**

To use this command:

1. Pick first location or item. This can be any place or item.
2. Right click to open context menu
3. Left click on **Keep for Distance**.
4. Pick second location or item
5. Left click on **Show Distance**.
6. This will open a window showing delta x, y, z distances, linear distance and sound travel time.
7. Left click on **OK** will close the window.

Extrude

This command extrudes a **Face** along x, y and z axes to create a three-dimensional body consisting of rectangular sides and a displaced copy of the original **Face**. The **Displacement Window** will open where the extrusion distances can be entered in rectangular or polar coordinates.

To use this command:

1. Left click on **Extrude.** This will open the **Displacement Window**.
2. If you wish to move the new **Face** to a new position insert the correct delta coordinates for the move and click **OK**.

Invert

This command allows the reversal of the primary side of the selected **Face** by reversing the order of all attached **Vertices**.

Flatten

This command allows flattening one or all **Faces** of the room in order to satisfy the room's tolerance setting for plane faces.
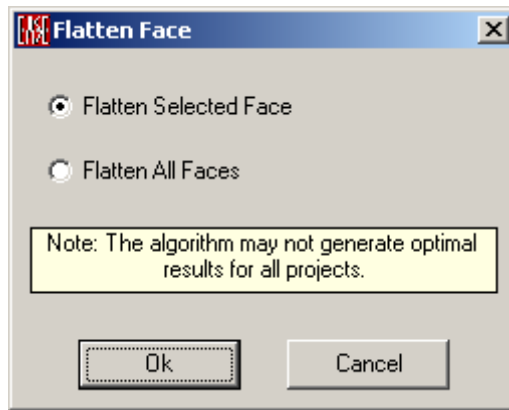
Flatten Selected Face

This command allows the selected non-planar **Face** to be changed to a plane. The new plane is composed of the average positions of all attached **Vertices**. These **Vertex** positions are updated automatically.

Flatten All Faces

This command performs an optimization run on all **Vertices** and **Faces** of the project. The procedure tries to move all **Vertices** of the room by the minimum amount required to obtain only plane **Faces**.

Warning: This may move Vertices in an unexpected way!

Hint: **Tolerance** for plane **Faces** can be edited under **Room Data** | **Settings**

Align Coat Face

This command moves a **Coat Face** close to the **Face** it is assigned to by the **Coat Face** properties and ensures that the **Coat Face** is located entirely inside the containing **Face**.

Vertex On Face Margin

This command allows the insertion of a **Vertex** along the edge of the selected **Face**. This **Vertex** is also added to the definition of all **Faces** using this common edge.

To use this command:

1. Left click on **Vertex On Face Margin**.
2. Use the mouse to move the **Vertex** along the margin to desired position.
3. Left click to insert **Vertex**.
4. Right click to escape insertion.

Hint: The location of the new **Vertex** is shown in the Statusbar panel **Cursor**.

Vertex On Face

This command allows the insertion of a **Vertex** at a picked spot in the plane of the selected **Face**.

To use this command:

1. Make sure the **Face** is selected at the desired point of insertion.

---

2. Left click on **Vertex On Face**.

3. This will open the **Vertex Properties** Window.

4. Left click on **OK**.

Area above Face

This command allows the creation of an **Audience Area** above a selected **Face**. This **Audience Area** is created at ear height above the selected **Face**. The limitations of this command are:

1. The **Face** shall have four **Vertices**.

2. The **Face** shall not exceed 60° vertically from the x-y plane.

Change Wall Material

This command allows the replacement of a **Wall Material** assigned to the selected **Face**.

To use this command:

1. Left click on **Change Wall Material**. This will open a **Select Wall Material** window.

2. Select desired **Wall Material**.

3. To see detailed information click on **Details**.

4. To edit the **Wall Materials** list click on **Browse**. This will open the **Select Project Database Window**.

5. Left click on **OK**.

Shortcut: **F2**

Show All Same

This command allows the highlighting of all **Faces** that are assigned the same **Wall Material**.

Shortcut: **F3**

Change All Same

This command allows replacing the **Wall Materials** of all **Faces** with the same **Wall Material** as the selected **Face**.

To use this command:

1. Left click on **Change All Same**. This will open a **Select Wall Material** window.

2. Select desired **Wall Material**.

3. To see detailed information click on **Details**.

4. To edit the **Wall Materials** list click on **Browse**. This will open the **Select Project Database** Window.

5. Left click on **OK**.

Shortcut: **Ctrl+F3**

Color

This command is used to change the color of the selected **Face** when used in other program modules, such as rendering.

To use this command:

1. Left click on **Color.**

2. This opens the **Color** window to allow setting of the **Face** color.

3. Left click on **OK.**

Shortcut: **Ctrl+F2**

Item View

This command will allow viewing the room from the picked position on the selected **Face**. This command opens the **Item View Window**.

Properties

This command will open the Face Properties Window for the selected **Face**.

Shortcut: **F4**

RMB Menu - Picked Loudspeaker

Activate/Deactivate

This command toggles the activity status, **Activate** / **Deactivate**, of any **Loudspeaker**.

Duplicate

This command allows duplication of a selected **Loudspeaker** in place or displaced depending on option settings.

 To use this command:

1. Left click on **Duplicate**.

2. This will open the **Displacement Window**

3. If you wish to move the new **Loudspeaker** to a new spot insert the correct delta coordinates for the move and click **OK**. If you click **Cancel** the program will assume you want to use the current position coordinates to create the new **Loudspeaker**.

4. A **Properties** window will open for insertion of the new **Loudspeaker** parameters.

5. Left click on **OK**.

Shortcut: **Ins**

Delete

This command will remove the picked **Loudspeaker** from the project.

Shortcut: **Del**

Displace

This command opens the **Displacement Window** for the **loudspeaker**. If you wish to move the **Loudspeaker** to a new spot insert the correct delta coordinates for the move and click **OK**. If you click **Cancel** the program will exit without changes.

Shortcut: **Shift+d**

Mirror Item

This command mirrors the selected **Loudspeaker** around the axis plane defined under **Options | Mirror**.

See also Mirror Tab in Options Window

Center

This pans the display to **Center** the selected **Loudspeaker** in the window.

Shortcut: **Enter**

Keep for Distance

This command makes the selected **Loudspeaker** the reference to which the distance of subsequently selected items will be attributed when the **Show Distance** command is selected.

Shortcut: **k**

Show Distance

This command will allow showing the actual distance between two picked locations. When this command is first used in any Edit Project session, unpreceded by the command **Keep for Distance**, it will show the distance relative to the origin.

Shortcut: **Shift+0 or k**

To use this command:

1. Pick first location or item. This can be any place or item.
2. Right click to open context menu
3. Left click on **Keep for Distance**.
4. Pick second location or item
5. Left click on **Show Distance**.
6. This will open a window showing delta x, y, z distances, linear distance and sound travel time.
7. Left click on **OK** will close the window.

Show/Hide dB Coverage Cones

This command toggles the viewing option that allows **Loudspeaker Coverage Cones** to be shown in the drawing. The display options can be modified under **Options | Items** to allow viewing of **3**, **6** and **9 dB Cones**. There are other parameters that can also be modified.

Set Aiming Point

Aiming point of a **Loudspeaker** is the intersection point of the **Loudspeaker** axis, along which SPL is normally maximum, and the **Audience Area** covered by the **Loudspeaker**. This command allows graphical aiming of the selected **Loudspeaker**.

To use this command:

1. Make sure **dB Cones** are shown.
2. Left click on **Set Aiming Point**.
3. Pick the desired **Loudspeaker** aiming point.
4. To reset **Loudspeaker** aiming to original position click RMB. The reset only applies to the last **Loudspeaker** aimed

Enter Aiming Point

This command allows entry of a specific X, Y and Z coordinate for aiming of the selected **Loudspeaker**.

Assign Mirror Loudspeaker

This command allows the assignment of any **Loudspeaker** as a mirror for use in turning or moving as a mirror function.

Change Speaker Model

This command allows the replacement of a **Speaker Model** assigned to the selected **Loudspeaker**.

To use this command:

1. Left click on **Change Speaker Model**.
2. This will open a **Select Speaker Model** window.
3. Select desired **Speaker Model**.
4. To see detailed information click on **Details**.
5. To edit the **Speaker Models** list click on **Browse**. This will open the **Select Project Database Window**.
6. Left click on **OK**.

Shortcut: **F2**

Show All Same

This command allows the highlighting of all **Loudspeakers** that are assigned the same **Speaker Model**.

Shortcut: **F3**

Change All Same

This command allows replacing the **Speaker Model** of all **Loudspeakers** with the same **Speaker Model** as the selected **Loudspeaker**.

To use this command:

1. Left click on **Change All Same**.
2. This will open a **Select Speaker Model** window.
3. Select desired **Speaker Model**.
4. To see detailed information click on **Details**.
5. To edit the **Speaker Models** list click on **Browse**. This will open the **Select Project Database Window**.
6. Left click on **OK**.

Shortcut: **Ctrl+F3**

Color

This command is used to change the color of the selected **Loudspeaker** when used in other program modules, such as rendering.

To use this command:

1. Left click on **Color.**
2. This opens the **Color** window to allow setting of the **Loudspeaker** color.

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3. Left click on **OK.**

Shortcut: **Ctrl+F2**

Loudspeaker Aiming

This command opens the **Item View Window** in **Loudspeaker Aiming** mode viewed from the reference point. This mode will allow graphical or manual aiming of the selected **Loudspeaker**.

Properties

This command will open the Loudspeaker Properties Window for the selected **Loudspeaker**.

Shortcut: **F4**

RMB Menu - Picked Audience Area

Activate/Deactivate

This command toggles the activity status, **Activate** / **Deactivate**, of any **Audience Area**.

Duplicate

This command allows duplication of a selected **Audience Area** in place or displaced depending on option settings.

 To use this command:

1. Left click on **Duplicate**

2. This will open the **Displacement Window**.

3. If you wish to move the new **Audience Area** to a new spot insert the correct delta coordinates for the move and click **OK**. If you click **Cancel** the program will assume you want to use the current position coordinates to create the new **Audience Area**.

4. A **Properties** window will open for insertion of the new **Audience Area** parameters.

5. Left click on **OK**

Shortcut: **Ins**

Delete

This command will remove the picked **Audience Area** from the project.

Shortcut: **Del**

Displace

This command opens the **Displacement Window** for an **Audience Area**. If you wish to move the **Audience Area** to a new spot insert the correct delta coordinates for the move and click **OK**. If you click **Cancel** the program will exit without changes.

Shortcut: **Shift+d**

Mirror Item

This command mirrors the selected **Audience Area** around the axis plane defined under **Options | Mirror**.

See also Mirror Tab in Options Window.

Center

This pans the display to **Center** the picked **Audience Area** in the window.

Shortcut: **Enter**

Keep for Distance

This command makes the picked point on the selected **Audience Area** the reference to which the distance of subsequently selected items will be attributed when the **Show Distance** command is selected.

Shortcut: **k**

Show Distance

This command will allow showing the actual distance between two picked locations. When this command is first used in any Edit Project session, unpreceded by the command **Keep for Distance**, it will show the distance relative to the origin.

Shortcut: **Shift+0 or k**

To use this command:

1. Pick first location or item. This can be any place or item.
2. Right click to open context menu
3. Left click on **Keep for Distance**.
4. Pick second location or item
5. Left click on **Show Distance**.
6. This will open a window showing delta x, y, z distances, linear distance and sound travel time.
7. Left click on **OK** will close the window.

Seat On Area

This command allows the insertion of a **Listener Seat** at a picked spot in the plane of the selected **Audience Area**.

To use this command:

1. Make sure the **Audience Area** is selected at the desired point of insertion.
2. Left click on **Seat On Area**.
3. This will open the **Listener Seat Properties** window.
4. Left click on **OK**.

Insert Seat Grid

This command allows insertion of a 2-dimensional array of **Listener Seats** covering the selected **Audience Area**. The spacing can be user defined. This grid can be used for investigations of reflections and reflectors in the **Raytracing Module**.

To use this command:

1. Left click on **Insert Seat Grid**.
2. This will open a window allowing entry of the x spacing of **Listener Seats**.
3. Left click on **OK**.

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4. This will open a window allowing entry of the y spacing of **Listener Seats**.

5. Left click on **OK**.

Color

This command is used to change the color of the selected **Audience Area** when used in other program modules, such as rendering.

To use this command:

1. Left click on **Color**.

2. This opens the **Color** window to allow setting of the **Audience Area** color.

3. Left click on **OK**.

Shortcut: **Ctrl+F2**

Item View

This command will allow viewing the room from the picked position on an **Audience Area**. This command opens the **Item View Window**.

Properties

This command will open the Audience Area Properties Window for the selected **Audience Area**.

Shortcut: **F4**

RMB Menu - Picked Listener Seat

Activate/Deactivate

This command toggles the activity status, **Activate** / **Deactivate**, of any **Listener Seat**.

Duplicate

This command allows duplication of a selected **Listener Seat** in place or displaced depending on option settings.

To use this command:

1. Left click on **Duplicate**.

2. This will open the **Displacement Window**.

3. If you wish to move the new **Listener Seat** to a new spot insert the correct delta coordinates for the move and click **OK**. If you click **Cancel** the program will assume you want to use the current position coordinates to create the new **Listener Seat**.

4. A **Properties** window will open for insertion of the new **Listener Seat** parameters.

5. Left click on **OK**.

Shortcut: **Ins**

Delete

This command will remove the picked **Listener Seat** from the project.

Shortcut: **Del**

Displace

This command opens the **Displacement Window** for the **Listener Seat**. If you wish to move the **Listener Seat** to a new spot insert the correct delta coordinates for the move and click **OK**. If you click **Cancel** the program will exit without changes.

Shortcut: **Shift+d**

Mirror Item

This command mirrors the selected **Listener Seat** around the axis plane defined under **Options | Mirror**.

See also Mirror Tab in Options Window.

Center

This pans the display to **Center** the picked **Listener Seat** in the window.

Shortcut: **Enter**

Keep for Distance

This command makes the selected **Listener Seat** the reference to which the distance of subsequently selected items will be attributed when the **Show Distance** command is selected.

Shortcut: **k**

Show Distance

This command will allow showing the actual distance between two picked locations. When this command is first used in any Edit Project session, unpreceded by the command **Keep for Distance**, it will show the distance relative to the origin.

Shortcut: **Shift+0 or k**

To use this command:

1. Pick first location or item. This can be any place or item.
2. Right click to open context menu.
3. Left click on **Keep for Distance**.
4. Pick second location or item.
5. Left click on **Show Distance**.
6. This will open a window showing delta x, y, z distances, linear distance and sound travel time.
7. Left click on **OK** will close the window.

Color

This command is used to change the color of the selected **Listener Seat** when used in other program modules, such as rendering.

To use this command:

1. Left click on **Color.**
2. This opens the **Color** window to allow setting of the Listener Seat color.
3. Left click on **OK.**

Shortcut: **Ctrl+F2**

Listener Orientation

This command opens the **Item View Window** in **Listener Orientation** mode. This mode will allow graphical or manual aiming of the selected **Listener Seat** viewed from the Perspective of the **Listener Seat**.

Properties

This command will open the Listener Seat Properties Window for the selected **Listener Seat**.

Shortcut: **F4**

RMB Menu - Picked IR Emitter

Activate/Deactivate

This command toggles the activity status, **Activate** / **Deactivate**, of any IR Emitter.

Duplicate

This command allows duplication of a selected **IR Emitter** in place or displaced depending on option settings.

 To use this command:

1. Left click on **Duplicate.**

2. This will open the **Displacement Window**.

3. If you wish to move the new **IR Emitter** to a new spot insert the correct delta coordinates for the move and click **OK**. If you click **Cancel** the program will assume you want to use the current position coordinates to create the new **IR Emitter**.

4. A **Properties** window will open for insertion of the new **IR Emitter** parameters.

5. Left click on **OK.**

Shortcut: **Ins**

Delete

This command will remove the picked F from the project.

Shortcut: **Del**

Displace

This command opens the **Displacement Window** for the **IR Emitter**. If you wish to move the **IR Emitter** to a new spot insert the correct delta coordinates for the move and click **OK.** If you click **Cancel** the program will exit without changes.

Shortcut: **Shift+d**

Mirror Item

This command mirrors the selected **IR Emitter** around the axis plane defined under **Options | Mirror**.

See also Mirror Tab in Options Window

Center

This pans the display to center the picked **IR Emitter** in the window.

Shortcut: **Enter**

Keep for Distance

This command makes the selected **IR Emitter** the reference to which the distance of subsequently selected items will be attributed when the **Show Distance** command is selected.

Shortcut: **k**

Show Distance

This command will allow showing the actual distance between two picked locations. When this command is first used in any Edit Project session, unpreceded by the command **Keep for Distance**, it will show the distance relative to the origin.

Shortcut: **Shift+0 or k**

To use this command:

1. Pick first location or item. This can be any place or item.
2. Right click to open context menu
3. Left click on **Keep for Distance**.
4. Pick second location or item
5. Left click on **Show Distance**.
6. This will open a window showing delta x, y, z distances, linear distance and sound travel time.
7. Left click on **OK** will close the window

Change Radiator

This command allows the replacement of a **Radiator Model** assigned to the selected **IR Emitter**.

To use this command:

1. Left click on **Change Radiator**.
2. This will open a **Select Radiator** window.
3. Select desired **Radiator Model**.
4. To see detailed information click on **Details**.
5. To edit the **Radiator Models** list click on **Browse**. This will open the **Select Project Database Window**.
6. Left click on **OK**.

Shortcut: **F2**

Show All Same

This command allows the highlighting of all **IR Emitters** that are assigned the same **Radiator Model**.

Shortcut: **F3**

Change All Same

This command allows replacing the **Radiator Model** of all **IR Emitters** with the same **Radiator Model** as the selected **IR Emitter**.

To use this command:

1. Left click on **Change All Same**.

2. This will open a **Select Radiator** window.

3. Select desired **Radiator Model**.

4. To see detailed information click on **Details**.

5. To edit the **Radiator Models** list click on **Browse**. This will open the **Select Project Database Window**.

6. Left click on **OK**.

Shortcut: **Ctrl+F3**

Color

This command is used to change the color of the selected **IR Emitter** when used in other program modules, such as rendering.

To use this command:

1. Left click on **Color.**

2. This opens the **Color** window to allow setting of the **IR Emitter** color.

3. Left click on **OK.**

Shortcut: **Ctrl+F2**

IR Emitter Aiming

This command will allow viewing the room from emissions center of the **IR Emitter**. This allows graphical or manual aiming of the **IR Emitter**. This command opens the **Item View Window**.

Properties

This command will open the IR Emitter Properties Window for the selected **IR Emitter**.

Shortcut: **F4**

RMB Menu - Picked Lamp

Activate/Deactivate

This command toggles the activity status, **Activate** / **Deactivate**, of any **Lamp**.

Duplicate

This command allows duplication of a selected **Lamp** in place or displaced depending on option settings.

To use this command:

1. Left click on **Duplicate.**

2. This will open the **Displacement Window**.

3. If you wish to move the new **Lamp** to a new spot insert the correct delta coordinates for the move and click **OK**. If you click **Cancel** the program will assume you want to use the current position coordinates to create the new **Lamp**.

4. A **Properties** window will open for insertion of the new **Lamp** parameters.

5. Left click on **OK.**

Shortcut: **Ins**

Delete

This command will remove the picked **Lamp** from the project.

Shortcut: **Del**

Displace

This command opens the **Displacement Window** for the **Lamp**. If you wish to move the **Lamp** to a new spot insert the correct delta coordinates for the move and click **OK.** If you click **Cancel** the program will exit without changes.

Shortcut: **Shift+d**

Mirror Item

This command mirrors the selected **Lamp** around the axis plane defined under **Options | Mirror**.

See also Mirror Tab in Options Window

Center

This pans the display to center the picked **Lamp** in the window.

Shortcut: **Enter**

Keep for Distance

This command makes the selected **Lamp** the reference to which the distance of subsequently selected items will be attributed when the **Show Distance** command is selected.

Shortcut: **k**

Show Distance

This command will allow showing the actual distance between two picked locations. When this command is first used in any Edit Project session, unpreceded by the command **Keep for Distance**, it will show the distance relative to the origin.

Shortcut: **Shift+0 or k**

To use this command:

1. Pick first location or item. This can be any place or item.

2. Right click to open context menu

3. Left click on **Keep for Distance**.

4. Pick second location or item

5. Left click on **Show Distance**.

6. This will open a window showing delta x, y, z distances, linear distance and sound travel time.

7. Left click on **OK** will close the window

Change Light Source

This command allows the replacement of a **Light Source** assigned to the selected **Lamp**.

To use this command:

1. Left click on **Change Light Source**.

---

2. This will open a **Select Light Source** window.

3. Select desired **Light Source**.

4. To see detailed information click on **Details**.

5. To edit the **Light Source** list click on **Browse**. This will open the **Select Project Database Window**.

6. Left click on **OK**.

Shortcut: **F2**

Show All Same

This command allows the highlighting of all **Lamps** that are assigned the same **Light Source**.

Shortcut: **F3**

Change All Same

This command allows replacing the **Light Source** of all **Lamps** with the same **Light Source** as the selected **Lamp**.

To use this command:

1. Left click on **Change All Same**.

2. This will open a **Select Light Source** window.

3. Select desired **Light Source**.

4. To see detailed information click on **Details**.

5. To edit the **Light Source** list click on **Browse**. This will open the **Select Project Database Window**.

6. Left click on **OK**.

Shortcut: **Ctrl+F3**

Color

This command is used to change the color of the selected **Lamp** when used in other program modules, such as rendering.

To use this command:

1. Left click on **Color.**

2. This opens the **Color** window to allow setting of the Lamp color.

3. Left click on **OK.**

Shortcut: **Ctrl+F2**

Lamp Aiming

This opens the **Item View Window** in **Lamp Aiming** mode, with a view of the Room from the **Lamp**. This allows graphical or manual aiming of the selected **Lamp**.

Properties

This command will open the Lamp Properties Window for the selected **Lamp**.

Shortcut: **F4**

RMB Menu - Picked Object

Duplicate

This command allows duplication of a selected **Object** in place or displaced depending on option settings.

 To use this command:

1. Left click on **Duplicate.**

2. This will open the **Displacement Window**.

3. If you wish to move the new Object to a new spot insert the correct delta coordinates for the move and click **OK**. If you click **Cancel** the program will assume you want to use the current position coordinates to create the new Object.

4. A **Properties** window will open for insertion of the new Object parameters.

5. Left click on **OK.**

Shortcut: **Ins**

Delete

This deletes the definition of an existing **Object,** but without deleting the **Items** that make up the **Object.** The following dialog box will ask for also deleting the items contained in the **Object**.

Shortcut: **Del**

Displace

This command opens the **Displacement Window** for the **Object**. If you wish to move the **Object** to a new spot insert the correct delta coordinates for the move and click **OK.** If you click **Cancel** the program will exit without changes.

Shortcut: **Shift+d**

Mirror

This command mirrors the selected **Object** at the axis plane defined under **Options | Mirror**.

See also Mirror Tab in Options Window

Shortcut: **M**

Keep for Distance

This command makes the selected **Object** the reference to which the distance of subsequently selected items will be attributed when the **Show Distance** command is selected.

Shortcut: **k**

Show Distance

This command will allow showing the actual distance between two picked locations. When this command is first used in any Edit Project session, unpreceded by the command **Keep for Distance**, it will show the distance relative to the origin.

Shortcut: **Shift+0 or k**

To use this command:

1. Pick first location or item. This can be any place or item.

2. Right click to open context menu

3. Left click on **Keep for Distance**.

4. Pick second location or item

5. Left click on **Show Distance**.

6. This will open a window showing delta x, y, z distances, linear distance and sound travel time.

Left click on **OK** will close the window

Scale

This multiplies all dimensions of the **Object** by a user-specified **Scale** factor, such as 2 for twice the size or .5 for ½ the size.

Connect

This removes duplicate **Vertices** that are present as a result of two **Shapes** or **Objects** being combined in the **Room** model. **Connect** can also "clean up" small displacements between **Vertices** that are intended to be coincident.

Disconnect

This creates a duplicate set **Vertices** for the **Object**, and then disconnects the **Object** and its new **Vertices** from the model so that they can subsequently be moved (by another operation) without changing the shape of other **Faces, Objects**, or **Edges** that share the original **Vertices**.

Move

The **Move Object** dialog box will open, permitting the displacement to be entered as displacement in the x, y, and z directions or using arrow keys. Each step of the arrow keys will have the new location of the **Object** shown in the **Main Room Edit Window**.

Save As

This allows an **Object** to be saved as a file for use in another project:

- as a new **Project file** (*.frd)

- as a new **Object** (*.frd) to insert it in other projects

- as a **Loudspeaker Array** (*.fla) using all activated loudspeakers of the current project.

A dialog box will prompt for a filename and saving location.

Properties

This command will open the Object Properties Window for the selected **Object**.

Shortcut: **F4**

Wall Materials Table

This window allows viewing of all **Wall Materials** in a tabular format.

Using the Shortcut **F3** all the faces having the picked wall material are highlighted.

The following dialog box allows setting these highlighted faces in active mode:
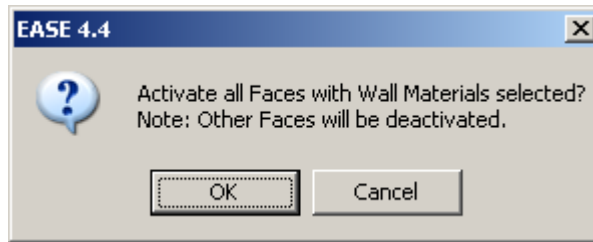
File Menu

Send Table To

This command sends the table, either to the clipboard for pasting in other applications, or to a text file for reading by spreadsheet programs.

File

This saves the table to a *.txt file.

Clipboard

This copies the picture to the clipboard for use in other applications.

Exit

This invokes immediate redraw of the room model and closes the window.

View Menu

Color

This adds or removes for viewing the **Color** column to or from the table content.

Absorption

This adds or removes the **Absorption** columns to or from the table content.

Scattering

This adds or removes the **Scattering** columns to or from the table content.

Default Column Width

This resets changed columns with different width to the default values.

Table Menu

This toggles between the 10 different tables for

- **Wall Materials** (only view mode)
- **Vertices**
- **Edges**
- **Faces**
- **Loudspeakers**
- **Audience Areas**
- **Listener Seats**
- **IR Emitters**
- **Lamps**

- **Objects**

Vertex Properties Window

This window allows changing the properties of an individual **Vertex**. This can include color and coordinates. You can also make it visible or invisible here during viewing. If data has changed, a yellow envelope will appear. This shows you that by using the **Apply** or **Ok** button the current room data will be changed. If the traffic lights are red, the **Vertex** data is not correct.
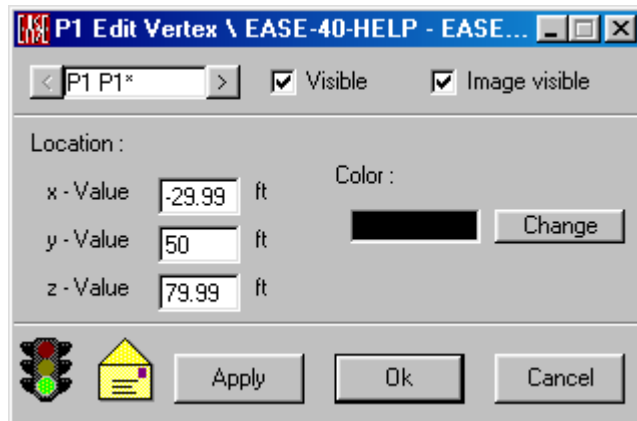
Vertex Number Window

Shows the **Vertex** number and mirror **Vertex** number. The arrows allow selection of sequential like items in ascending or descending order

OK

Applies changes and closes window.

Cancel

Discards changes and closes window.

Apply

Applies changes and keeps window open.

Traffic Light Icon

A **Red** light indicates that data in this window is mathematically incorrect and would fail a **Check Data** Command.

Yellow Envelope Icon

This indicates changes have been made in this window that have not been **Applied**.

Location

This allows entry of the absolute x, y and z coordinates of the **Vertex**.

Color / Change

This allows the selection of a color for a specific **Vertex** to make it stand out from the others.

Visible

This toggles the visibility of this **Vertex**.

Image Visible

This toggles the visibility of this **Vertex's Mirror Image** in a symmetric room.

Vertex Table Window

This window allows viewing or editing of all **Vertices** in a tabular format. Most of these functions are available for multiple selection of **Vertices**.

Selecting a table item will highlight this vertex in the Edit Project window.

File Menu

Apply

This invokes immediate redraw of the room model.

Send Table To

This command sends the table, either to the clipboard for pasting in other applications, or to a text file for reading by spreadsheet programs.

File

This saves the table to a *.txt file.

Clipboard

This copies the picture to the clipboard for use in other applications.

Exit

This invokes immediate redraw of the room model and closes the window.

View Menu

Color

This adds or removes the **Color** column to or from the table content.

Location

This adds or removes the **Location** column to or from the table content.

Default Column Width

This resets changed columns with different width to the default values.

Edit Menu

New Item

This adds a new **Vertex**. If a previous **Vertex** is not selected the new **Vertex** will be added to the end of the list. If a **Vertex** is selected the new **Vertex** will be added after the **Vertex** number selected and higher numbered **Vertices** will be renumbered. The default location is (0, 0, 0).

Duplicate Item

This duplicates the selected **Vertex**. The new **Vertex** will be added to the list after the selected **Vertex** and higher numbered **Vertices** will be renumbered. The default location is the same as the duplicated **Vertex**.

Copy

This command allows one or more **Vertices** to be copied from the table and added to the internal clipboard. To select consecutive **Vertices**, LMB the first required **Vertex**, press the Shift key and simultaneously LMB the last required **Vertex**. To select inconsecutive **Vertices**, LMB required **Vertex**, press the Control key and simultaneously LMB the next required **Vertex** and so on.

Shortcut: **Ctrl+C**

Paste

This command allows one or more **Vertices** to be pasted to the table from the clip board.

Shortcut: **Ctrl+V**

Delete

The selected **Vertices** are erased from the project if they are not belonging to any **Face** or **Edge**. To select consecutive **Vertices**, LMB the first required **Vertex**, press the Shift key and simultaneously LMB the last required **Vertex**. To select inconsecutive **Vertices**, LMB required **Vertex**, press the Control key and simultaneously LMB the next required **Vertex** and so on.

Shortcut: **Del**

Table Menu

This toggles between the 10 different tables for

- **Wall Materials** (only view mode)
- **Vertices**
- **Edges**
- **Faces**
- **Loudspeakers**
- **Audience Areas**
- **Listener Seats**
- **IR Emitters**
- **Lamps**
- **Objects**

Tools Menu

Set Value To

This allows setting certain properties of the selected **Vertices**.

Vis

This will open a dialog box with the options **True** for visible **Vertices** and **False** for turning the selected **Vertices** invisible.

Img

This will open a dialog box with the options **True** for imaged **Vertices** and **False** for turning the Image of the selected **Vertices** off.

Color

This will open a color palette to set the color of the selected **Vertices**.

x

This will open a dialog box to enter the x-coordinate of the selected **Vertices**.

y

This will open a dialog box to enter the y-coordinate of the selected **Vertices**.

z

This will open a dialog box to enter the z-coordinate of the selected **Vertices**.

Add Value To

This allows incrementing/decrementing the coordinates of the selected **Vertices**.

x

This will open a dialog box to enter the increment/decrement of the x-coordinate of the selected **Vertices**.

y

This will open a dialog box to enter the increment/decrement of the y-coordinate of the selected **Vertices**.

z

This will open a dialog box to enter the increment/decrement of the z-coordinate of the selected **Vertices**.

Negate Value

This resets the value of certain properties to the opposite sign for the selected **Vertices**.

Vis

This will turn visible **Vertices** invisible and vice versa for the selected **Vertices**.

Img

This will turn imaged **Vertices** invisible and vice versa for the selected **Vertices**.

x

This will turn positive x-coordinates negative and vice versa for the selected **Vertices**.

y

This will turn positive y-coordinates negative and vice versa for the selected **Vertices**.

z

This will turn positive z-coordinates negative and vice versa for the selected **Vertices**.

Displace

This command opens a **Displacement** window for the **Vertex**. If you wish to move the **Vertex** to a new spot insert the correct delta coordinates for the move and click **OK.** If you click **Cancel** the program will exit without changes.

Edge Properties Window

This window allows changing the properties of an individual **Edge**. This can include color and coordinates. You can also make it visible or invisible during viewing. If data has changed, a yellow envelope will appear. This shows you that by using the **Apply** or **Ok** button the current room data will be changed. If the traffic lights are red, the **Edge** data is not correct.
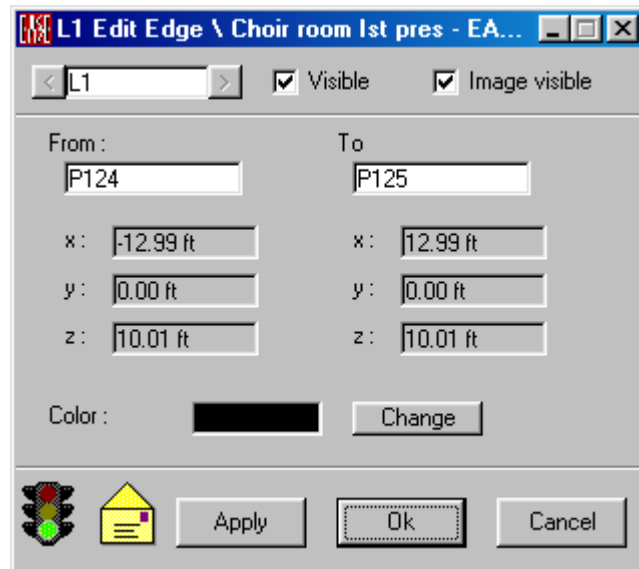
Edge Number Window

Shows the **Edge** number and mirror **Edge** number. The arrows allow selection of sequential like items in ascending or descending order

OK

Applies changes and closes window.

Cancel

Discards changes and closes window.

Apply

Applies changes and keeps window open.

Traffic Light Icon

A **Red** light indicates that data in this window is mathematically incorrect and would fail a **Check Data** Command.

Yellow Envelope Icon

This indicates changes have been made in this window that have not been **Applied**.

From / To

This allows assignment of two **Vertices** that this **Edge** will join.

Color / Change

This allows the selection of a **Color** for this **Edge** to make it stand out from the others.

Visible

This toggles the **Visibility** of this **Edge**.

Image Visible

This toggles the **Visibility** of this **Edge**'s mirror image in a symmetric room.

Edge Table Window

This window allows viewing or editing of all **Edges** in a tabular format.

Most of these functions are available for multiple selection of **Edges**.

Selecting a table item will highlight this edge in the Edit Project window.

File Menu

Apply

This invokes immediate redraw of the room model.

Send Table To

This command sends the table, either to the clipboard for pasting in other applications, or to a text file for reading by spreadsheet programs.

File

This saves the table to a *.TXT file.

Clipboard

This copies the picture to the clipboard for use in other applications.

Exit

This invokes immediate redraw of the room model and closes the window.

View Menu

Color

This adds or removes the **Color** column to or from the table content.

Default Column Width

This resets changed columns with different width to the default values.

Edit Menu

New Item

This adds a new **Edge**. If a previous **Edge** is not selected the new **Edge** will be added to the end of the list. If an **Edge** is selected the new **Edge** will be added after the **Edge** number selected and higher numbered **Edges** will be renumbered.

Duplicate Item

This allows the duplication of a selected **Edge**. The new **Edge** will be added to the list after the selected **Edge** and higher numbered **Edges** will be renumbered. The default location is the same as the duplicated **Edge**.

Copy

This command allows one or more **Edges** to be copied from the table and added to the internal clipboard. To select consecutive **Edges**, LMB the first required **Edge**, press the Shift key and simultaneously LMB the last required **Edge**. To select inconsecutive **Edges**, LMB required **Edge**, press the Control key and simultaneously LMB the next required **Edge** and so on.

Shortcut: **Ctrl+C**

Paste

This command allows one or more **Edges** to be pasted to the table from the clipboard.

Shortcut: **Ctrl+V**

Delete

The selected **Edges** are erased from the project. To select consecutive **Edges**, LMB the first required **Edge**, press the Shift key and simultaneously LMB the last required **Edge**. To select inconsecutive **Edges**, LMB required **Edge**, press the Control key and simultaneously LMB the next required **Edge** and so on.

Shortcut: **Delete**

Table Menu

This toggles between the 10 different tables for

- **Wall Materials** (only view mode)
- **Vertices**
- **Edges**

- **Faces**
- **Loudspeakers**
- **Audience Areas**
- **Listener Seats**
- **IR Emitters**
- **Lamps**
- **Objects**

Tools Menu

Set Value To

This allows setting certain properties of the selected **Edges**.

Vis

This will open a dialog box with the options **True** for visible **Edges** and **False** for turning the selected **Edges** invisible.

Img

This will open a dialog box with the options **True** for imaged **Edges** and **False** for turning the Image of the selected **Edges** off.

Color

This will open a color palette to set the color of the selected **Edges**.

Negate Value

This resets the value of certain properties to the opposite sign for the selected **Edges**.

Vis

This will turn visible **Edges** invisible and vice versa for the selected **Edges**.

Img

This will turn imaged **Edges** invisible and vice versa for the selected **Edges**.

Face Properties Window

This window allows changing the properties of an individual **Face**. This can include color, material and coordinates. You can also make it visible or invisible here during viewing. If data has changed, a yellow envelope will appear. This shows you that by using the **Apply** or **Ok** button the current room data will be changed. If the traffic lights are red, the **Face** data is not correct.
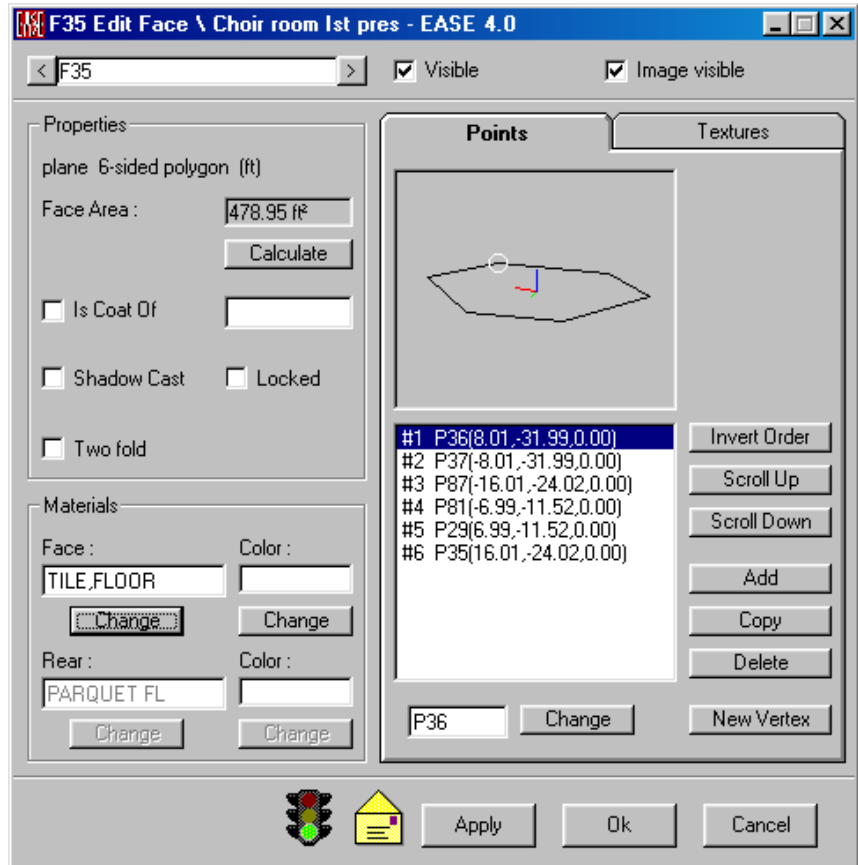
Face Number Window

Shows the **Face** number and **Mirror Face** number. The arrows allow selection of sequential **Faces** in ascending or descending order.

Visible

A check here makes the **Face Visible**.

Image Visible

A check here makes this **Face's Mirror Image Visible** in a symmetric room.

OK

Applies changes and closes window.

Cancel

Discards changes and closes window.

Apply

Applies changes and keeps window open.

Traffic Light Icon

A **Red** light indicates that data in this window is mathematically incorrect (for example, a **Face** may not lie within a plane) and would fail **Check Data**.

Yellow Envelope Icon

This indicates changes have been made in this window that have not been **Applied**.

Properties

Face Area

This shows the **Area** of the **Face** in square feet or square meters.

Calculate

Calculates the area of the **Face**.

Is Coat Of

An entry here means that this **Face** takes the place of the same **Area** of the **Face** onto which it is **Coated**.

Shadow Casting

This indicates whether this **Face** is casting an acoustic shadow.

Locked

This locks the **Shadow Cast** property against changes by the program.

Two fold

This allows assignment of **Wall Materials** to both sides of a **Face** (to simulate barriers, absorbers, or reflectors), with both sides looking into the room. The **Wall Materials** on the two sides may be the same or different.

Materials

This area specifies assignment of **Wall Materials** to a **Face**.

Face / Change

This assigns a **Wall Material** to the normally active side of a **Face**. **Change** allows selection of another **Wall Materials** from the list of those available in the project. In the **List** window, **Details** shows absorption and Scattering (according to ISO standard 17497) coefficients.

Color / Change

This allows assignment of a color to this side of this **Face**.

Rear / Change

This assigns a material to the normally inactive side of a **Face**. It is only available for **Two-Fold Faces**. **Change** allows selection of another **Wall Materials** from the list of those available in the project. In the **List** window, **Details** shows absorption and Scattering (according to ISO standard 17497) coefficients.

Color / Change

This allows assignment of a **Color** to this side of this **Face**.

Points Tab

This data window displays the **Vertices** that make up the **Face**.

Invert Order

This command **Inverts** the Order of the **Vertices**. This has the effect of changing the side of the **Face** that is exposed within the room.

Scroll Up

This command scrolls the **Vertex** order up one **Vertex** with each use.

Scroll Down

This command **Scrolls** the **Vertex** order down one **Vertex** with each use.

Add

This command **Adds** a new **Vertex** at the end of the list.

Copy

This command **Copies** a selected **Vertex** position to a new **Vertex**.

Delete

This command deletes a selected **Vertex** from the **Face**.

New Vertex

This command creates a new **Vertex** that is not part of the **Face**.

Vertex Box / Change

This command allows reassignment of a **Vertex** in the **Face**.

Textures Tab

This window allows the viewing and editing of **Textures** for an individual **Face**.
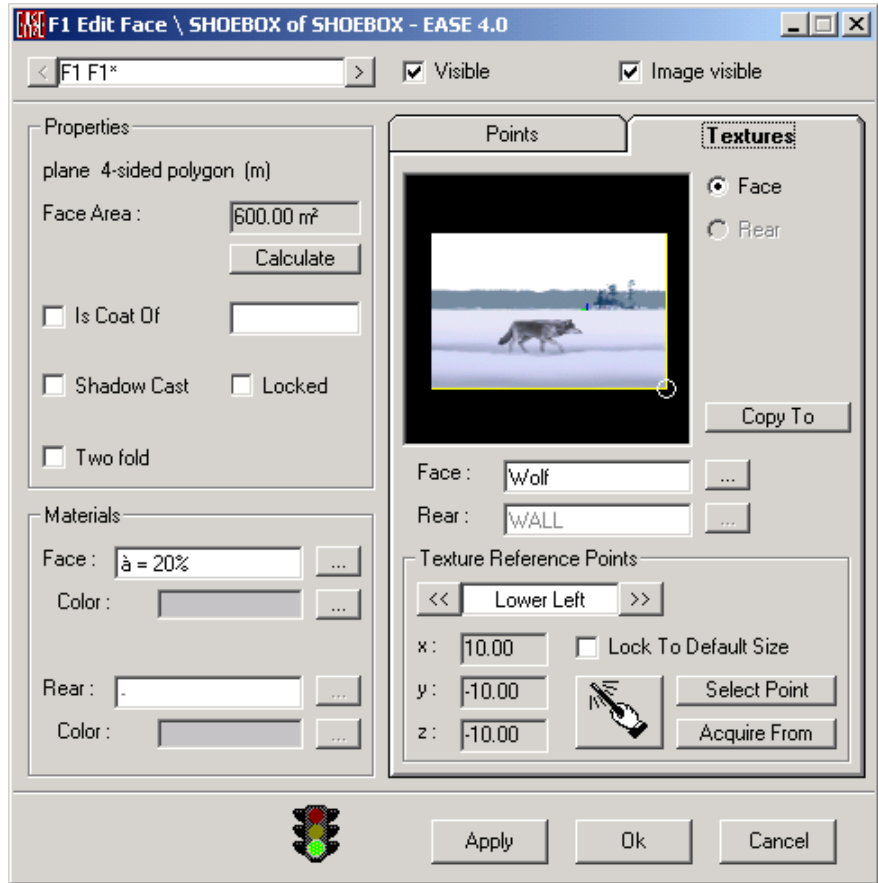
Face

A selection here will allow the viewing and editing of texture parameters for the front of the selected **Face**.

Rear

A selection here will allow the viewing and editing of texture parameters for the rear of the selected **Face**.

Copy To

Left Click on this button opens a **Face Selection** window. This will allow you to select the **Face** or **Faces** the texture settings of the actual **Face** will be transferred to. This procedure allows a simple tiling of the textures from one **Face** to the selected adjacent **Faces**. To apply the texture of an adjacent **Face** to the current **Face** use the command **Acquire From Face**.

Example:

Transferred with **Copy To**
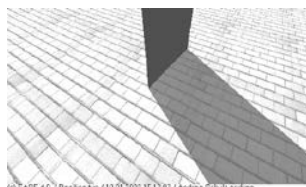
Transferred without **Copy To**

(c) EASE 4.0 / Basilica.typ / 10.01.2002 15:13:15 / Andrea Schult andrea
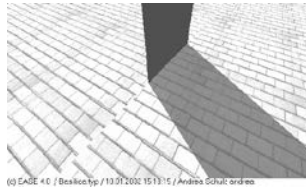
Face Window

This window allows selection of the texture applied to the front of the **Face**.

Rear Window

This window allows selection of the texture applied to the front of the **Face.**

Texture Reference Points

This area allows parameters to be entered setting the starting points of the texture.

Location Window

This window selects the corner of the texture block that the texture will begin tiling.

Lock to Default Size

A checkmark here allows to "freeze" the default size of a texture sample. The size of a texture sample can be defined in the **Texture Editor**.

X,Y, and Z Windows

These windows show the corner points of the used texture inside the face. They can be defined either graphically by LMB click into the display window or using the **Select Point/Direction** buttons.

Selection Mouse Mode

This command enables a specific selection mouse mode, allowing to use the RMB to select a point, then used for the texture layout.

Select Point (Not Locked mode) / Select Direction (Locked mode)

This opens a window allowing selection of **Vertices** as reference points for the texture tile. The lower two **Vertices** set the bottom line, the two **Vertices** to the left sets the height of the texture. In locked mode these points only define the orientation of the tiles to adjust the tile layout as desired.

Note: After the **Copy To** Command you should check and if necessary reset the texture coordinates of the **Faces** copied to.

In the same way make sure that after acquiring texture data the texture tiles are adjusted as required.

Acquire From

This allows you to acquire texture settings from another **Face**. The data, that means the type of the texture and its 3D-coordinates, will be transferred to the current **Face**. By means of this command one can couple the texture of the actual

Face to any other **Face** of the Room. This procedure works like **Copy To** but reversed.

See Example under **Copy To**

Face Table Window

This window allows viewing or editing of all **Faces** in a tabular format. Most of these functions are available for multiple selections of **Faces**.

Selecting a table item will highlight this face in the Edit Project window.

Traffic Light Icon

A **Red** light indicates that data in this window is mathematically incorrect (for example, a **Face** may not lie within a plane) and would fail **Check Data**.

Yellow Envelope Icon

This indicates changes have been made in this window that have not been **Applied**.

File Menu

Apply

This invokes immediate redraw of the room model.

Send Table To

This command sends the table, either to the clipboard for pasting in other applications or to a text file for reading by spreadsheet programs.

File

This saves the table to a *.TXT file.

Clipboard

This copies the picture to the clipboard for use in other applications.

Exit

This invokes immediate redraw of the room model and closes the window.

View Menu

Color

This adds or removes the **Color** column to or from the table content.

Textures

This adds or removes a **Texture** column to or from the table content.

Default Column Width

This resets changed columns with different width to the default values.

Edit Menu

New Item

This allows the addition of a new **Face** into a project. If a previous **Face** is not selected the new **Face** will be added at the end of the list. If a **Face** is selected the new **Face** will be added after the selected **Face**, and higher numbered **Faces** will be renumbered.

Duplicate Item

This duplicates the selected **Face**. The new **Face** will be added to the list right after the selected **Face** number. The default location is the same as the duplicated **Face**.

Copy

This command allows one or more **Faces** to be copied from the table and added to the internal clipboard. To select consecutive **Faces**, LMB the first required **Face**, press the Shift key and simultaneously LMB the last required **Face**. To select inconsecutive **Faces**, LMB required **Face**, press the Control key and simultaneously LMB the next required **Face** and so on.

Shortcut: **Ctrl+C**

Paste

This command allows one or more **Faces** to be pasted to the table from the clip board.

Shortcut: **Ctrl+V**

Delete

The selected **Faces** are erased from the project. To select consecutive **Faces**, LMB the first required **Face**, press the Shift key and simultaneously LMB the last required **Face**. To select inconsecutive **Faces**, LMB required **Face**, press the Control key and simultaneously LMB the next required **Face** and so on.

Shortcut: **Del**

Table Menu

This toggles between the 10 different tables for

- **Wall Materials** (only view mode)
- **Vertices**
- **Edges**
- **Faces**
- **Loudspeakers**
- **Audience Areas**
- **Listener Seats**
- **IR Emitters**
- **Lamps**
- **Objects**

Tools Menu

Set Value To

This allows commonly setting certain properties of the selected **Faces**.

Vis

This will open a dialog box with the options **True** for visible **Faces** and False for turning the selected **Faces** invisible.

Img

This will open a dialog box with the options **True** for imaged **Faces** and **False** for turning the Image of the selected **Faces** off.

Face Material

This will open a Window to select the desired Face material

Color

This will open a color palette to set the **Color** of the selected **Faces**.

2-Fold

This will open a dialog box with the options **True** for 2-Fold **Faces** and **False** for turning the selected **Faces** to Single-Fold.

Rear Material

This will open a Window to select the desired Rear Face material

Rear Clr.

This will open a color palette to set the **Color** of the rear of the selected **Faces**.

Face Texture

This will open a Window to select the desired Face texture

Rear Texture

This will open a Window to select the desired Rear Face texture

Shading

This will open a dialog box with the options **True** for Shadow-Casting **Faces** and **False** for turning the selected **Faces** to acoustically transparent.

Locked

This will open a dialog box with the options **True** for locking and **False** for releasing Shadow-Casting property of the selected **Faces**.

Negate Value

This resets the value of certain properties to the opposite sign for the selected **Faces**.

Vis

This will turn visible **Faces** invisible and vice versa for the selected **Faces**.

Img

This will turn imaged **Faces** invisible and vice versa for the selected **Faces**.

2-Fold

This will turn 2-Fold **Faces** Single-Fold and vice versa for the selected **Faces**.

Shading

This will turn Shadow-Casting **Faces** acoustically transparent and vice versa for the selected **Faces**.

Locked

This will release locked Shadow-Casting property and vice versa for the selected **Faces**.

Add Area Above

This creates an **Audience Area** above a selected **Face** at ear height above the selected **Face**.

The limitations of this command are:

1. The **Face** must have four **Vertices**.

2. The angle between the **Face** and the x-y plane must not exceed 60°.

Color and Material Coupled

This command allows the **Color** or **Wall Material** assigned to a **Face** to be used as an editing tool. You can assign any **Color** or **Wall Material** to any **Face** or combination of **Faces**. Using **Color and Material Coupled** causes all Faces having that **Color** or **Wall Material** to be linked for purposes of assigning other **Colors** or **Wall Materials.** If you select a **Color,** then all **Faces** that have that **Wall Material** will change to the **Color** that matches the chosen **Color**. If you select a **Wall Material** then all **Faces** that have that **Color** will change to the **Wall Material** that matches the chosen **Wall Material**.

For example, suppose that you want to change the material assigned to a large area of curved wall (that you have split into multiple **Faces** to approximate the curvature). First, you would color all these **Faces** yellow (or any other unique color) individually, then select **Color and Material Coupled.** Now, when you change the **Wall Material** assigned to one of them, all those having that same color will be changed simultaneously to that same material. Assigning the same **Wall Materials** to all of the desired **Faces** can use this same example and then selecting a new **Color** for one **Face** and all of the **Faces** with the same **Wall Materials** will change **Color** to match.

Loudspeaker Properties Window

This window allows the viewing and editing of properties for an individual **Loudspeaker**, including color, material coordinates, the **Speaker Model** assigned, electrical parameters, aiming, and visibility.
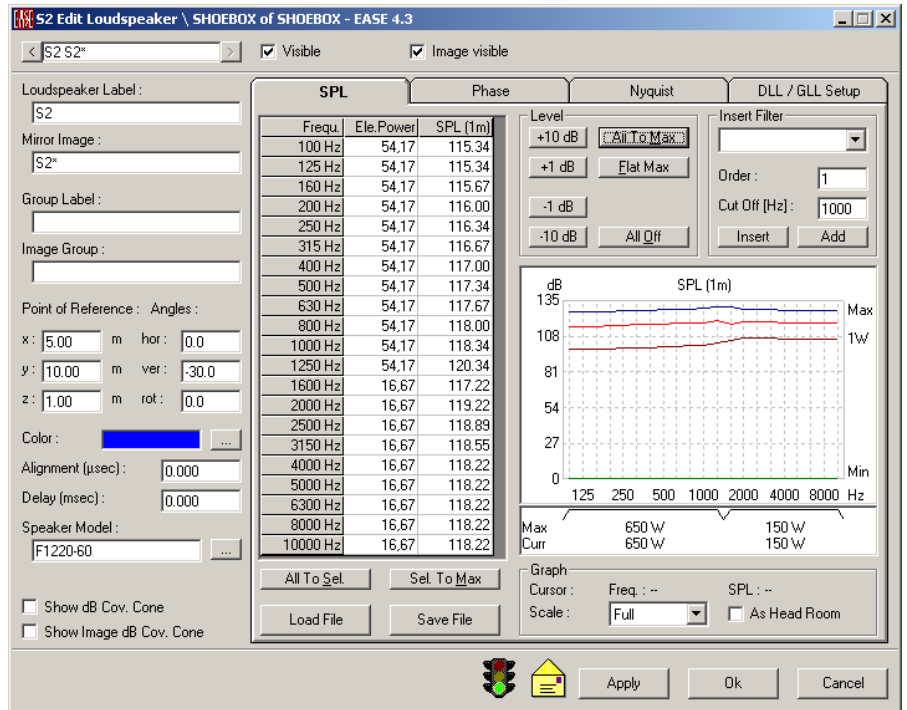
Loudspeaker Number Window

Shows the **Loudspeaker** number and mirror Item number. The arrows allow selection of sequential **Loudspeakers** in ascending or descending order

Visible

This toggles the visibility of this **Loudspeaker**.

Image Visible

This toggles the visibility of this **Loudspeaker's** mirror image in a symmetric room.

OK

Applies changes and closes window.

Cancel

Discards changes and closes window.

Apply

Applies changes and keeps window open.

Traffic Light Icon

A **Red** light indicates that data in this window is mathematically incorrect and would fail **Check Data**.

Yellow Envelope Icon

This indicates changes have been made in this window that have not been **Applied**.

Loudspeaker Label

This allows entry of a user chosen descriptor for the **Loudspeaker**.

Mirror Image

This allows entry of a user chosen descriptor for the **Mirror Image** of the **Loudspeaker.**

Group Label

This data window allows entry of a user chosen descriptor for a **Group,** to which the **Loudspeaker** belongs.

Image Group

This data window allows entry of a user chosen descriptor for the **Mirror Image** of a **Group,** to which the Image **Loudspeaker** belongs.

Point of Reference

Sets the actual position of the **Loudspeaker** in the project relative to a point of reference given by the manufacturer. The **Reference Point** is often the point of origin used to measure the directivity data with a turntable. This **Reference Point** can take into account displacement from the real rotation center to describe the frequency dependent physical location of the sound origin from the **Loudspeaker**.

Angles

These define the orientation (aiming) of the **Loudspeaker** in the horizontal, vertical and rotational domains.

The horizontal angle is zero if the **Loudspeaker** is aimed along the negative y-axis and increases positively counterclockwise.

The vertical angle is zero if the **Loudspeaker** is not tilted, negative if tilted downwards and positive if tilted upwards.

The rotational angle is zero if the **Loudspeaker** is not rotated about its own axis, positive if rotated counterclockwise and vice versa.

Color

This allows assignment of specific **Color** to the selected **Loudspeaker**.

Alignment (μsec)

This accounts for electrical delay used to align **Loudspeakers** within an array.

Delay (msec)

This accounts for electrical delay applied to **Loudspeakers** to adjust for their differing positions within a room.

Speaker Model

This window shows the **Speaker Model** that is assigned to the **Loudspeaker**. **Change** opens a list of available **Speaker Models** to allow selection of a different **Speaker Model** at the same position. **Details** shows the basic **Speaker Model** property data.

Show dB Cov. Cone

This makes **dB Coverage Cones** visible in the 3d model for the selected **Loudspeaker** to aid in visualizing **Loudspeaker Coverage** while aiming.

Show Image dB Cov. Cone

This makes **dB Coverage Cones** visible in the 3d model for the selected **Image Loudspeaker** to aid in visualizing **Loudspeaker Coverage** while aiming.

SPL Tab

This displays **Loudspeaker Electrical Power** and **Magnitude Response** data in tabular and graphical form and allows editing of that data.

Note that since EASE 4.3 a new level convention and an associated, different input signal type is available that allows relating EASE SPL results directly to SPL measurements in the field. It is the default for new projects and can be switched on for existing projects in the **Room Data** window on the **Settings** tab.

When this level convention based on broadband pink noise is active, the allowed behavior changes in EASE for entering loudspeaker power settings. For any speaker, the rated maximum power must not be exceeded by the power sum over all 1/3rd octave bands included in a passband.

This usually requires the manual update of existing projects to pass Check Data and it generally also leads to lower power settings with respect to a particular 1/3rd octave band. However, in the later mapping and response calculations true sum levels will be calculated so that the broadband level sum as well as results for smaller bandwidths match with results provided by measurement tools when starting from the same 1/3rd octave band spectrum.

Note: If the loudspeaker is a DLL or GLL then the **Ele. Power** column may contain a "-" instead of a value. If this is the case then the values for **SPL (1m)** represent the level relative to the maximum level for the loudspeaker for each 1/3rd Octave Band. This means the maximum value will be 0.00 rather than the expected SPL, and the only values that can be entered instead of 0.00 will be

negative values. If the project contains loudspeakers of both SPK and DLL or GLL types be sure to adjust levels as needed.

All To Sel.

This sets all bands to the power entered for the band most recently set. Set one frequency band to the power desired for all bands and then Left Click **All to Sel**. All bands will be set to that power, except that any band whose maximum rated power is less than the desired level will be set to its maximum power.

Sel. To Max

This command will set the selected frequency band to its maximum rated power.

Load File

This command loads a complex filter setting from a file into the response of the **Loudspeaker**.

Save File

This command saves the complex filter setting to a file for future use.

Level

+10 dB, +1dB, -1dB, -10dB

These buttons increase or decrease the **SPL** and **Electrical Power** in increments of 1 dB or 10 dB, up to the limits of the rated power of the **Speaker Model**.

This command changes the actual overall level (red curve) in corresponding dB steps. The field above shows the actual frequency and the corresponding SPL.

All To Max

This command will set all frequency bands to their maximum rated power.

Flat Max

This option creates a flat frequency response by using the max. value of the entered response curve.

Default

This command will set all frequency bands to the level values recommended by the manufacturer. This option is only available if supported by the currently assigned **Speaker Model**.

All Off

This command will set all frequency bands to zero power.

Insert Filter

This allows a crossover filter to be applied to the **Loudspeaker**. EASE includes data for high pass and low pass filters having Butterworth alignment. You can set the steepness and the crossover frequency. You may select between these two filters, or you may load your own filter file. Data for other filters can be entered as a user provided file.

Note: This filter will be applied to the raw response of the **Speaker Model**.

Order

Enter an integer specifying the order of the filter. This sets the steepness of the filter's roll off. A first order filter will have a slope of -6 dB/octave, a second order filter will be -12 dB/octave, third order will be -18 dB/octave, and fourth order will be -24 dB/octave.

Cutoff (Hz)

This sets the -3 dB frequency point of the filter.

Insert

This command loads the selected filter into the response of the **Loudspeaker**.

Add

This command adds the selected filter on top of the response of the **Loudspeaker**.

Graph

Cursor

This section displays the location of the mouse cursor when the mouse points at the **SPL** graph. Using the scaling of the graph, the cursor position will be shown as SPL versus Frequency.

Scale

This command sets the vertical scale of the graph to allow closer viewing. The **10 dB, 30 dB**, and **90 dB** selections set the vertical scale of the graph to the chosen value. **Full** sets the vertical scale to the full range of the data.

As Head Room

When selected this option normalizes the SPL graph to the maximum level so that all values become relative to the allowed maximum. This corresponds to a head room display.

Phase Tab

This tab displays the **Phase Response** of the **Loudspeaker Model** in table and graphical form, and allows the table to be edited.
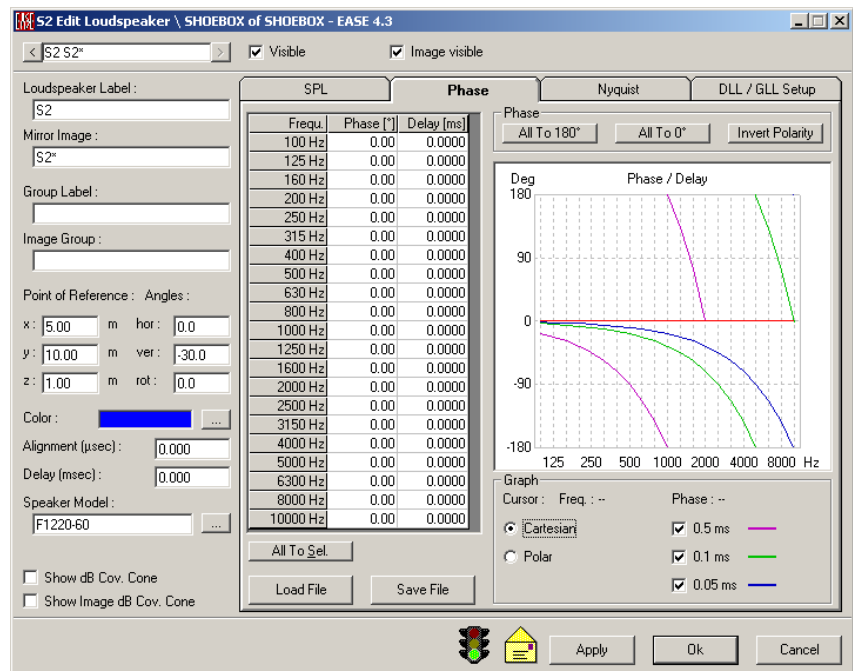
All To Sel.

This sets all frequency bands to the value of the selected band.

Load File

This command loads a complex filter setting from a file into the response of the **Loudspeaker**.

Save File

This command saves the complex filter setting to a file for future use.

Phase

If phase response data has been entered by a user, it will be displayed here. If phase response data is provided for a **Speaker Model**, it may be entered it here.

All To 180°

This sets all frequency bands to 180 degrees.

All To 0°

This sets all frequency bands to 0 degrees.

Invert Polarity

This inverts the **Polarity** of the electrical signal fed to the **Loudspeaker** by inverting its **Phase Response**.

Graph

Cursor

This section displays the location of the mouse cursor when the mouse points at the **Phase** graph. Using the scaling of the graph, the cursor position will be shown as Phase versus Frequency.

Cartesian

Sets the display to Cartesian coordinates

Polar

Sets the display to Polar coordinates.

0.5ms, 0.1ms, 0.05ms

Allows display of the phase shift associated with 0.5 ms, 0.1 ms, and 0.05 ms of signal delay.

Nyquist Tab

Displays the **Nyquist** plot of the **Loudspeaker**'s response.
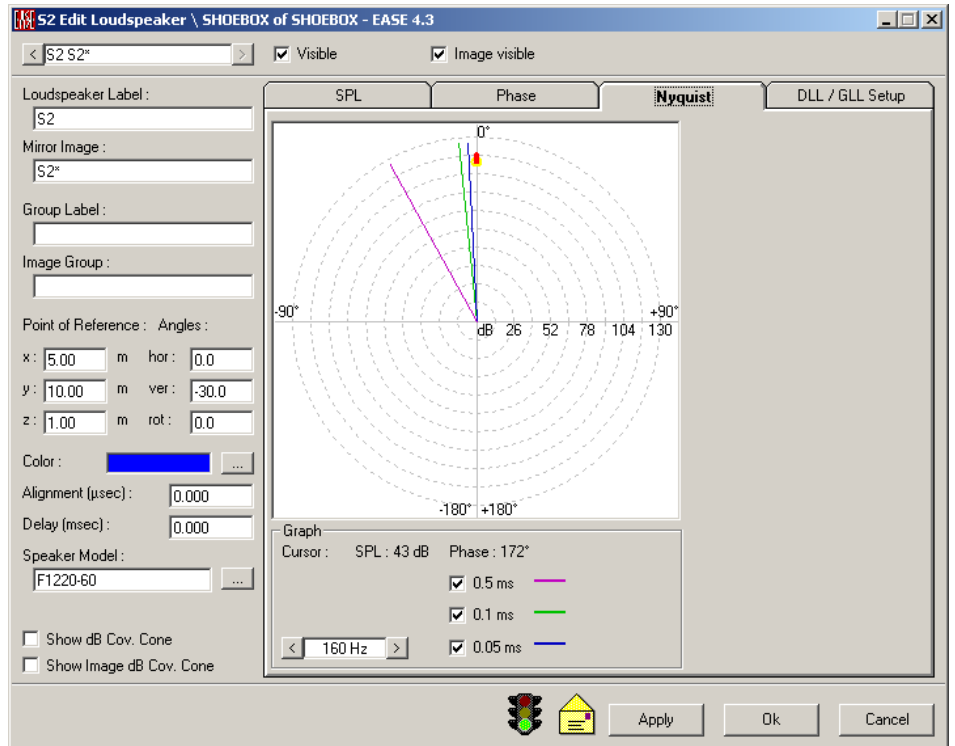
0.5ms, 0.1ms, 0.05ms

Allows display of the phase shift associated with 0.5 ms, 0.1 ms, and 0.05 ms of signal delay.

Level and Phase angle windows

Displays the **Level** and **Phase** for the location of the mouse cursor.

Frequency Selection

Causes a cursor to step through the Nyquist response one frequency band at a time.

DLL / GLL Setup Tab

This tab allows adjusting the DLL / GLL setting parameters as well as viewing additional information about the currently selected **Speaker Model**.
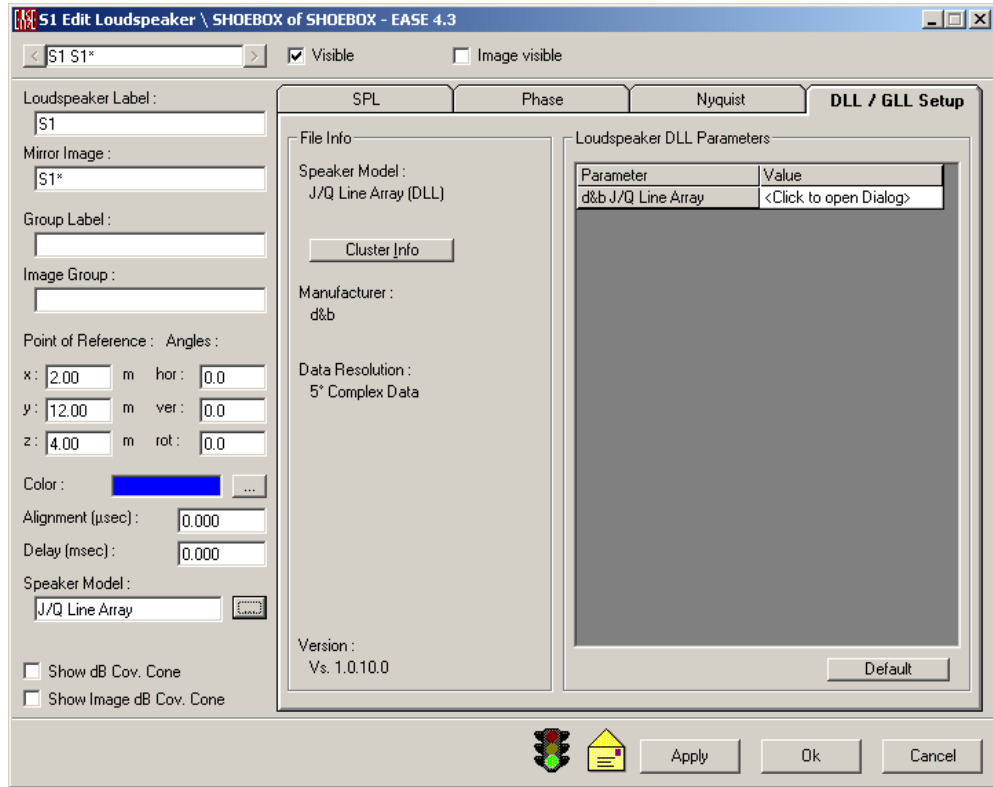
File Info

This section shows additional information about the **Speaker Model** assigned to the **Loudspeaker**.

Speaker Model

Model number of the loudspeaker or line array.

Cluster Info

This opens the Cluster Info Window.

Manufacturer

Name of the company or loudspeaker design firm that created the loudspeaker and its EASE data file.

Data Resolution

Underlying resolution with respect to frequency, angle and phase.

Version

Version number of the data file.

Loudspeakers DLL/GLL Parameters

This allows setting parameters for **Loudspeakers** described by use of a .dll or .gll file.

Default

Resets the DLL/GLL setting parameters of the current **Loudspeaker** to their initial values.

Loudspeaker Table Window

This window allows viewing or editing of all **Loudspeakers** in a tabular format.

Most of these functions are available for multiple selections of **Loudspeakers**.

Selecting a table item will highlight this loudspeaker in the Edit Project window.

File Menu

Apply

This **Applies Data** and invokes immediate redraw of the room model.

Send Table To

This command sends the table, either to the clipboard for pasting in other applications or to a text file for reading by spreadsheet programs.

File

This saves the table to a *.TXT file.

Clipboard

This copies the picture to the clipboard for use in other applications.

Exit

This **Applies Data**, invokes immediate redraw of the room model and closes the window.

View Menu

Color

This adds or removes the **Color** column to or from the table content.

Location

This adds or removes the **Location** column to or from the table content.

Angles

This adds or removes the **Angle** column to or from the table content.

Level

This adds or removes the **Level** column to or from the table content.

Phase

This adds or removes the **Phase** column to or from the table content.

Default Column Width

This resets changed columns with different width to the default values.

Edit Menu

New Item

This adds a new **Loudspeaker**. If a **Loudspeaker** is not selected the new **Loudspeaker** will be added at the end of the list. If a **Loudspeaker** is selected then the new **Loudspeaker** will be added after the selected **Loudspeaker**, and higher numbered **Loudspeakers** will be renumbered.

Duplicate Item

This duplicates a selected **Loudspeaker**. The new **Loudspeaker** will be added to the list after the selected **Loudspeaker** number, and higher numbered **Loudspeakers** will be renumbered. The default location is the same as the duplicated Loudspeaker.

Copy

This command allows one or more **Loudspeakers** to be copied from the table and added to the internal clipboard. To select consecutive **Loudspeakers**, LMB the first required **Loudspeaker**, press the Shift key and simultaneously LMB the last required **Loudspeaker**. To select inconsecutive **Loudspeakers**, LMB required **Loudspeaker**, press the Control key and simultaneously LMB the next required **Loudspeaker** and so on. Shortcut: **Ctrl+C**

Paste

This command allows one or more **Loudspeakers** to be pasted to the table from the clipboard.

Shortcut: **Ctrl+V**

Delete

The selected **Loudspeakers** are erased from the project. To select consecutive **Loudspeakers**, LMB the first required **Loudspeaker**, press the Shift key and simultaneously LMB the last required **Loudspeaker**. To select inconsecutive **Loudspeakers**, LMB required **Loudspeaker**, press the Control key and simultaneously LMB the next required **Loudspeaker** and so on.

Shortcut: **Del**

Table Menu

This toggles between the 10 different tables for

- **Wall Materials** (only view mode)
- **Vertices**
- **Edges**
- **Faces**
- **Loudspeakers**
- **Audience Areas**
- **Listener Seats**
- **IR Emitters**
- **Lamps**
- **Objects**

Tools Menu

Set Value To

This allows setting certain properties of the selected **Loudspeakers**.

Vis

This will open a dialog box with the options **True** for visible **Loudspeakers** and **False** for turning the selected **Loudspeakers** invisible.

Img

This will open a dialog box with the options **True** for imaged **Loudspeakers** and **False** for turning the Image of the selected **Loudspeakers** off.

Color

This will open a color palette to set the **Color** of the selected **Loudspeakers**.

Speaker Model

This will open a Window to select the desired Speaker model

Delay

This will open a dialog box for setting the delay in milliseconds for the selected **Loudspeakers**.

Alignment

This will open a dialog box for setting the alignment in microseconds for the selected **Loudspeakers**.

x

This will open a dialog box to enter the x-coordinate of the selected **Loudspeakers**.

y

This will open a dialog box to enter the y-coordinate of the selected **Loudspeakers**.

z

This will open a dialog box to enter the z-coordinate of the selected **Loudspeakers**.

Hor

This will open a dialog box to enter the horizontal angle of the selected **Loudspeakers**.

Ver

This will open a dialog box to enter the vertical angle of the selected **Loudspeakers**.

Rot

This will open a dialog box to enter the rotational angle of the selected **Loudspeakers**.

L 100Hz, L125Hz, …

This will open a dialog box to enter the SPL at 1m for the respective frequency band of the selected **Loudspeakers**.

Ph 100Hz, Ph 125Hz, …

This will open a dialog box to enter the phase angle for the respective frequency band of the selected **Loudspeakers**.

Add Value To

This allows incrementing/decrementing the values of the selected **Loudspeakers**.

Delay

This will open a dialog box to enter the increment/decrement of the delay of the selected **Loudspeakers**.

Alignment

This will open a dialog box to enter the increment/decrement of the alignment of the selected **Loudspeakers**.

x

This will open a dialog box to enter the increment/decrement of the x-coordinate of the selected **Loudspeakers**.

y

This will open a dialog box to enter the increment/decrement of the y-coordinate of the selected **Loudspeakers**.

z

This will open a dialog box to enter the increment/decrement of the z-coordinate of the selected **Loudspeakers**.

Hor

This will open a dialog box to enter the increment/decrement of the horizontal angle of the selected **Loudspeakers**.

Ver

This will open a dialog box to enter the increment/decrement of the vertical angle of the selected **Loudspeakers**.

Rot

This will open a dialog box to enter the increment/decrement of the rotational angle of the selected **Loudspeakers**.

L 100Hz, L125Hz, …

This will open a dialog box to enter the increment/decrement of the SPL at 1m for the respective frequency bands of the selected **Loudspeakers**.

Ph 100Hz, Ph 125Hz, …

This will open a dialog box to enter the increment/decrement of the phase angle for the respective frequency bands of the selected **Loudspeakers**.

Negate Value

This resets the value of certain properties to the opposite sign for the selected **Loudspeakers**.

Vis

This will turn visible **Loudspeakers** invisible and vice versa for the selected **Loudspeakers**.

Img

This will turn imaged **Loudspeakers** invisible and vice versa for the selected **Loudspeakers**.

x

This will turn positive x-coordinates negative and vice versa for the selected **Loudspeakers**.

y

This will turn positive y-coordinates negative and vice versa for the selected **Loudspeakers**.

z

This will turn positive z-coordinates negative and vice versa for the selected **Loudspeakers**.

Hor

This will turn positive horizontal angles negative and vice versa for the selected **Loudspeakers**.

Ver

This will turn positive vertical angles negative and vice versa for the selected **Loudspeakers**.

Rot

This will turn positive rotational angles negative and vice versa for the selected **Loudspeakers**.

Ph 100Hz, Ph 125Hz, …

This will turn positive phase angles negative and vice versa for the respective frequency bands of the selected **Loudspeakers**.

Add Prefix to Label

This allows editing of the label name(s)

Label

This will add a prefix to the Label for the selected **Loudspeakers**.

Image Label

This will add a prefix to the Image Label for the selected **Loudspeakers**.

Group Label

This will add a prefix to the Group Label for the selected **Loudspeakers**.

Group Image Label

This will add a prefix to the Group Image Label for the selected **Loudspeakers**.

Add Suffix to Label

This allows editing of the label name(s)

Label

This will add a suffix to the Label for the selected **Loudspeakers**.

Image Label

This will add a suffix to the Image Label for the selected **Loudspeakers**.

Group Label

This will add a suffix to the Group Label for the selected **Loudspeakers**.

Group Image Label

This will add a suffix to the Group Image Label for the selected **Loudspeakers**.

Remove Prefix from Label

This allows editing of the label name(s)

Label

This will remove a prefix from the Label for the selected **Loudspeakers**.

Image Label

This will remove a prefix from the Image Label for the selected **Loudspeakers**.

Group Label

This will remove a prefix from the Group Label for the selected **Loudspeakers**.

Group Image Label

This will remove a prefix from the Group Image Label for the selected **Loudspeakers**.

Remove Suffix from Label

This allows editing of the label name(s)

Label

This will remove a suffix from the Label for the selected **Loudspeakers**.

Image Label

This will remove a suffix from the Image Label for the selected **Loudspeakers**.

Group Label

This will remove a suffix from the Group Label for the selected **Loudspeakers**.

Group Image Label

This will remove a suffix from the Group Image Label for the selected **Loudspeakers**.

Displace

This opens a displacement window to allow entry of delta coordinates to displace all selected **Loudspeakers**.

Align to Loudspeaker

This option allows aligning all selected **Loudspeakers** in time based on the arrival time of a defined **loudspeaker**. This reference **loudspeaker** is selected in the following window.

Use DLL/GLL Setup from Loudspeaker

This option allows copying the DLL/GLL configuration of a particular **Loudspeaker** to all **Loudspeakers** selected in the table. This source L**oudspeaker** is selected in the following window. Notice that copying and pasting setups is only possible for **Loudspeakers** that have the same **Speaker Model** assigned. That means that they have to be referring to the same DLL or GLL file.

Audience Area Properties Window

This window allows changing the properties of an individual **Audience Area**, including color coordinates, visibility, and display shift.
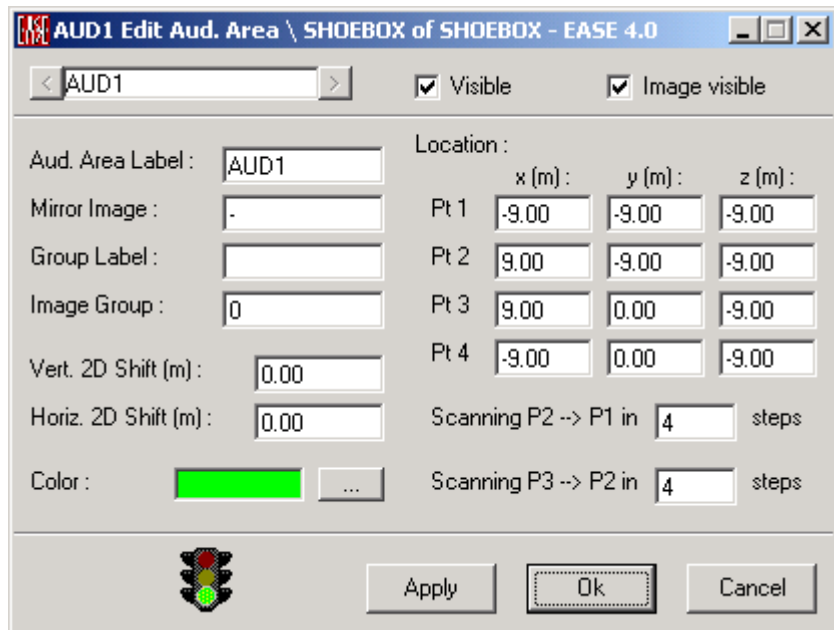
Aud. Area Label/Mirror Image

This window allows entry of a user chosen descriptor for the **Audience Area**.

Group Label/Image Group

This data window allows entry of a user chosen descriptor for a **Group** of **Audience Areas**.

Vertical 2D Shift

The display of an **Audience Area** in the **Area Mapping** window can be shifted so that **Audience Areas** that lie on top of each other in plan do not obscure one another in the display (as, for example, when seating in a balcony is on top of seating on a main floor). This field defines the shift along the Y-axis. This only affects the view not the calculation.

Horizontal 2D Shift

The display of an **Audience Area** in the window where calculations are displayed can be shifted so that **Audience Areas** that lie on top of each other in plan do not obscure one another in the display(as, for example, when seating in a balcony is on top of seating on a main floor). This field defines the shift along the X-axis. This only affects the view not the calculation.

Color / Change

This allows assignment of any **Color** to the selected **Audience Area**.

Visible

This toggles the **Visibility** of the selected **Audience Area**.

Image Visible

This toggles the **Visibility** of the mirror **Image** of this **Audience Area** in a symmetric room.

Location

The four points entered here as x, y and z coordinates define the locations of the corners of the **Audience Area**.

Scanning P2->P1

This specifies the resolution to be used for mapping within this **Audience Area** for isoline calculations.

Scanning P3->P2

This specifies the resolution to be used for mapping within this **Audience Area** for isoline calculations.

Item Number Window

Shows the Item number and mirror Item number. The arrows allow selection of sequential like items in ascending or descending order

OK

Applies changes and closes window.

Cancel

Discards changes and closes window.

Apply

Applies changes and keeps window open.

Traffic Light Icon

A **Red** light indicates that data in this window is mathematically incorrect and would fail **Check Data**.

Yellow Envelope Icon

This indicates changes have been made in this window that have not been **Applied**.

Audience Area Table Window

This window allows viewing or editing of all **Audience Area**s in tabular format. Most functions are available for multiple selections of **Audience Areas**.

Selecting a table item will highlight this area in the Edit Project window.

Traffic Light Icon

A **Red** light indicates that data in this window is mathematically incorrect and would fail **Check Data**.

Yellow Envelope Icon

This indicates changes have been made in this window that have not been **Applied**.

File Menu

Apply

This **Applies** the data and **Redraws** the room model.

Send Table To

This command sends the table, either to the clipboard for pasting in other applications or to a text file for reading by spreadsheet programs.

File

This saves the table to a *.TXT file.

Clipboard

This copies the picture to the clipboard for use in other applications.

Exit

This **Applies** the data, **Redraws** the room model, and closes the Table.

View Menu

Color

This adds or removes the **Color** column to or from the table content.

Location

This adds or removes the **Location** column to or from the table content.

Default Column Width

This resets changed columns with different width to the default values.

Edit Menu

New Item

This adds one or more **Audience Areas** to the project. If an **Audience Area** is not selected the new **Audience Area** will be added at the end of the list. If an **Audience Area** is selected the new **Audience Area** will be added after the selected **Audience Area**, and higher numbered **Audience Areas** will be renumbered.

Duplicate Item

This duplicates a selected **Audience Area**. The new **Audience Area** will be added to the list right the selected **Audience Area** number, and higher numbered **Audience Areas** will be renumbered. The default location is the same as the duplicated **Audience Area**.

Copy

This command allows one or more **Audience Areas** to be copied from the table and added to the internal clipboard. To select consecutive **Audience Areas**, LMB the first required **Audience Area**, press the Shift key and simultaneously LMB the last required **Audience Area**. To select inconsecutive **Audience**

Areas, LMB required **Audience Area**, press the Control key and simultaneously LMB the next required **Audience Area** and so on.

Shortcut: **Ctrl+C**

Paste

This command allows one or more **Audience Areas** to be pasted to the table from the clip board.

Shortcut: **Ctrl+V**

Delete

The selected **Audience Areas** are erased from the project. To select consecutive **Audience Areas**, LMB the first required **Audience Area**, press the Shift key and simultaneously LMB the last required **Audience Area**. To select inconsecutive **Audience Areas**, LMB required **Audience Area**, press the Control key and simultaneously LMB the next required **Audience Area** and so on.

Shortcut: **Del**

Table Menu

This toggles between the 10 different tables for

- **Wall Materials** (only view mode)
- **Vertices**
- **Edges**
- **Faces**
- **Loudspeakers**
- **Audience Areas**
- **Listener Seats**
- **IR Emitters**
- **Lamps**
- **Objects**

Tools Menu

Set Value To

This allows setting certain properties of the selected **Audience Areas**.

Vis

This will open a dialog box with the options **True** for visible **Audience Areas** and **False** for turning the selected **Audience Areas** invisible.

Img

This will open a dialog box with the options **True** for imaged **Audience Areas** and **False** for turning the Image of the selected **Audience Areas** off.

Color

This will open a color palette to set the color of the selected **Audience Areas**.

hor. Shift

This will open a dialog box to enter the value of the horizontal shift of the selected **Audience Areas**.

ver. Shift

This will open a dialog box to enter the value of the vertical shift of the selected **Audience Areas**.

P2->P1

This will open a dialog box to enter the number of steps of scanning from P2 to P1 of the selected **Audience Areas**.

P3->P2

This will open a dialog box to enter the number of steps of scanning from P3 to P2 of the selected **Audience Areas**.

P1 x, P1 y, P1 z, …, P3 x, P3 y, P3 z, …

This will open a dialog box to enter the x, y, or z-coordinate of the respective points of the selected **Audience Areas**.

Add Value To

This allows incrementing/decrementing the values of the selected **Audience Areas**.

hor. Shift

This will open a dialog box to enter the increment/decrement of the horizontal shift of the selected **Audience Areas**.

ver. Shift

This will open a dialog box to enter the increment/decrement of the vertical shift of the selected **Audience Areas**.

P2->P1

This will open a dialog box to enter the increment/decrement of steps of scanning from P2 to P1 of the selected **Audience Areas**.

P3->P2

This will open a dialog box to enter the increment/decrement of steps of scanning from P3 to P2 of the selected **Audience Areas**.

P1 x, P1 y, P1 z, …, P3 x, P3 y, P3 z, …

This will open a dialog box to enter the increment/decrement of the x, y, or z-coordinate of the respective points of the selected **Audience Areas**.

Negate Value

This resets the value of certain properties to the opposite sign for the selected **Audience Areas**.

Vis

This will turn visible **Audience Areas** invisible and vice versa for the selected **Audience Areas**.

Img

This will turn imaged Audience Areas invisible and vice versa for the selected **Audience Areas**.

hor. Shift

This will turn positive horizontal shift negative and vice versa for the selected **Audience Areas**.

ver. Shift

This will turn positive vertical shift negative and vice versa for the selected **Audience Areas**.

P1 x, P1 y, P1 z, …, P3 x, P3 y, P3 z, …

This will turn positive x, y, or z-coordinate negative for the respective points of the selected **Audience Areas**.

Add Prefix to Label

This allows editing of the label name(s)

Label

This will add a prefix to the Label for the selected **Audience Areas**.

Image Label

This will add a prefix to the Image Label for the selected **Audience Areas**.

Group Label

This will add a prefix to the Group Label for the selected **Audience Areas**.

Group Image Label

This will add a prefix to the Group Image Label for the selected **Audience Areas**.

Add Suffix to Label

This allows editing of the label name(s)

Label

This will add a suffix to the Label for the selected **Audience Areas**.

Image Label

This will add a suffix to the Image Label for the selected **Audience Areas**.

Group Label

This will add a suffix to the Group Label for the selected **Audience Areas**.

Group Image Label

This will add a suffix to the Group Image Label for the selected **Audience Areas**.

Remove Prefix from Label

This allows editing of the label name(s)

Label

This will remove a prefix from the Label for the selected **Audience Areas**.

Image Label

This will remove a prefix from the Image Label for the selected **Audience Areas**.

Group Label

This will remove a prefix from the Group Label for the selected **Audience Areas**.

Group Image Label

This will remove a prefix from the Group Image Label for the selected **Audience Areas**.

Remove Suffix from Label

This allows editing of the label name(s)

Label

This will remove a suffix from the Label for the selected **Audience Areas**.

Image Label

This will remove a suffix from the Image Label for the selected **Audience Areas**.

Group Label

This will remove a suffix from the Group Label for the selected **Audience Areas**.

Group Image Label

This will remove a suffix from the Group Image Label for the selected **Audience Areas**.

Displace

This opens a displacement window to allow entry of delta coordinates to displace all selected **Audience Areas**.

Listener Seat Properties Window

This window allows changing the properties of an individual **Listener Seat,** including color coordinates, orientation, and visibility.
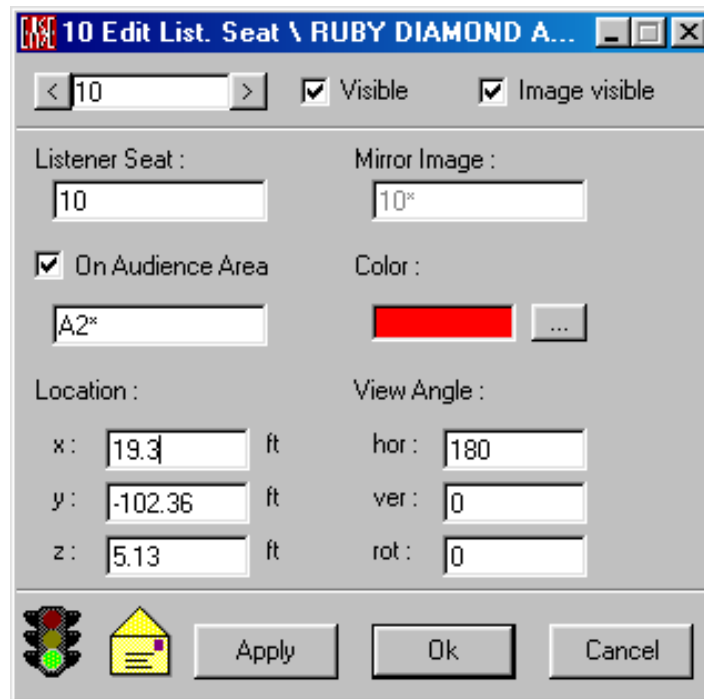
Listener Seat Number Window

Shows the **Listener Seat** number and **Mirror Listener Seat** number. The arrows allow selection of sequential **Seats** in ascending or descending order

OK

Applies changes and closes window.

Cancel

Discards changes and closes window.

Apply

Applies changes and keeps window open.

Traffic Light Icon

A **Red** light indicates that data in this window is mathematically incorrect and would fail **Check Data**.

Yellow Envelope Icon

This indicates changes have been made in this window that have not been **Applied**.

Listener Seat/Mirror Image

These data windows allow entry of user chosen descriptors for the **Listener Seats**.

On Audience Area

This appends a **Listener Seat** to an **Audience Area**. The z-coordinate of the seat is 50 cm or 20" higher than the z-value of the picked area spot.

Location

This describes the x, y or z coordinate of the dummy head or more general listener position.

View Angle

The forward orientation of a dummy head in the **Listener Seat** in the horizontal, vertical and rotational domains.

Color / Change

This command allows assignment of a specific **Color** to the selected **Listener Seat**.

Visible

A check here makes the **Listener Seat Visible**.

Image Visible

A check here makes this **Listener Seat's Mirror Image Visible** in a symmetric room.

Listener Seat Table Window

This window allows viewing or editing of all **Listener Seats** in a tabular format. Most functions are available for multiple selections of Listener Seats.

Selecting a table item will highlight this seat in the Edit Project window.

Traffic Light Icon

A **Red** light indicates that data in this window is mathematically incorrect and would fail **Check Data**.

Yellow Envelope Icon

This indicates changes have been made in this window that have not been **Applied**.

File Menu

Apply

This **Applies Data** and invokes immediate redraw of the room model.

Send Table To

This command sends the table, either to the clipboard for pasting in other applications, or to a text file for reading by spreadsheet programs.

File

This saves the table to a *.TXT file.

Clipboard

This copies the picture to the clipboard for use in other applications.

Exit

This **Applies Data**, invokes immediate redraw of the room model, and closes the Table.

View Menu

Color

This adds or removes the **Color** column to or from the table content.

Location

This adds or removes a **Location** column to or from the table content.

Angles

This adds or removes the **Angle** column to or from the table content.

Default Column Width

This resets changed columns with different width to the default values.

Edit Menu

New Item

This adds one or more new **Listener Seats**. If a **Listener Seat** is not selected then the new **Listener Seat** will be added to the end of the list. If a **Listener Seat** is selected the new **Listener Seat** will be added after the selected **Listener Seat,** and higher numbered **Listener Seats** will be renumbered.

Duplicate Item

This duplicates the selected **Listener Seat**. The new **Listener Seat** will be added to the list after the selected **Listener Seat,** and higher numbered **Listener Seats** will be renumbered. The default location is the same as the duplicated **Listener Seat**.

Copy

This command allows one or more **Listener Seats** to be copied from the table and added to the internal clipboard. To select consecutive **Listener Seats**, LMB the first required **Listener Seat**, press the Shift key and simultaneously LMB the last required **Listener Seat**. To select inconsecutive **Listener Seats**, LMB required **Listener Seat**, press the Control key and simultaneously LMB the next required **Listener Seat** and so on.

Shortcut: **Ctrl+C**

Paste

This command allows one or more **Listener Seats** to be pasted to the table from the clipboard.

Shortcut: **Ctrl+V**

Delete

The selected **Listener Seats** are erased from the project. To select consecutive **Listener Seats**, LMB the first required **Listener Seat**, press the Shift key and simultaneously LMB the last required **Listener Seat**. To select inconsecutive **Listener Seats**, LMB required **Listener Seat**, press the Control key and simultaneously LMB the next required **Listener Seat** and so on.

Shortcut: **Del**

Table Menu

This toggles between the 10 different tables for

- **Wall Materials** (only view mode)
- **Vertices**
- **Edges**
- **Faces**
- **Loudspeakers**
- **Audience Areas**
- **Listener Seats**
- **IR Emitters**
- **Lamps**
- **Objects**

Tools Menu

Set Value To

This allows setting certain properties of the selected **Listener Seats**.

Vis

This will open a dialog box with the options **True** for visible **Listener Seats** and **False** for turning the selected **Listener Seats** invisible.

Img

This will open a dialog box with the options **True** for imaged **Listener Seats** and **False** for turning the Image of the selected **Listener Seats** off.

Color

This will open a color palette to set the **Color** of the selected **Listener Seats**.

x

This will open a dialog box to enter the x-coordinate of the selected **Listener Seats**.

y

This will open a dialog box to enter the y-coordinate of the selected **Listener Seats**.

z

This will open a dialog box to enter the z-coordinate of the selected **Listener Seats**.

Hor

This will open a dialog box to enter the horizontal angle of the selected **Listener Seats**.

Ver

This will open a dialog box to enter the vertical angle of the selected **Listener Seats**.

Rot

This will open a dialog box to enter the rotational angle of the selected **Listener Seats**.

Add Value To

This allows incrementing/decrementing the values of the selected **Listener Seats**.

x

This will open a dialog box to enter the increment/decrement of the x-coordinate of the selected **Listener Seats**.

y

This will open a dialog box to enter the increment/decrement of the y-coordinate of the selected **Listener Seats**.

z

This will open a dialog box to enter the increment/decrement of the z-coordinate of the selected **Listener Seats**.

Hor

This will open a dialog box to enter the increment/decrement of the horizontal angle of the selected **Listener Seats**.

Ver

This will open a dialog box to enter the increment/decrement of the vertical angle of the selected **Listener Seats**.

Rot

This will open a dialog box to enter the increment/decrement of the rotational angle of the selected **Listener Seats**.

Negate Value

This resets the value of certain properties to the opposite sign for the selected **Listener Seats**.

Vis

This will turn visible Listener Seats invisible and vice versa for the selected **Listener Seats**.

Img

This will turn imaged Listener Seats invisible and vice versa for the selected **Listener Seats**.

x

This will turn positive x-coordinates negative and vice versa for the selected **Listener Seats**.

y

This will turn positive y-coordinates negative and vice versa for the selected **Listener Seats**.

z

This will turn positive z-coordinates negative and vice versa for the selected **Listener Seats**.

Hor

This will turn positive horizontal angles negative and vice versa for the selected **Listener Seats**.

Ver

This will turn positive vertical angles negative and vice versa for the selected **Listener Seats**.

Rot

This will turn positive rotational angles negative and vice versa for the selected **Listener Seats**.

Add Prefix to Label

This allows editing of the label name(s)

Label

This will add a prefix to the Label for the selected **Listener Seats**.

Image Label

This will add a prefix to the Image Label for the selected **Listener Seats**.

Group Label

This will add a prefix to the Group Label for the selected **Listener Seats**.

Group Image Label

This will add a prefix to the Group Image Label for the selected **Listener Seats**.

Add Suffix to Label

This allows editing of the label name(s)

Label

This will add a suffix to the Label for the selected **Listener Seats**.

Image Label

This will add a suffix to the Image Label for the selected **Listener Seats**.

Group Label

This will add a suffix to the Group Label for the selected **Listener Seats**.

Group Image Label

This will add a suffix to the Group Image Label for the selected **Listener Seats**.

Remove Prefix from Label

This allows editing of the label name(s)

Label

This will remove a prefix from the Label for the selected **Listener Seats**.

Image Label

This will remove a prefix from the Image Label for the selected **Listener Seats**.

Group Label

This will remove a prefix from the Group Label for the selected **Listener Seats**.

Group Image Label

This will remove a prefix from the Group Image Label for the selected **Listener Seats**.

Remove Suffix from Label

This allows editing of the label name(s)

Label

This will remove a suffix from the Label for the selected **Listener Seats**.

Image Label

This will remove a suffix from the Image Label for the selected **Listener Seats**.

Group Label

This will remove a suffix from the Group Label for the selected **Listener Seats**.

Group Image Label

This will remove a suffix from the Group Image Label for the selected **Listener Seats**.

Displace

This opens a displacement window to allow entry of delta coordinates to displace all selected **Listener Seats**.

IR Emitter Properties Window

This window allows changing the properties of an individual **IR Emitter,** including color coordinates, orientation, and visibility.
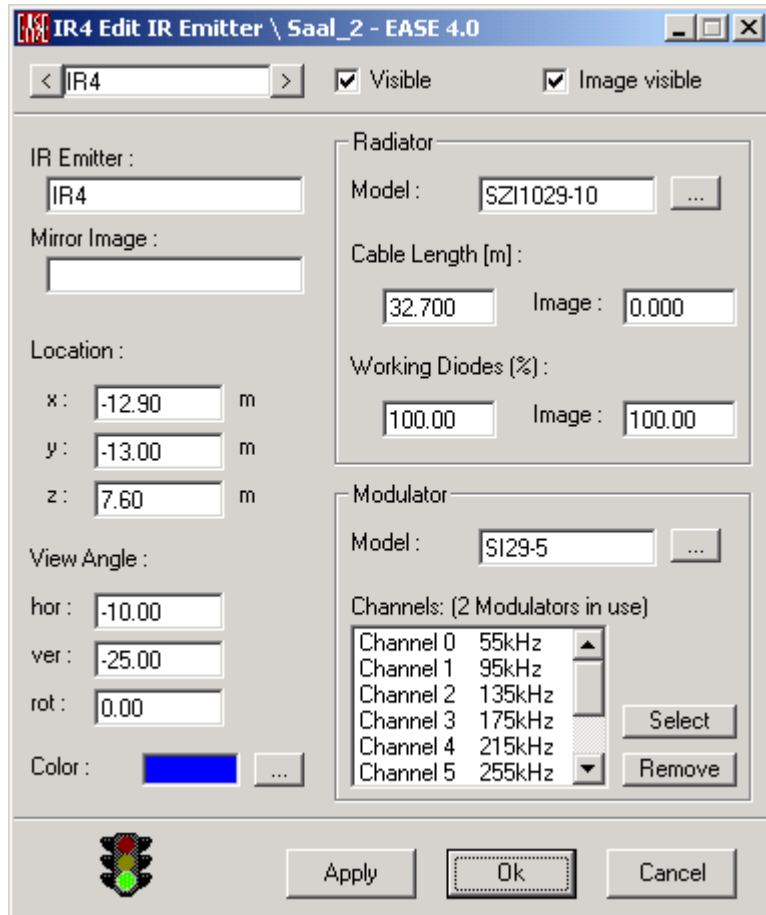
IR Emitter Number Window

Shows the **IR Emitter** number and **Mirror IR Emitter** number. The arrows allow selection of sequential **IR Emitters** in ascending or descending order

OK

Applies changes and closes window.

Cancel

Discards changes and closes window.

Apply

Applies changes and keeps window open.

Traffic Light Icon

A **Red** light indicates that data in this window is mathematically incorrect and would fail **Check Data**.

Yellow Envelope Icon

This indicates changes have been made in this window that have not been **Applied**.

IR Emitter/Mirror Image

These data windows allow entry of user chosen descriptors for the **IR Emitter.**

Location

This describes the x, y or z coordinate of the **IR Emitter**

View Angle

The forward orientation of the **IR Emitter** in the horizontal, vertical and rotational domains.

Color / Change

This command allows assignment of a specific **Color** to the selected **IR Emitter**.

Radiator

This command adds a corresponding **Radiator** to the selected **IR Emitter**.

Cable Length

This command allows assignment of a specific cable length in m or ft to the selected **IR Emitter**.

Working Diodes

This command allows assignment of a specific radiator diodes fraction in % which is in operation.

Modulator

This command allows the selection of a corresponding **Modulator** to the selected **IR Emitter**.

Channels

The **Add** and **Remove** command below allows the selection of the available Channels and transfer frequencies.

Visible

A check here makes the **IR Emitter Visible**.

Image Visible

A check here makes this **IR Emitter's Mirror Image Visible** in a symmetric room.

IR Emitter Table Window

This window allows viewing or editing of all **IR Emitters** in a tabular format. Most functions are available for multiple selections of **IR Emitters**.

Selecting a table item will highlight this IR Emitter in the Edit Project window.

Traffic Light Icon

A **Red** light indicates that data in this window is mathematically incorrect and would fail **Check Data**.

Yellow Envelope Icon

This indicates changes have been made in this window that have not been **Applied**.

File Menu

Apply

This **Applies Data** and invokes immediate redraw of the room model.

Send Table To

This command sends the table, either to the clipboard for pasting in other applications, or to a text file for reading by spreadsheet programs.

File

This saves the table to a *.TXT file.

Clipboard

This copies the picture to the clipboard for use in other applications.

Exit

This **Applies Data**, invokes immediate redraw of the room model, and closes the Table.

View Menu

Color

This adds or removes the **Color** column to or from the table content.

Location

This adds or removes the **Location** column to or from the table content.

Angles

This adds or removes the **Angle** column to or from the table content.

Default Column Width

This resets changed columns with different width to the default values.

Edit Menu

New Item

This adds one or more new **IR Emitters**. If an **IR Emitter** is not selected then the new **IR Emitter** will be added to the end of the list. If an **IR Emitter** is selected the new **IR Emitter** will be added after the selected **IR Emitter,** and higher numbered **IR Emitters** will be renumbered.

Duplicate Item

This duplicates the selected **IR Emitter**. The new **IR Emitter** will be added to the list after the selected **IR Emitter,** and higher numbered **IR Emitters** will be renumbered. The default location is the same as the duplicated **IR Emitter**.

Copy

This command allows one or more **IR Emitters** to be copied from the table and added to the internal clipboard. To select consecutive **IR Emitters**, LMB the first required **IR Emitter**, press the Shift key and simultaneously LMB the last required **IR Emitter**. To select inconsecutive **IR Emitters**, LMB required **IR Emitter**, press the Control key and simultaneously LMB the next required **IR Emitter** and so on.

Shortcut: **Ctrl+C**

Paste

This command allows one or more **IR Emitters** to be pasted to the table from the clipboard.

Shortcut: **Ctrl+V**

Delete

The selected **IR Emitters** are erased from the project. To select consecutive **IR Emitters**, LMB the first required **IR Emitter**, press the Shift key and simultaneously LMB the last required **IR Emitter**. To select inconsecutive **IR Emitters**, LMB required **IR Emitter**, press the Control key and simultaneously LMB the next required **IR Emitter** and so on.

Shortcut: **Del**

Table Menu

This toggles between the 10 different tables for

- **Wall Materials** (only view mode)
- **Vertices**
- **Edges**
- **Faces**
- **Loudspeakers**
- **Audience Areas**
- **Listener Seats**
- **IR Emitters**
- **Lamps**
- **Objects**

Tools Menu

Set Value To

This allows setting certain properties of the selected **IR Emitters**.

Vis

This will open a dialog box with the options **True** for visible **IR Emitters** and **False** for turning the selected **IR Emitters** invisible.

Img

This will open a dialog box with the options **True** for imaged **IR Emitters** and **False** for turning the Image of the selected **IR Emitters** off.

Radiator

This will open a Window to select the desired Radiator

Color

This will open a color palette to set the **Color** of the selected **IR Emitters**.

Modulator

This will open a Window to select the desired Modulator

x

This will open a dialog box to enter the x-coordinate of the selected **IR Emitters**.

y

This will open a dialog box to enter the y-coordinate of the selected **IR Emitters**.

z

This will open a dialog box to enter the z-coordinate of the selected **IR Emitters**.

Hor

This will open a dialog box to enter the horizontal angle of the selected **IR Emitters**.

Ver

This will open a dialog box to enter the vertical angle of the selected **IR Emitters**.

Rot

This will open a dialog box to enter the rotational angle of the selected **IR Emitters**.

Add Value To

This allows incrementing/decrementing the values of the selected **IR Emitters**.

x

This will open a dialog box to enter the increment/decrement of the x-coordinate of the selected **IR Emitters**.

y

This will open a dialog box to enter the increment/decrement of the y-coordinate of the selected **IR Emitters**.

z

This will open a dialog box to enter the increment/decrement of the z-coordinate of the selected **IR Emitters**.

Hor

This will open a dialog box to enter the increment/decrement of the horizontal angle of the selected **IR Emitters**.

Ver

This will open a dialog box to enter the increment/decrement of the vertical angle of the selected **IR Emitters**.

Rot

This will open a dialog box to enter the increment/decrement of the rotational angle of the selected **IR Emitters**.

Negate Value

This resets the value of certain properties to the opposite sign for the selected **IR Emitters**.

Vis

This will turn visible **IR Emitters** invisible and vice versa for the selected **IR Emitters**.

Img

This will turn imaged **IR Emitters** invisible and vice versa for the selected **IR Emitters**.

x

This will turn positive x-coordinates negative and vice versa for the selected **IR Emitters**.

y

This will turn positive y-coordinates negative and vice versa for the selected **IR Emitters**.

z

This will turn positive z-coordinates negative and vice versa for the selected **IR Emitters**.

Hor

This will turn positive horizontal angles negative and vice versa for the selected **IR Emitters**.

Ver

This will turn positive vertical angles negative and vice versa for the selected **IR Emitters**.

Rot

This will turn positive rotational angles negative and vice versa for the selected **IR Emitters**.

Add Prefix to Label

This allows editing of the label name(s)

Label

This will add a prefix to the Label for the selected **IR Emitters**.

Image Label

This will add a prefix to the Image Label for the selected **IR Emitters**.

Group Label

This will add a prefix to the Group Label for the selected **IR Emitters**.

Group Image Label

This will add a prefix to the Group Image Label for the selected **IR Emitters**.

Add Suffix to Label

This allows editing of the label name(s)

Label

This will add a suffix to the Label for the selected **IR Emitters**.

Image Label

This will add a suffix to the Image Label for the selected **IR Emitters**.

Group Label

This will add a suffix to the Group Label for the selected **IR Emitters**.

Group Image Label

This will add a suffix to the Group Image Label for the selected IR Emitters.

Remove Prefix from Label

This allows editing of the label name(s)

Label

This will remove a prefix from the Label for the selected **IR Emitters**.

Image Label

This will remove a prefix from the Image Label for the selected **IR Emitters**.

Group Label

This will remove a prefix from the Group Label for the selected **IR Emitters**.

Group Image Label

This will remove a prefix from the Group Image Label for the selected **IR Emitters**.

Remove Suffix from Label

This allows editing of the label name(s)

Label

This will remove a suffix from the Label for the selected **IR Emitters**.

Image Label

This will remove a suffix from the Image Label for the selected **IR Emitters**.

Group Label

This will remove a suffix from the Group Label for the selected **IR Emitters**.

Group Image Label

This will remove a suffix from the Group Image Label for the selected **IR Emitters**.

Displace

This opens a displacement window to allow entry of delta coordinates to displace all selected **IR Emitters**.

Lamp Properties Window

This window allows changing the properties of an individual **Lamp** including its color, coordinates, orientation, assigned **Light Source**, and visibility in the model.
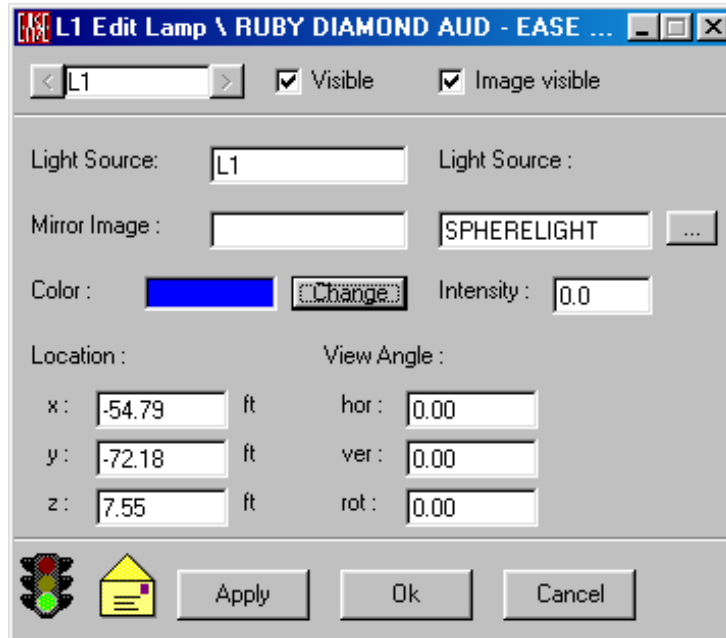
Lamp Number Window

Shows the **Lamp** number and mirror **Lamp** number. The arrows allow selection of sequential **Lamps** in ascending or descending order

OK

Applies changes and closes window.

Cancel

Discards changes and closes window.

Apply

Applies changes and keeps window open.

Traffic Light Icon

A **Red** light indicates that data in this window is mathematically incorrect and would fail **Check Data**.

Yellow Envelope Icon

This indicates changes have been made in this window that have not been **Applied**.

Lamp/Mirror Image

These data windows allow entry of user chosen descriptors for the **Lamp**.

Light Source

This window shows the manufacturers model number for a **Light Source**. By using **Change,** other models can be selected from the **EASE Database.** In the selector window, **Details** shows basic **Light Source** property data.

Note: The **Light Source Database** is not yet available.

Color / Change

This command allows assignment of a **Color** to the selected **Lamp**.

Intensity

This sets the Intensity of the **Lamp**.

Location

This describes the x, y or z coordinate of the **Lamp**.

View Angle

These windows describe the angular orientation of the **Lamp** in the horizontal, vertical and rotational domains.

Visible

A check here makes the **Lamp Visible**.

Image Visible

A check here makes this **Lamp's Mirror Image Visible** in a symmetric room.

Lamp Table Window

This window allows viewing or editing of all **Lamps** in tabular format.

Most of these functions are available for multiple selection of **Lamps**.

Selecting a table item will highlight this lamp in the Edit Project window.

Traffic Light Icon

A **Red** light indicates that data in this window is mathematically incorrect and would fail **Check Data**.

Yellow Envelope Icon

This indicates changes have been made in this window that have not been **Applied**.

File Menu

Apply

This **Applies** the data and redraws the room model.

Send Table To

This command sends the table, either to the clipboard for pasting in other applications, or to a text file for reading by spreadsheet programs.

File

This saves the table to a *.TXT file.

Clipboard

This copies the picture to the clipboard for use in other applications.

Exit

This **Applies** the data, redraws the room model, and closes the Table.

View Menu

Color

This adds or removes the Color column to or from the table content.

Location

This adds or removes the **Location** column to or from the table content.

Angles

This adds or removes the **Angle** column to or from the table content.

Default Column Width

This resets changed columns with different width to the default values.

Edit Menu

New Item

This adds a new **Lamp** to a project. If a previous **Lamp** is not selected the new **Lamp** will be added to the end of the list. If a **Lamp** is selected the new **Lamp** will be added after the **Lamp** number selected, and higher numbered **Lamps** will be renumbered. .

Duplicate Item

This allows the duplication of a selected **Lamp**. The new Lamp will be added to the list after the selected **Lamp**, and higher numbered **Lamps** will be renumbered. The default location is the same as the duplicated **Lamp**.

Copy

This command allows one or more **Lamps** to be copied from the table and added to the internal clipboard. To select consecutive **Lamps**, LMB the first required **Lamp**, press the Shift key and simultaneously LMB the last required **Lamp**. To select inconsecutive **Lamps**, LMB required **Lamp**, press the Control key and simultaneously LMB the next required **Lamp** and so on.

Shortcut: **Ctrl+C**

Paste

This command allows one or more **Lamps** to be pasted to the table from the clipboard.

Shortcut: **Ctrl+V**

Delete

The selected **Lamps** are erased from the project. To select consecutive **Lamps**, LMB the first required **Lamp**, press the Shift key and simultaneously LMB the last required **Lamp**. To select inconsecutive **Lamps**, LMB required **Lamp**, press the Control key and simultaneously LMB the next required **Lamp** and so on.

Shortcut: **Del**

Table Menu

This toggles between the 10 different tables for

- **Wall Materials** (only view mode)
- **Vertices**
- **Edges**
- **Faces**
- **Loudspeakers**
- **Audience Areas**
- **Listener Seats**
- **IR Emitters**
- **Lamps**
- **Objects**

Tools Menu

Set Value To

This allows setting certain properties of the selected **Lamps**.

Vis

This will open a dialog box with the options **True** for visible **Lamps** and **False** for turning the selected **Lamps** invisible.

Img

This will open a dialog box with the options **True** for imaged **Lamps** and **False** for turning the Image of the selected **Lamps** off.

Light Source

This will open a Window to select the desired Light source

Color

This will open a color palette to set the **Color** of the selected **Lamps**.

x

This will open a dialog box to enter the x-coordinate of the selected **Lamps**.

y

This will open a dialog box to enter the y-coordinate of the selected **Lamps**.

z

This will open a dialog box to enter the z-coordinate of the selected **Lamps**.

Hor

This will open a dialog box to enter the horizontal angle of the selected **Lamps**.

Ver

This will open a dialog box to enter the vertical angle of the selected **Lamps**.

Rot

This will open a dialog box to enter the rotational angle of the selected **Lamps**.

Add Value To

This allows incrementing/decrementing the values of the selected **Lamps**.

x

This will open a dialog box to enter the increment/decrement of the x-coordinate of the selected **Lamps**.

y

This will open a dialog box to enter the increment/decrement of the y-coordinate of the selected **Lamps**.

z

This will open a dialog box to enter the increment/decrement of the z-coordinate of the selected **Lamps**.

Hor

This will open a dialog box to enter the increment/decrement of the horizontal angle of the selected **Lamps**.

Ver

This will open a dialog box to enter the increment/decrement of the vertical angle of the selected **Lamps**.

Rot

This will open a dialog box to enter the increment/decrement of the rotational angle of the selected **Lamps**.

Negate Value

This resets the value of certain properties to the opposite sign for the selected **Lamps**.

Vis

This will turn visible **Lamps** invisible and vice versa for the selected **Lamps**.

Img

This will turn imaged **Lamps** invisible and vice versa for the selected **Lamps**.

x

This will turn positive x-coordinates negative and vice versa for the selected **Lamps**.

y

This will turn positive y-coordinates negative and vice versa for the selected **Lamps**.

z

This will turn positive z-coordinates negative and vice versa for the selected **Lamps**.

Hor

This will turn positive horizontal angles negative and vice versa for the selected **Lamps**.

Ver

This will turn positive vertical angles negative and vice versa for the selected **Lamps**.

Rot

This will turn positive rotational angles negative and vice versa for the selected **Lamps**.

Add Prefix to Label

This allows editing of the label name(s)

Label

This will add a prefix to the Label for the selected **Lamps**.

Image Label

This will add a prefix to the Image Label for the selected **Lamps**.

Group Label

This will add a prefix to the Group Label for the selected **Lamps**.

Group Image Label

This will add a prefix to the Group Image Label for the selected **Lamps**.

Add Suffix to Label

This allows editing of the label name(s)

Label

This will add a suffix to the Label for the selected **Lamps**.

Image Label

This will add a suffix to the Image Label for the selected **Lamps**.

Group Label

This will add a suffix to the Group Label for the selected **Lamps**.

Group Image Label

This will add a suffix to the Group Image Label for the selected **Lamps**.

Remove Prefix from Label

This allows editing of the label name(s)

Label

This will remove a prefix from the Label for the selected **Lamps**.

Image Label

This will remove a prefix from the Image Label for the selected **Lamps**.

Group Label

This will remove a prefix from the Group Label for the selected **Lamps**.

Group Image Label

This will remove a prefix from the Group Image Label for the selected **Lamps**.

Remove Suffix from Label

This allows editing of the label name(s)

Label

This will remove a suffix from the Label for the selected **Lamps**.

Image Label

This will remove a suffix from the Image Label for the selected **Lamps**.

Group Label

This will remove a suffix from the Group Label for the selected **Lamps**.

Group Image Label

This will remove a suffix from the Group Image Label for the selected **Lamps**.

Displace

This opens a displacement window for entry of x, y, and z distances by which the **Lamp** is to be displaced.

Object Properties Window

This window allows changing the properties of an individual **Object,** including its location, visibility, the items that are part of it, and many other parameters.
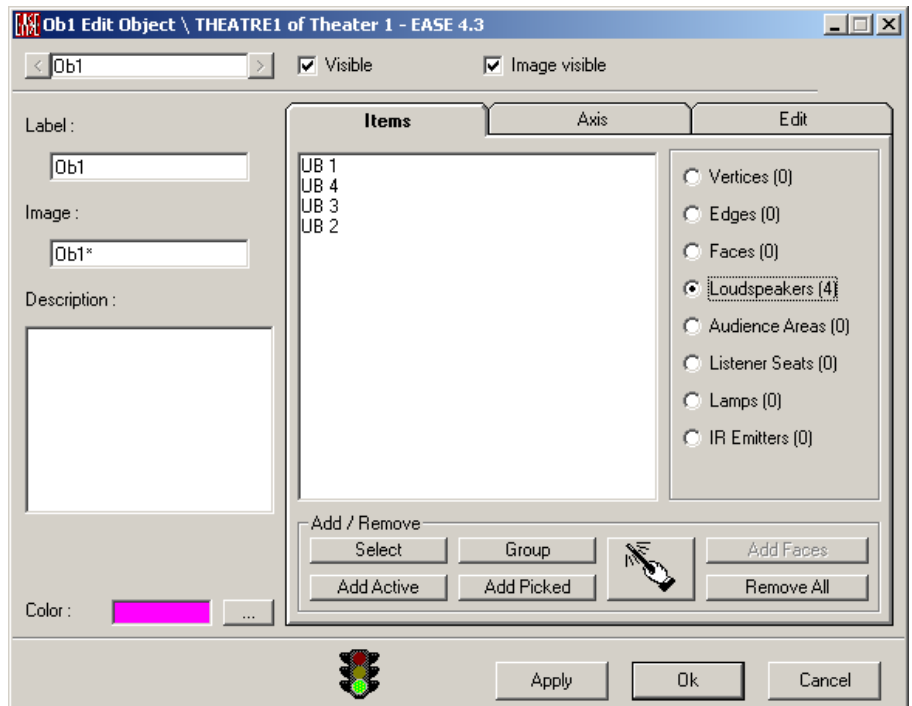
Object Number Window

Shows the **Object** number and mirror **Object** number. The arrows allow selection of sequential like items in ascending or descending order

Object Label / Mirror Image

These data windows allow entry of user chosen descriptors for the **Object**.

Description

This provides the User a notepad to describe the **Object** and make notes about it.

Color / Change

This allows assignment of a specific **Color** to the selected **Object.**

Visible

This toggles the visibility of this particular **Object**.

Image Visible

This toggles the visibility of this particular **Object**'s mirror image in a symmetric room.

OK

Applies changes and closes window.

Cancel

Discards changes and closes window.

Apply

Applies changes and keeps window open.

Traffic Light Icon

A **Red** light indicates that data in this window is mathematically incorrect and would fail **Check Data**.

Yellow Envelope Icon

This indicates changes have been made in this window that have not been **Applied**.

Items Tab

This allows viewing and editing the list of the **Items** that make up the **Object**.
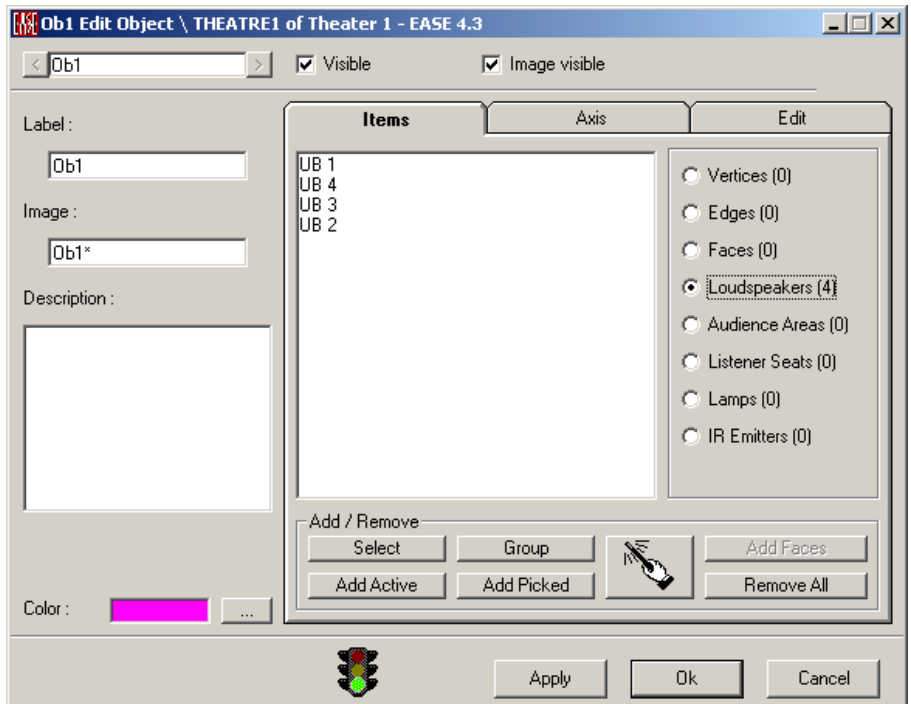
Item Display Window

Displays items of a given type that make up the **Object**.

Items

This shows the list of types of items that make up the **Object**.

Vertices, Edges, Faces, Loudspeakers, Audience Areas, Listener Seats, Lamps, IR Emitters

Selecting one of these boxes will cause display in the **Items** list of **Items** of the selected type.

Select

Brings up a list of all **Items** in the project of the selected type, and shows the ones that are part of the **Object.** More **Items** of the same type my be added by selecting them and clicking **OK**.

Add Active

Adds **Items** to the **Object** that are currently selected to be **Active**.

Group

Add a **Group of Items** to the **Object**.

Add Picked

Adds the currently picked **Item** to the **Object**.

Add Mouse Mode

This command enables a specific Add Mouse Mode. Use the LMB to pick **Items** and use the RMB to add **Items** to the **Object**.

Add (Item name)

Adds other **Items** that may be part of the selected **Items** such as Adding the **Vertices** to a **Face**.

Remove All

Removes all **Items** of the selected type from the **Object**.

Axis Tab

View and edit the **Point of Origin** and the **Aiming Axis** for the **Object**.
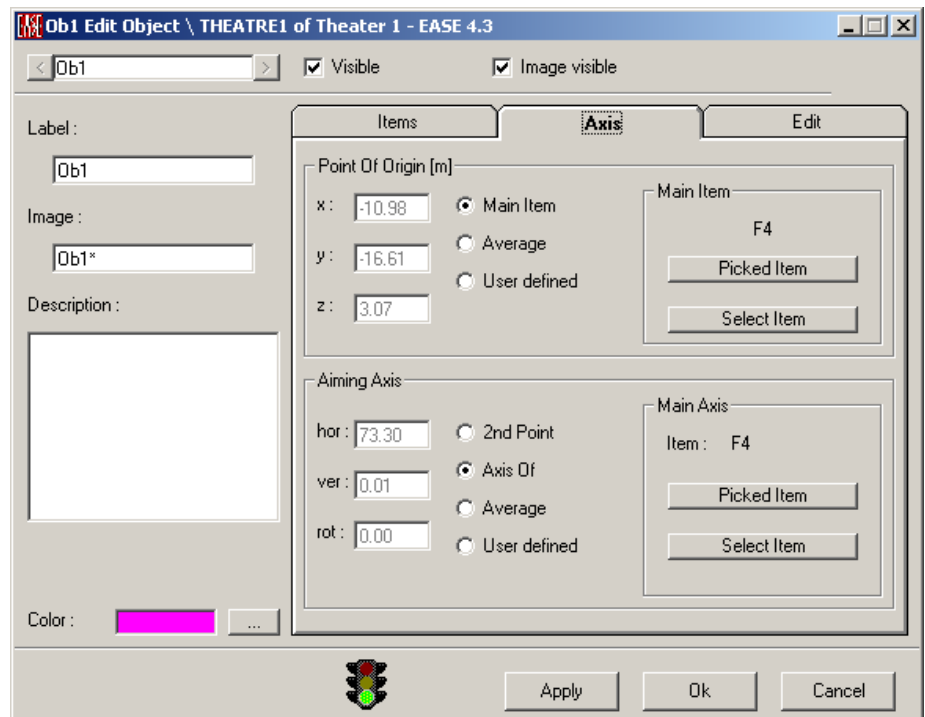
Point of Origin

The "Handling Point" for the **Object**.

X, Y and Z Location Windows

Allows entry of x, y, and z coordinates of the **Point Of Origin**.

Main Item

Allows choice of any **Item** in the Room as the **Point of Origin**. This selection also redefines the area to the right and allows selection of **Picked** or **Selected Items** for use as the **Point of Origin**.

Average

Sets the **Point of Origin** to the **Average** value of the locations of the **Items** that comprise the **Object**. This selection redefines the area to the right.

User defined

Sets the **Point of Origin** to the point entered in the x, y, and z windows.

This selection also redefines the area to the right and allows selection of **Picked Location** for use as the **Point of Origin**.

Aiming Axis

This area allows the setting of the orientation or the aiming of the **Object Main Axis**.

hor., ver. and rot. Angle Windows

These data entry windows allow entry of horizontal, vertical and rotational angles of the **Object** rotating around the **Point of Origin.**

2nd Point

A mark here allows the selection of an **Item** to aim at. This selection also redefines the area to the right and allows selection of **Picked** or **Selected Items** for use as the aiming point from the **Point of Origin.**

Axis of

A mark here sets the **Point of Origin Axis** orientation. . This selection also redefines the area to the right and allows selection of the **Picked** or **Selected Items** orientation for use as the **Point of Origin Axis** orientation.

Average

Sets the **Point of Origin Axis** to the **Average** value of the orientation axes of the **Items** that comprise the **Object**.

User defined

Sets the **Point of Origin Axis** to the orientation entered in the x, y, and z windows. This selection also redefines the area to the right and allows selection of the **Picked Items** orientation for use as the **Point of Origin Axis** orientation.

Edit Tab

This area allows the selection of component **Items** of the **Object** for editing individually.

Pull Down Window

This is where selection of the **Item** type to be edited is done. Use by left clicking the pull down button and selecting the desired Item type. This will cause the area beneath the pull down button to change and show the parameters that are available for that **Item** from this Tab.

Vertices, Edges,

The parameters available for editing of **Vertices or Edges** is the **Color** and **Visibility** property only.
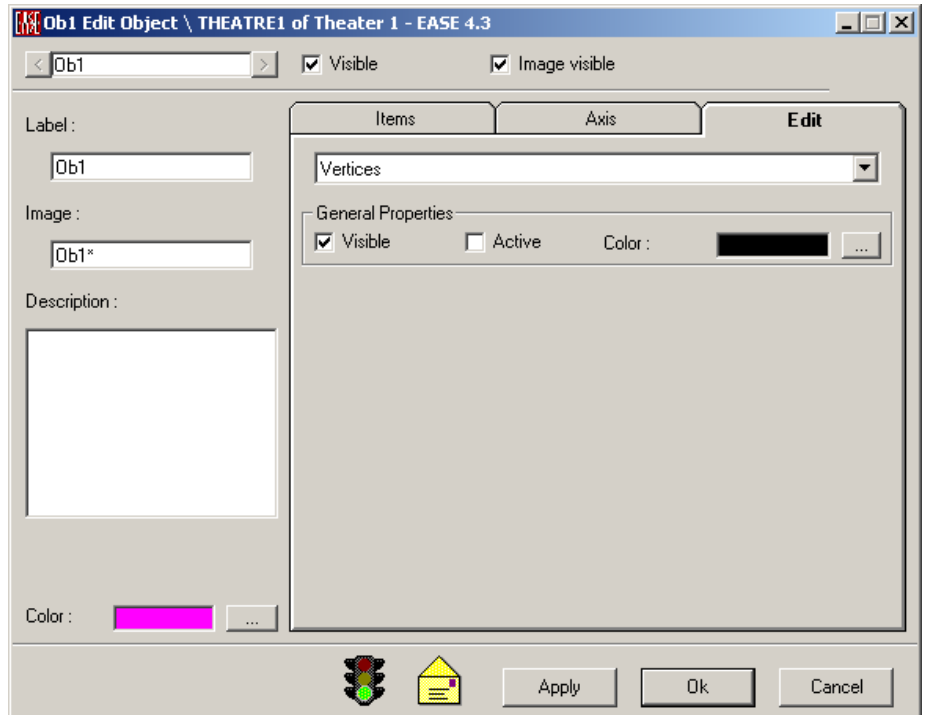
Faces

The parameters available in **Faces (General)** for editing of the **Face** are the **Color** (Front and Rear), **Wall Material** selection (Front and Rear) and the **Texture** Selection (Front and Rear) as well as the **Visibility**.
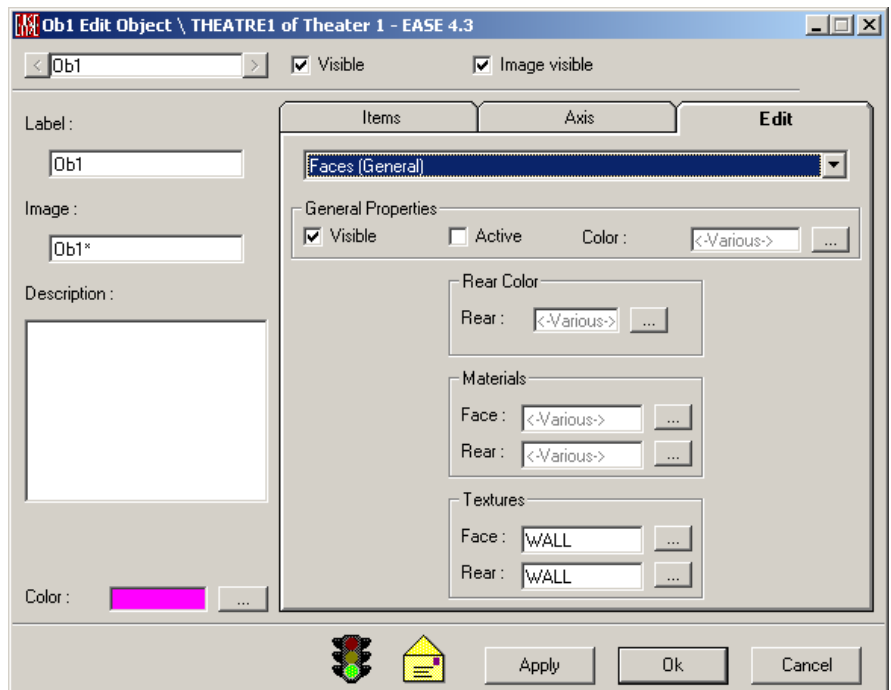
Faces (Statistics) option

This option allows tabular information about the Faces of the selected Object to be displayed.
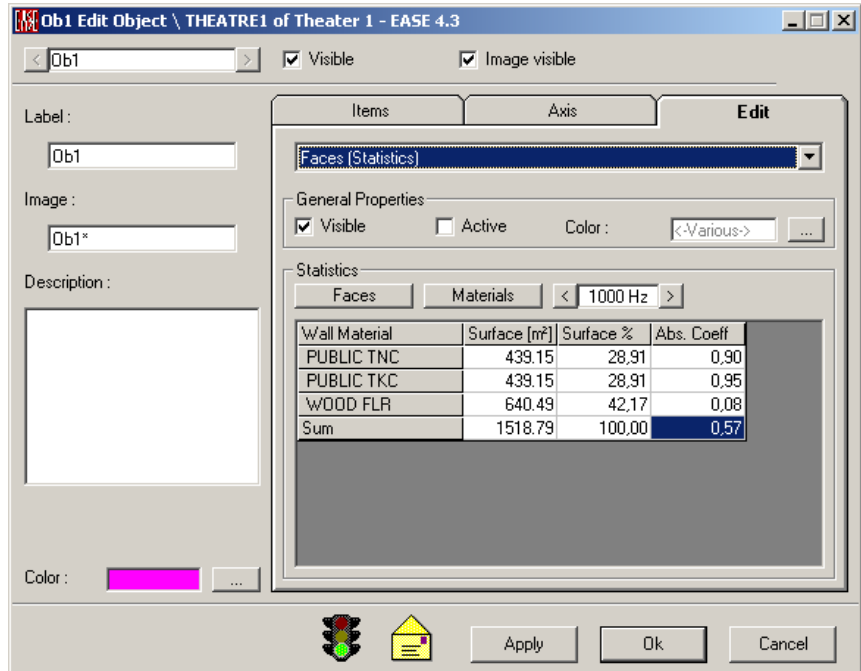
Faces

Selecting this option will allow the tabular Data to be referenced to the **Face** Number and display the Surface area of each **Face** and the percentage of the total area it is of the **Object**. It also shows the sum total of the **Face** area of the **Object**.

Materials

Selecting this option will allow the tabular Data to be referenced to the **Wall Material** description and display the Surface area of each **Wall Material** and the percentage of the total area it is of the **Object**. It also shows the sum total of the **Wall Material** area of the **Object** as well as an Absorption Coefficient depending on the selected frequency.

Frequency Selection Window

This selection window allows selection of the frequency desired for the display of the Absorption Coefficient in the tabular display.

Loudspeakers

The parameters available for common editing of **Loudspeakers** are the **Color**, **Speaker Model, Delay, Alignment, Activation** and **Visibility.**
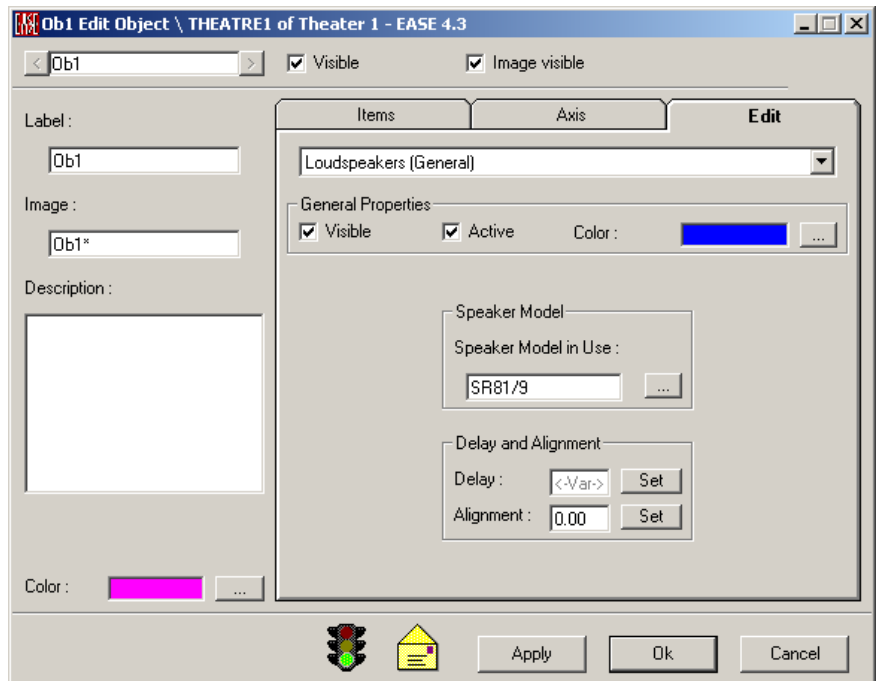
Another Tab allows the setting of the common levels:
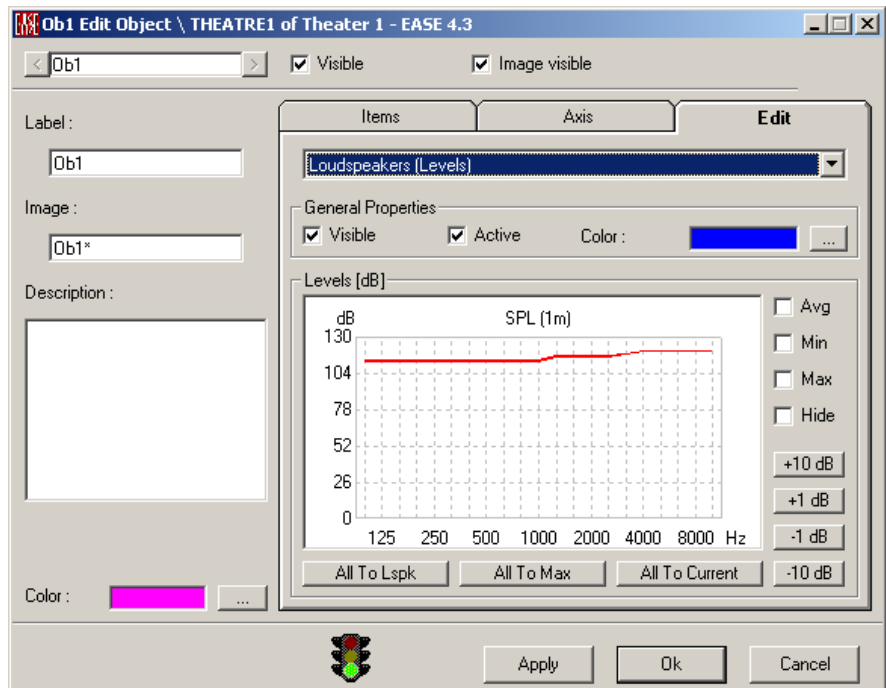
Audience Areas

The parameters available for editing of the **Audience Area** are the **Color** and the **Visibility.**

Listener Seats

The parameters available for editing of the **Listener Seat** are the **Color** and **Visibility.**

Lamps

The parameters available for editing of the **Lamps** are the **Color** and **Visibility.**

IR Emitters

The parameters available for editing of the **IR Emitters** are the **Color**, **Visibility** and **IR Emitter Model.**

All

The global parameters available for editing of the **All** are the **Color** and **Invisible/Visible.**

Object Table Window

This window allows only viewing of all **Objects** in tabular format.

Most of these functions are available for multiple selections of **Objects**.

Selecting a table item will highlight this object in the Edit Project window.

Traffic Light Icon

A **Red** light indicates that data in this window is mathematically incorrect and would fail **Check Data**.

Yellow Envelope Icon

This indicates changes have been made in this window that have not been **Applied**.

File Menu

Apply

This **Applies** the data and redraws the room model.

Send Table To

This command sends the table, either to the clipboard for pasting in other applications, or to a text file for reading by spreadsheet programs.

File

This saves the table to a *.TXT file.

Clipboard

This copies the picture to the clipboard for use in other applications.

Exit

This **Applies** the data, redraws the room model, and closes the Table.

View Menu

Color

This adds or removes the **Color** column to or from the table content.

Default Column Width

This resets changed columns with different width to the default values.

Edit Menu

New Item

This adds a new **Object** to a project. If a previous **Object** is not selected the new **Object** will be added to the end of the list. If an **Object** is selected the new **Object** will be added after the **Object** number selected, and higher numbered **Objects** will be renumbered.

Duplicate Item

This allows the duplication of a selected **Object**. The new Lamp will be added to the list after the selected **Object**, and higher numbered **Objects** will be renumbered. The default location is the same as the duplicated **Object**.

Copy

This command allows one or more **Objects** to be copied from the table and added to the internal clipboard. To select consecutive **Objects**, LMB the first required **Object**, press the Shift key and simultaneously LMB the last required **Object**. To select inconsecutive **Objects**, LMB required **Object**, press the Control key and simultaneously LMB the next required **Object** and so on.

Shortcut: **Ctrl+C**

Paste

This command allows one or more **Objects** to be pasted to the table from the clipboard.

Shortcut: **Ctrl+V**

Delete

The selected **Objects** are erased from the project. To select consecutive **Objects**, LMB the first required **Object**, press the Shift key and simultaneously LMB the last required **Object**. To select inconsecutive **Objects**, LMB required **Object**, press the Control key and simultaneously LMB the next required **Object** and so on.

Shortcut: **Del**

Table Menu

This toggles between the 10 different tables for

- **Wall Materials** (only view mode)
- **Vertices**
- **Edges**
- **Faces**
- **Loudspeakers**

- **Audience Areas**
- **Listener Seats**
- **IR Emitters**
- **Lamps**
- **Objects**

Tools Menu

Set Value To

This allows setting certain properties of the selected **Objects**.

Vis

This will open a dialog box with the options **True** for visible **Objects** and **False** for turning the selected **Objects** invisible.

Img

This will open a dialog box with the options **True** for imaged **Objects** and **False** for turning the Image of the selected **Objects** off.

Color

This will open a color palette to set the **Color** of the selected **Objects**.

x

This will open a dialog box to enter the x-coordinate of the selected **Objects**.

y

This will open a dialog box to enter the y-coordinate of the selected **Objects**.

z

This will open a dialog box to enter the z-coordinate of the selected **Objects**.

Hor

This will open a dialog box to enter the horizontal angle of the selected **Objects**.

Ver

This will open a dialog box to enter the vertical angle of the selected **Objects**.

Rot

This will open a dialog box to enter the rotational angle of the selected **Objects**.

Negate Value

This resets the value of certain properties to the opposite sign for the selected **Objects**.

Vis

This will turn visible **Objects** invisible and vice versa for the selected **Objects**.

Img

This will turn imaged **Objects** invisible and vice versa for the selected **Objects**.

x

This will turn positive x-coordinates negative and vice versa for the selected **Objects**.

y

This will turn positive y-coordinates negative and vice versa for the selected **Objects**.

z

This will turn positive z-coordinates negative and vice versa for the selected **Objects**.

Hor

This will turn positive horizontal angles negative and vice versa for the selected **Objects**.

Ver

This will turn positive vertical angles negative and vice versa for the selected **Objects**.

Rot

This will turn positive rotational angles negative and vice versa for the selected **Objects**.

Add Prefix to Label

This allows editing of the label name(s)

Label

This will add a prefix to the Label for the selected **Objects**.

Image Label

This will add a prefix to the Image Label for the selected **Objects**.

Group Label

This will add a prefix to the Group Label for the selected **Objects**.

Group Image Label

This will add a prefix to the Group Image Label for the selected **Objects**.

Add Suffix to Label

This allows editing of the label name(s)

Label

This will add a suffix to the Label for the selected **Objects**.

Image Label

This will add a suffix to the Image Label for the selected **Objects**.

Group Label

This will add a suffix to the Group Label for the selected **Objects**.

Group Image Label

This will add a suffix to the Group Image Label for the selected **Objects**.

Remove Prefix from Label

This allows editing of the label name(s)

Label

This will remove a prefix from the Label for the selected **Objects**.

Image Label

This will remove a prefix from the Image Label for the selected **Objects**.

Group Label

This will remove a prefix from the Group Label for the selected **Objects**.

Group Image Label

This will remove a prefix from the Group Image Label for the selected **Objects**.

Remove Suffix from Label

This allows editing of the label name(s)

Label

This will remove a suffix from the Label for the selected **Objects**.

Image Label

This will remove a suffix from the Image Label for the selected **Objects**.

Group Label

This will remove a suffix from the Group Label for the selected **Objects**.

Group Image Label

This will remove a suffix from the Group Image Label for the selected **Objects**.

EASE Compute Cluster Window (standalone only)

This command allows calculating a cluster (directivity balloon in the far field) by using selected loudspeakers in an existing project. To use his command:

1. Left click on **EASE Cluster**.

2. This will open a window labeled "**Compute Cluster**".
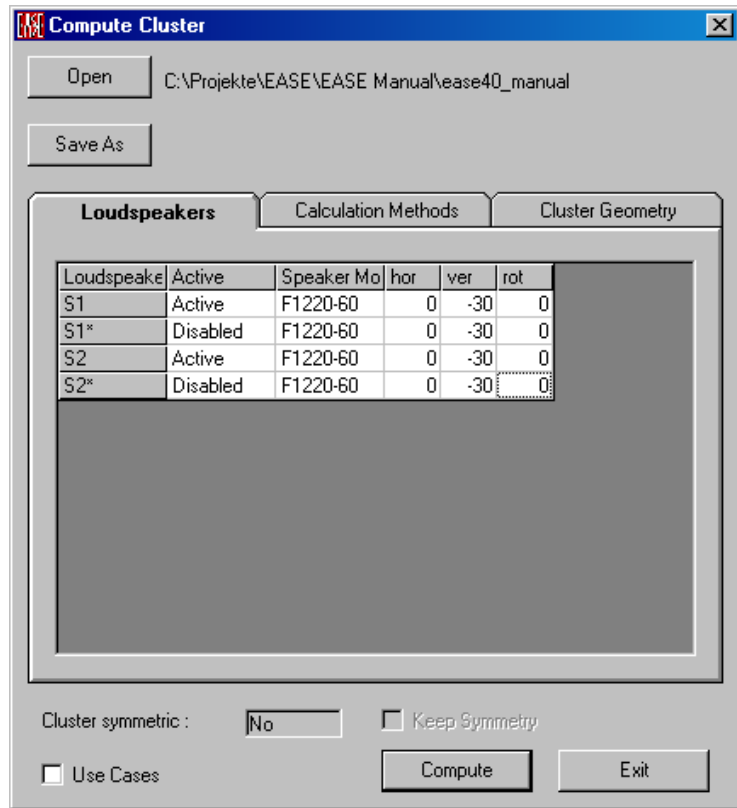
3. Left click on **Open** allows the loading of a project (*.frd file).

4. After loading you will see all the loudspeakers in the project listed in a table in a Not active mode.

5. Left click in Active column to activate the loudspeakers you want to include into the cluster

6. Now Look at the Cluster Geometry. The **Position** is the resultant center point as the new insert point of the cluster.
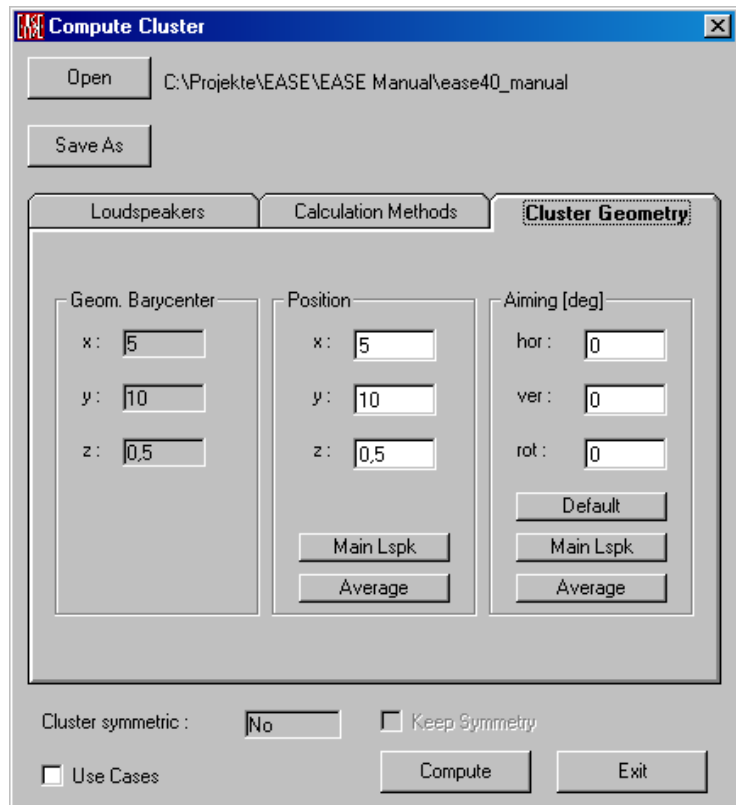
- If **Average** is selected, **Position** shows the average location of the center point of all active loudspeakers.

- If **Main Lspk** is selected, a window will open allowing the selection of a loudspeaker. The new center point **Position** is then set to the position of the chosen loudspeaker.

7. This **Aiming** is the resultant direction of the maximum SPL of the cluster.

- If **Average** is selected, **Aiming** shows the average direction of all active loudspeakers.

- If **Main Lspk** is selected, a window will open allowing the selection of a loudspeaker. The Aiming direction is then set to the direction of the chosen loudspeaker.

- **Default** resets the Aiming angles to 0,0,0.

8. **Calculation Method:** Allows selection of the formulae used to calculate the cluster balloon:
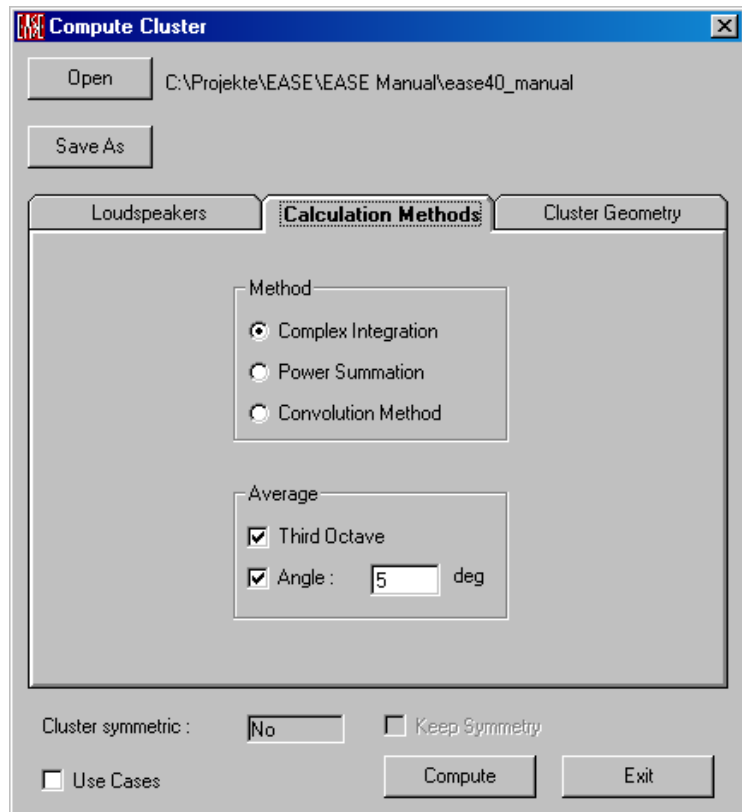
- **Complex Integration**: This uses running time complex interference to calculate the new directivity balloon.

- **Power Summation**: This uses simple energy addition to calculate the cluster balloon.

- **Convolution Method**: This is using the formulae developed by Mark Ureda.

9. **Average**: This allows selection of the method that mathematically smoothes the cluster balloon (only active with **Complex Integration**):

- **Third Octave** sets the bandwidth of the energy, centered on the selected frequency, which is used to excite the device.

- **Angle** averages the energy over the angle chosen.

10. **Use Cases**: This command allows the use of the active loudspeaker cases to construct the case of the new cluster speaker model. When used in the room the cluster case will appear as the individual loudspeaker cases but will act as a single loudspeaker.

11. **Keep Symmetry**: This command allows the symmetry of the cluster balloon and case data to be kept, if the active loudspeakers are arranged symmetrically and the speaker models (cases, balloons) are symmetric.

12. Left click on **Compute**.

13. This will open a **Save File** window. Select path and filename for the new cluster speaker model.

14. Left click on **Save**.

15. The **Busy** window will open and indicate it is calculating the balloon of the new cluster.

---

16. Left click on Save As allows to save the cluster under a different name.

Select [Database Item] Window

This window allows assigning a database item to the currently selected element(s) of the room.

- For a **Loudspeaker** this window is labeled **Select Speaker Model**.

- For a **Face** this window is labeled **Select Wall Material** or **Select Texture**.

- For a **Lamp** this window is labeled **Select Light Source**.

- For an **IR Emitter** this window is labeled **Select IR Modulator** or **Select IR Radiator**.

Note that this window can be resized if more or less screen space is required for display.
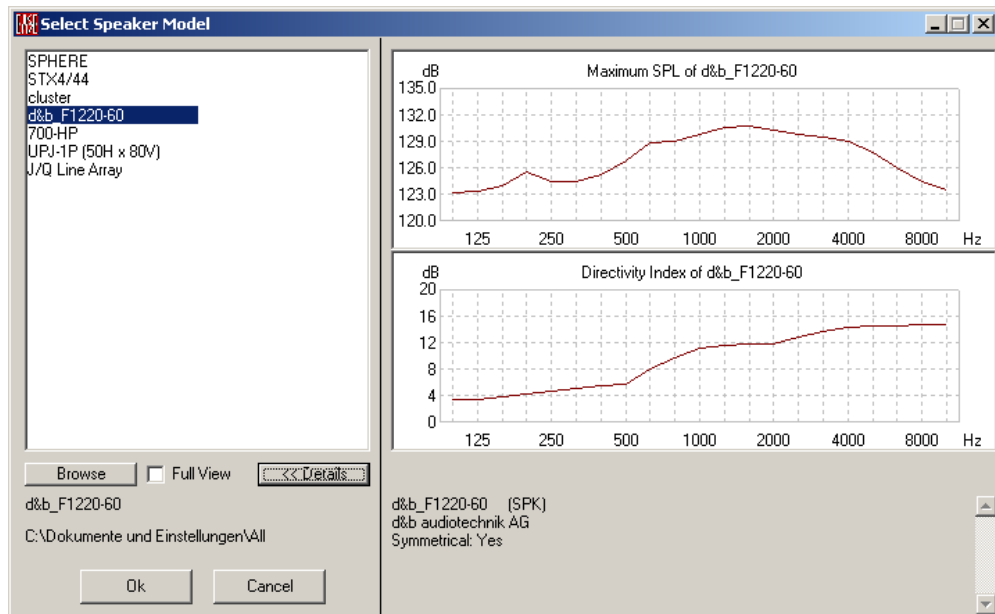
Browse

This command opens the **Select Project Database Window** which allows viewing the current project database and adding new database items from the hard disk.

Full View

This switches the list display between multiple columns and a single column.

Details

Depending on the type of database being selected from, this section offers more information about the database item selected on the left.

- In the **Select Speaker Model** mode this will show the Maximum SPL and the Directivity Index.

- In the **Select Wall Material** mode this will show the Absorption and the Scattering Coefficient.

OK

Accepts current selection and closes window.

Cancel

Discards current selection and closes window.

Room Data Window

Allows entry of name, location, noise level, selection of reverb time equation, and other parameters for use in labeling and simulating the project.

OK

Applies changes and closes window.

Cancel

Discards changes and closes window.

Apply

Applies changes and keeps window open.

Recompute

This starts a new computation of the **Room Parameters** such as the **Surface Area, Volume, Mean Free Path Time, Mean Free Path Length, Volume** and **Reverberation Time**, where latest changes are to be considered in the new computation.

Data Tab

This page allows entry of general information about the project.

Room Data

This area allows entry of the Room Name and Location

Hall

This is where the Room Name of the facility can be entered.

Town

Enter the location of the project.

Project Version

Enter the running version of the actual project.

Room Geometry

Volume

EASE will calculate the volume of the enclosed space after the room is closed.

Effective Surface

EASE will calculate all the surface areas that are actually exposed to the sound field.

Total Surface

This will show the total surface area of all of the surfaces in the Project including **Double Sided Faces** and **Coated Faces**.

Room Open

Check the box to tell EASE the room is not closed.

Room Symmetric

Check the box to tell EASE to build the room symmetrically. When this box is checked, all **Items** will be duplicated and mirrored about the **Axis Of Symmetry**.

Symmetry Axis at x =

This sets the offset of the symmetry axis from the x-axis.

Mean free path length

EASE calculates **Mean Free Path Length** to be equal to four times the **Volume** divided by the **Surface Area** (in m or ft). It is the average distance a sound beam will travel between one reflection and the next.

Mean free path time

EASE calculates the **Mean Free Path Time** to be equal to the **Mean Free Path Length** divided by actual **Sound Velocity**.

Remarks

This provides the User a notepad to describe the **Project** and make notes about the conditions in the Room.

Room RT Tab

This page allows entry of parameters that are used for the calculation of Statistical Room Reverberation Time for the Project.

Reverb. Time

Formula

Select in this box the formula to use for statistical calculation of the Room RT from the Room Data entered (e.g. Sabine or Eyring).

Locked

If Checked, EASE will not re-compute the RT automatically. Instead, EASE will use the values in the table. This allows entry of measured data or desired data.

Interpolate

This allows interpolating for example octave band values to third octave band ones.

Desired [s]

This line allows entry of a desired target RT. This number can be taken from charts and /or calculations. It is used in RT displays to provide a means of comparison between the calculated and desired curves.

(Open Button)

Opens a file dialog window to load a file with user defined RTs (*.exr).

(Save Button)

Opens a file dialog window to save a file with user defined RTs (*.exr).

Air Parameters

Humidity

This is the **Relative Humidity in %** EASE will use for the calculation of air absorption of sound.

Temperature

This is the **Temperature** (Centigrade/Fahrenheit) EASE will use for the calculation of air absorption and velocity of sound.

Pressure

This is the **Air Pressure** (hPa/Hg) EASE will use for the calculation of air absorption of sound.

Chart

The calculated Reverb times and Absorption Coefficients will be shown here in a tabular form. Measured or desired reverberation data can also be entered manually for use when **RT Locked** is used.

Noise Tab

This page allows entry of the noise levels that will be used for the calculation of acoustic measures for the Project.
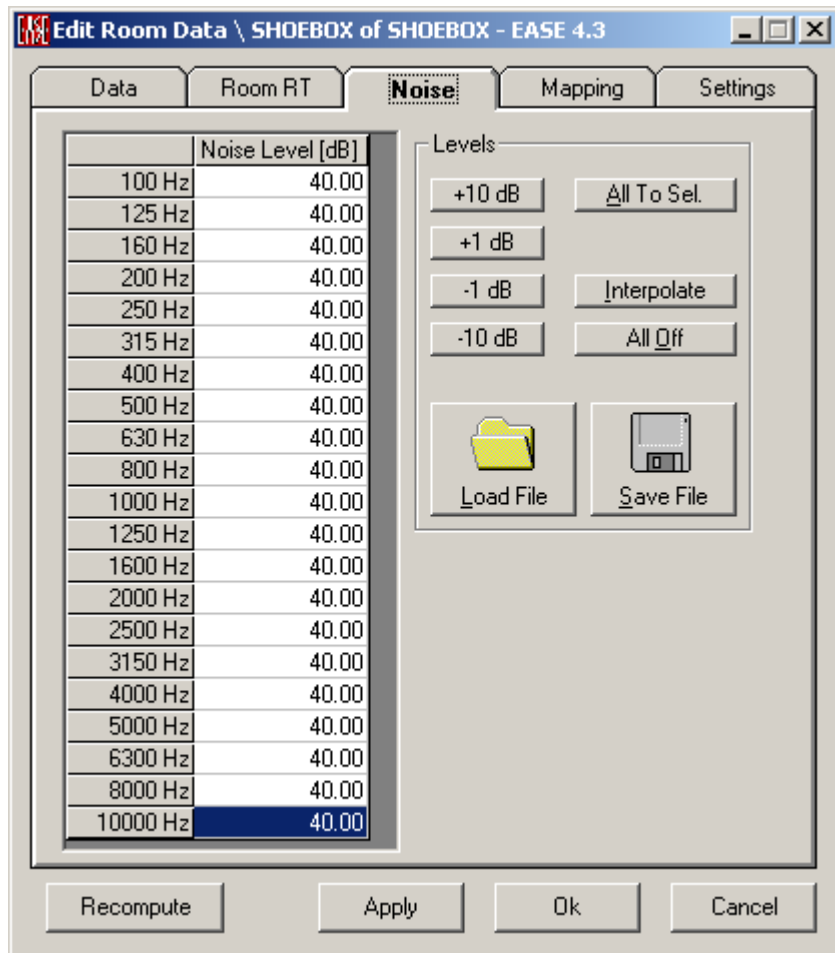
Chart

The unweighted noise levels are shown here in a tabular form. They can be entered as a function of frequency.

Edit Noise

+10 dB, +1 dB, -1 dB, -10 dB

By means of these buttons you increase or decrease the noise level for all frequencies at the same time.

All to Sel.

This will set the noise level at all frequencies to the selected level of a single frequency band.

Interpolate

This allows interpolating for example octave band values to 1/3rd octave band ones.

All Off

This command will switch off the noise for all frequencies and for all types of calculation.

Load File

Opens a file dialog window to load a file with user defined noise curves (*.exn).

Save File

Opens a file dialog window to save a file with user defined noise curves (*.exn).

Mapping Tab

These are default settings that will be used throughout the project. The user can override these settings for any individual calculation.
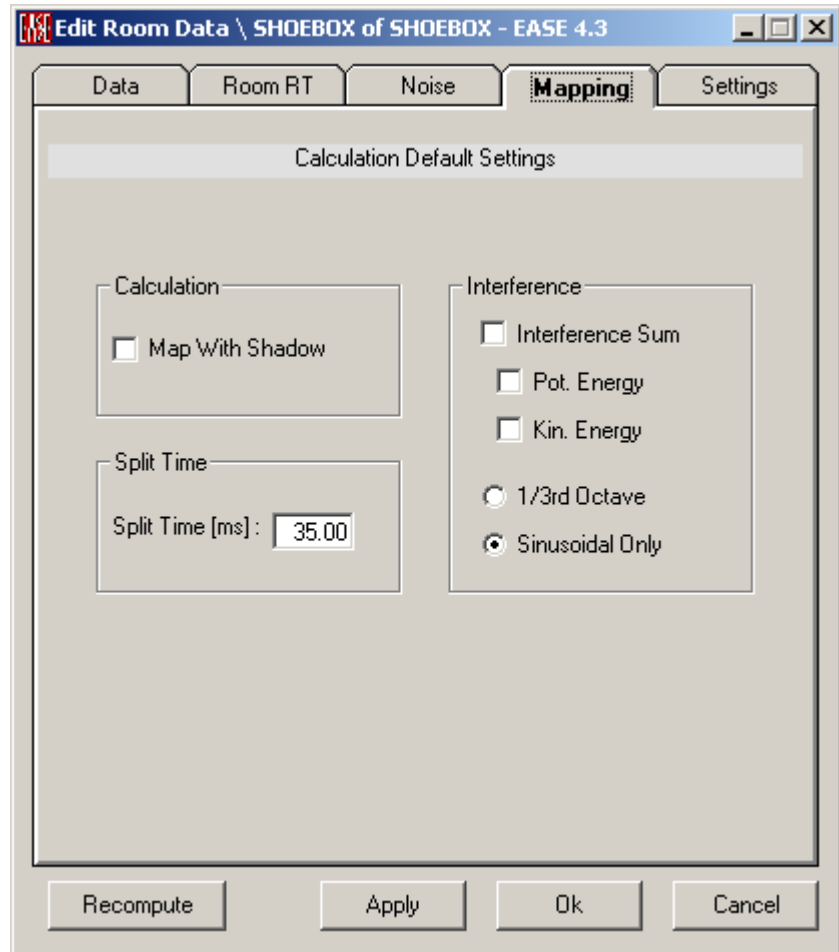
Split Time

Split Time [ms]

This sets the cut-off time for energy-fraction maps like C-Split and L-Split where direct sound ends and reverberant sound begins.

Calculation

Map with Shadow

This activates the **Shadow Cast** function, causing **Listener Seats** and parts of **Audience Areas** that are shadowed by a **Face** to a given **Loudspeaker** to receive no direct sound from that **Loudspeaker** in the model.

Interference

Allows the choice of whether and how the interference between individual **Loudspeakers** should be computed and displayed.

Interference Sum, Pot. Energy, Kin. Energy

See Appendix A, Direct SPL

1/3rd Octave, Sinusoidal Only

Allows the choice of the frequency bandwidth used for interference computation.

Settings Tab

This page allows the setting of miscellaneous global parameters.
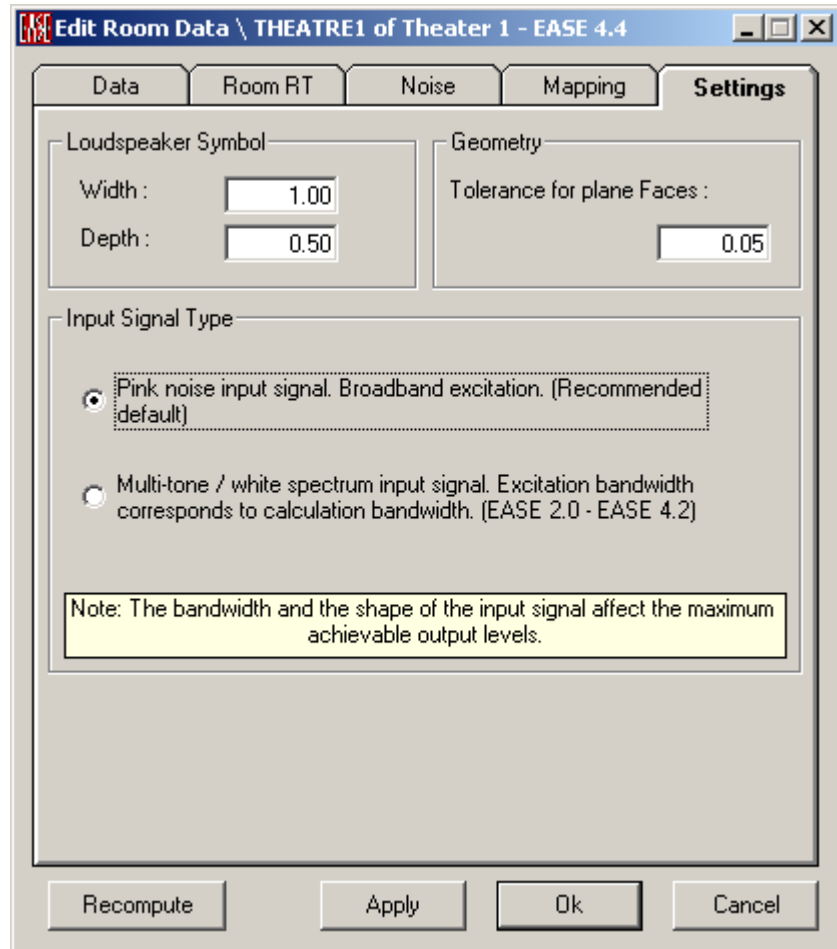
Loudspeaker Symbol

This area allows setting the size of the **Loudspeaker** symbol as shown in the **Room Editor** window.

Geometry

This area allows setting the size of the **Tolerance for plane Faces**.

Input Signal Type

Since EASE 4.3 a new level convention and an associated, different input signal type is available that allows relating EASE SPL results directly to SPL measurements in the field. It is the default for new projects and can be switched on for existing projects using the upper radio button in the section **Input Signal Type**.

When this level convention based on broadband pink noise is active, the allowed behavior changes in EASE for entering loudspeaker power settings. For any

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speaker, the rated maximum power must not be exceeded by the power sum over all 1/3rd octave bands included in a passband.

This usually requires the manual update of existing projects to pass Check Data and it generally also leads to lower power settings with respect to a particular 1/3rd octave band. However, in the later mapping and response calculations true sum levels will be calculated so that the broadband level sum as well as results for smaller bandwidths match with results provided by measurement tools when starting from the same 1/3rd octave band spectrum.

Area Layout Window

The **Area Layout** window is designed to facilitate the viewing, positioning and editing of **Audience Areas** including the addition of **Listener Seats.**
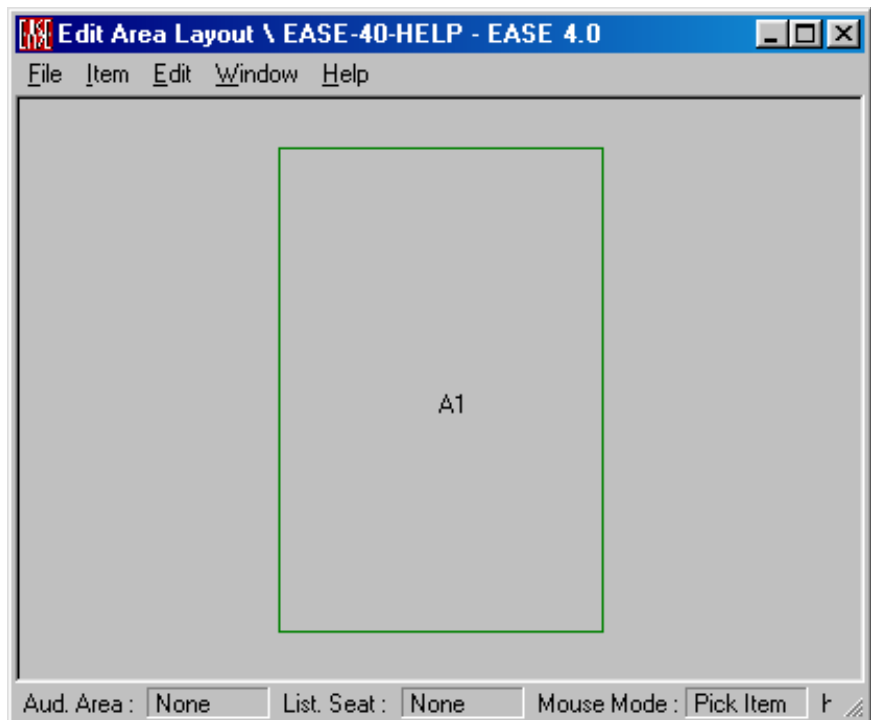
Key Conventions

F1	Help
F9	Options
PgUp	Move area selected in the +Z
PgDn	Move area selected in the –Z

Shift+

Left Arrow	Move area selected in the -X
Right Arrow	Move area selected in the +X
Up Arrow	Move area selected in the +Y
Down Arrow	Move area selected in the -Y

Mouse Conventions

LMB on item	This allows picking (selection) of an Audience Area and/or Listener Seat.

Statusbar Conventions

The bar displays data for the project or window such as:

Aud. Area	This displays the Audience Area label
Listener Seat	This displays the Listener Seat label.
Mouse Mode	This displays the operational mode of the mouse. This can be Pick, Move and Insert Seat
Horizontal Shift	This will allow display of the number of (FT, Meters) in the X direction the audience area is moved from its original position. This allows display of areas that may intersect each other and obstruct the viewing of mapped data. This shift does not change the calculation of the data. The shift is only for display.
Vertical Shift	This will allow display of the number of (FT, Meters) in the Y direction the audience area is moved from its original position. This allows display of areas that may intersect each other and obstruct the viewing of mapped data. This shift does not change the calculation of the data. The shift is only for display.
Cursor	This allows viewing of the continuous cursor position while on an audience area.

File Menu

Apply

Applies changes and keeps window open.

Options

This opens the Options Window Area Layout Tab to allow the setting of parameters for use in that part of the program.

Shortcut: **F9**

Exit

This exits the Area Layout window.

Item Menu

Listener Seats

A check here makes **Listener Seats** visible. A change causes an immediate redraw.

Audience Area Labels

A check here makes **Audience Area Labels** visible.

Listener Seat Labels

A check here makes **Listener Seat Labels** visible.

Edit Menu

Undo

This command reverses the previous action performed

Redo

This command reverses the last **Undo** action.

Move

This command enables the **Move** mode (Remember, in symmetric projects you cannot move horizontally any item that crosses the symmetry axis).

To use this command:

1. Left click on **Move Item**.
2. Pick the item to move.
3. Move mouse to new location.
4. Left click to place the item.
5. Right click will escape from function.

Insert Listener Seat

This command allows direct insertion of **Listener Seats** into the drawing.

To use this command:

1. Left click on **Insert Listener Seat**.
2. This will allow the use of the mouse to select a position for the new **Listener Seat**. It is not necessary to be exact.
3. Left click to place the item.
4. This can be repeated as many times as are necessary
5. Right click will escape from function.

Delete Listener Seat

This command allows deletion of a selected **Listener Seat**.

To use this command:

1. Left click on the **Listener Seat** that is to be deleted.
2. Left click on **Delete Listener Seat**.
3. This can be repeated as many times as are necessary
4. Right click will escape from function.

Window Menu

This menu allows access to different commands that affect the open window.

Screen Quarter

This allows placement of the active window into any of 5 positions.

Center

This places the open window in the center of the screen.

Upper Left

This places the open window in the upper left corner of the screen.

Upper Right

This places the open window in the upper right corner of the screen.

Lower Left

This places the open window in the lower left corner of the screen.

Lower Right

This places the open window in the lower right corner of the screen.

Cascade Windows

This makes all open windows appear in a stacked format.

Help Menu

This menu allows access to all forms of help.

Help Topics

This offers a list of commonly asked help subjects. We have made a concerted effort to develop the Help files and the manual together. If you need an answer as to what a particular command does go to the help files! You will likely find your answer there!

About

This displays information about your EASE program.

Memory Used

This submenu displays the computer memory actually used.

Select Project Database Window

This window allows the selection of specific **Speaker Models, Wall Materials, Light Sources, Textures** and **IR Modulators** and **IR Radiators** to be used in the project database. This window consists of several tabs accessing each of the specific databases but using the same set of commands.

Note that this window can be resized if more or less screen space is required for display.
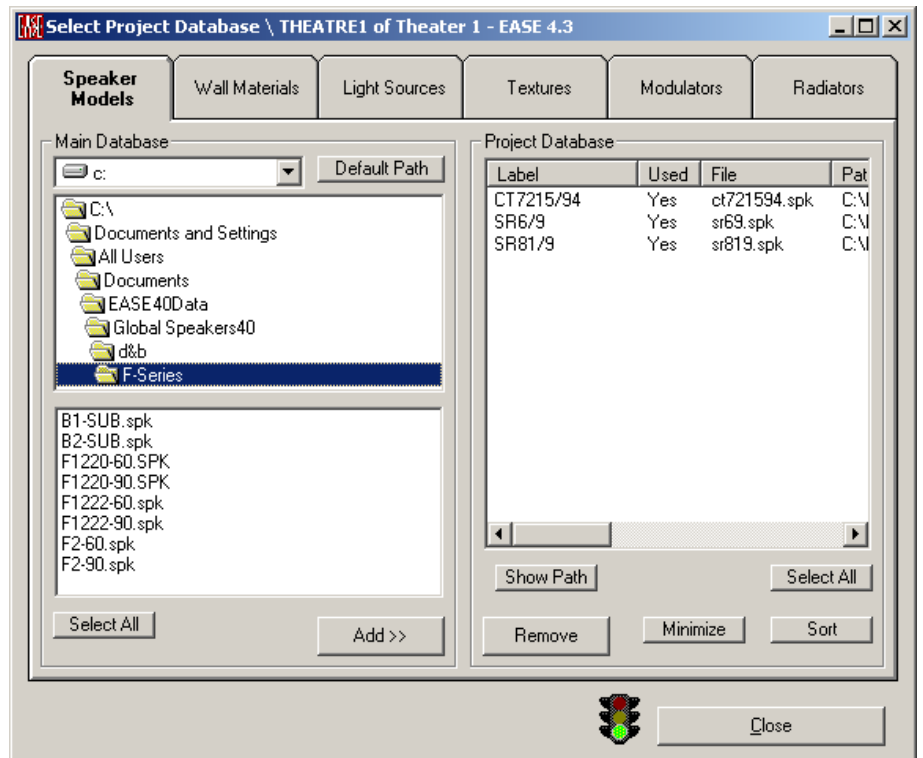
Speaker Models Tab

This tab shows the **Project Speaker Model List** in the **Project Database** window.

Wall Materials Tab

This tab shows the **Project Wall Material List** in the **Project Database** window.

Light Sources Tab

This tab shows the **Project Light Sources List** in the **Project Database** window.

Textures Tab

This tab shows the **Project Textures List** in the **Project Database** window.

Modulators Tab

This tab shows the **Project IR Modulators List** in the **Project Database** window.

Radiators Tab

This tab shows the **Project IR Radiators List** in the **Project Database** window.

Traffic Light Icon

A **Red** light indicates that data in this window is mathematically incorrect and would fail **Check Data**.

Close

This will accept any changes that are made in the window.

Main Database

The 1st data slot (top left of window) allows the selection of the drive where the base files are located.

The 2nd area (the middle area) allows the selection of the folder location.

The 3rd area (the bottom area) shows a list of base files in the database, that is, on the hard disk. This list can be selected individually or using the **Select All** button, completely. After selection the base files may be added to the **Project Database** by using the **Add** button.

Default Path button

This sets the left and middle window to the default path for the type of database currently selected. This path can be defined in the **EASEMain** module in the **Options Window**.

Select All

This selects all of the base files in the middle window.

Add >>

This adds all of the selected base files to the right window.

Project Database

This lists the base files that are currently in the **Project Database** (although not all may be in use). Base files can be deleted from the **Project Database** list by selecting them and using the **Remove** button. The **Minimize** button will remove all base files from the **Project Database** that are not currently in use (i.e., assigned to **Loudspeakers, Faces etc.**).

Show Path

This shows the path to the base files in the **Project Database**.

Select All

This selects all of the base files in the right window.

Remove

This removes the selected base files from the **Project Databas**e.

Minimize

This removes all base files from the Project Database that are not currently assigned in use (i.e., assigned to **Loudspeakers, Faces etc.**).

Sort

This sorts the base file list alphanumerically.

Reverberation Time Window

This displays the reverb time of the room graphically and as a table for display and/or printing.
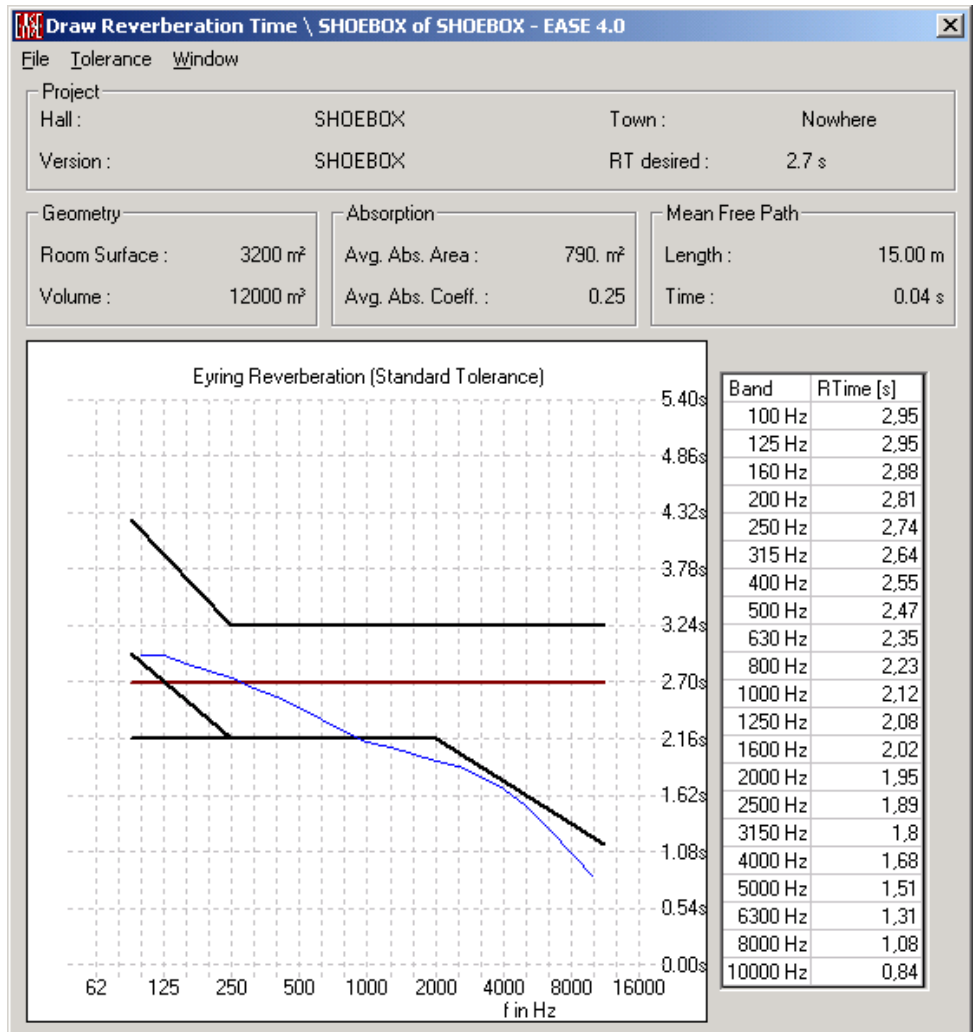
Project

Hall

This shows the name of the room or project.

Town

This shows the location of the project.

Version

This shows the name of the project version.

RT Desired

This displays the value entered in the **RT Desired** field on the **Room RT** tab of the **Room Data** window.

Geometry

Room Surface

This displays the calculated active **Surface Area** exposed within the room.

Volume

This shows the calculated cubic volume of the enclosed room

Absorption

Avg. Abs. Area

This displays the calculated value of squared meters or Sabins, depending on the settings of units system, of absorption in the room (i.e. average absorption coefficient for the room multiplied by the **Room Surface Area**).

Avg. Abs. Coeff.

This displays the calculated **Average Absorption Coefficient** (i.e., the total absorption in squared meters or Sabins, depending on the settings of units system, divided by the **Room Surface Area**)**.**

Mean Free Path

Length

EASE calculates the **Mean Free Path Length** as equal to four times the **Volume** of the **Room** divided by the **Surface Area** (in m or ft).

Time

EASE calculates the **Mean Free Path Time** to be equal to the **Mean Free Path Length** divided by actual **Sound Velocity**.

RT Graph Window

This displays the computed reverberation time as a graph.

RT Table Window

This displays the computed reverberation time in table form.

File Menu

Send Picture To

This sends the current **Picture** (**Reverberation Time Graph** without the frames) to a file, the clipboard, or **EASE Page Designer**.

Clipboard

This copies the current **Picture** to the clipboard for use in other applications

File

This saves the current **Picture** to a file. The files can be saved in many formats, including:

Windows Bitmap……………………………*.BMP

JPEG…………………………………………*.JPG

CompuServe GIF……………………………*.GIF

Portable Network Graphics…………………*.PNG

Tagged File Format…………………………*.TIF

LuRa Tech Wavelet…………………………*.LWF

Zsoft Paintbrush……………………………*.PCX

Windows Icon………………………………*.ICO

Enhanced Windows Metafile………………*.EMF

Truevision Targa……………………………*.TGA.

EASE Page Designer

This opens the current active picture in the **EASE Page Designer** module, allowing modifications to and annotations of the picture before printing.

Send Window Picture To

This sends the complete content of the current graphic window to a file, the clipboard, or **EASE Page Designer**.

Clipboard

This copies the picture to the clipboard for use in other applications

File

This saves the picture to a file. The files can be saved in many formats, including:

Windows Bitmap…………………………*.BMP

JPEG……………………………………*.JPG

CompuServe GIF…………………………*.GIF

Portable Network Graphics…………………*.PNG

Tagged File Format…………………………*.TIF

LuRa Tech Wavelet…………………………*.LWF

Zsoft Paintbrush……………………………*.PCX

Windows Icon………………………………*.ICO

Enhanced Windows Metafile………………*.EMF

Truevision Targa……………………………*.TGA.

EASE Page Designer

This opens the current active picture in the **EASE Page Designer** module, allowing modifications to and annotations of the picture before printing.

Print

This prints the open window, pixel for pixel, without the window frame, e.g. without the command buttons and scroll bars.

Exit

This closes the **Reverberation Time Window.**

Tolerance Menu

This menu allows one of three engineering guideline **Tolerances** for reverberation to be displayed on the graph.

Standard

This shows the acceptable deviation based on a desired RT. The red line is the desired RT and is the same at all frequencies. The area bounded by the black lines is the acceptable deviation. At the lower frequencies the time moves upward (recommended for music performances) and at higher frequencies the time moves down (influence of air dissipation). An ideal curve would have the same distance from the curve to the top black line. An ideal range would be to have the room curve never exceeding the top black line when empty and not dropping under the bottom black line when full.

Dolby

This shows the acceptable deviation based on Dolby Room specifications. The red line is the ideal room curve. The green bracket shows the crossover point at 500 Hz (volume dependent) and the room RT must fall between the upper and lower bracket marks at 500 Hz. The area bounded by the black lines is the acceptable deviation. At the lower frequencies the time moves upward and at higher frequencies the time moves down. As you can see there isn't too much tolerance from 500 to 2K. The ideal curve must be correct when the room is both empty and full.

THX

This shows the acceptable deviation based on the THX Room specifications. The green bracket shows the crossover point at 500 Hz (volume dependent) and the room RT must fall between the upper and lower bracket marks at 500 Hz. The brown line sets the room RT maximum limit and the dark blue line sets the room minimum. If the RT is above the red line and less than the brown line at the lower frequencies then the higher frequencies must not deviate below the light blue line at the higher frequencies. If the RT is below the light blue line and more than the Dark blue line at the higher frequencies then the lower frequencies must not deviate above the red line at the lower frequencies.

RT Only

This removes any tolerance information from the window and shows only the Room RT.

Window Menu

This menu allows access to different commands that affect the open window

Screen Quarter

This allows placement of the active window into any of 5 positions.

Center

This places the open window in the center of the screen.

Upper Left

This places the open window in the upper left corner of the screen.

Upper Right

This places the open window in the upper right corner of the screen.

Lower Left

This places the open window in the lower left corner of the screen.

Lower Right

This places the open window in the lower right corner of the screen.

Cascade Windows

This makes all open windows appear in a stacked format.

Options Window

This allows setting of parameters for the Edit Project Data module.

Apply

Applies the current Settings and leaves the **Options** window open.

OK

Applies the current Settings and closes the **Options** Window.

Cancel

Closes the Options window without saving or **Applying** changes.

General Tab
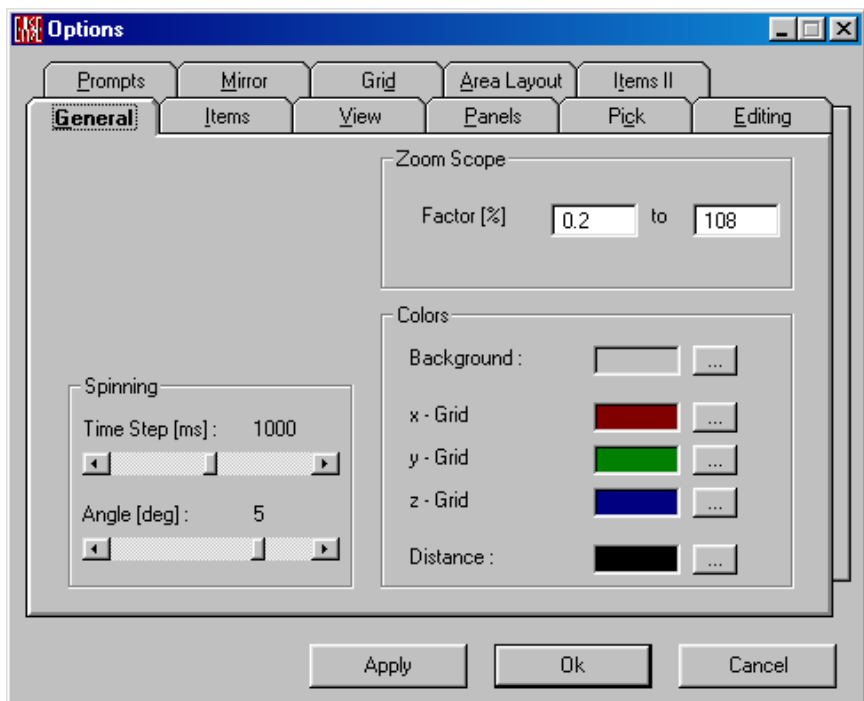
Zoom Scope

This area allows setting the limits of the Zoom Function.

Factor Limit Windows (%)

Sets the limits of the Zoom Function in the main **Edit Room** window.

Spinning

This area allows setting of the parameters for the Spin function.

Time Step Slider (ms)

This sets the time interval between steps when **Spinning**.

Angle Slider (deg)

This sets the increment in degrees of turning from one step to another when **Spinning**.

Colors

This sets the colors for the general appearance of the **Edit Room** window.

Background / …

This sets the background color for the **Edit Room** Window.

x-Grid / …

This sets the color of the x-axis grid.

y-Grid / …

This sets the color of the y-axis grid.

z-Grid / …

This sets the color of the z-axis grid.

Distance / …

This sets the color used to display distances.

Items Tab
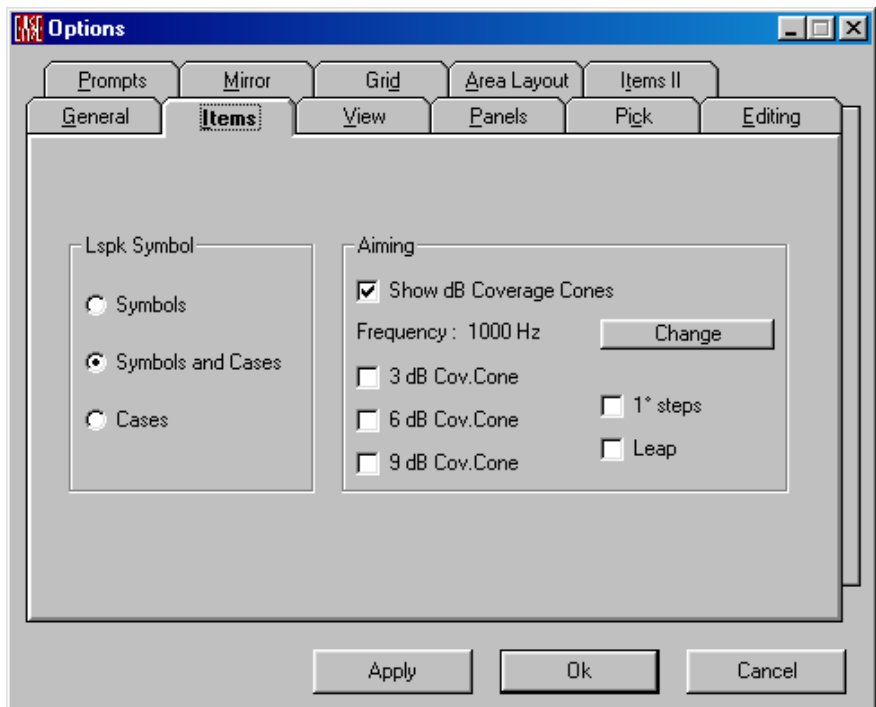
Loudspeaker Symbol

Defines how **Loudspeakers** are displayed in the **Edit Room** window.

Symbols

This radio button will make a **Loudspeaker** symbol visible in the model, but not the **Case** or **Wire frame**. The size of the symbol can be adjusted in the **Edit | Room Data | Settings** Tab.

Symbols and Cases

This radio button will make the **Loudspeaker** symbol and the appropriate **Speaker Case** or **Wire frame** visible in the model.

Cases

This radio button will make only the **Speaker Case** or **Wire frame** visible in the model.

Aiming

This area will allow setting the parameters for the coverage cone displays in the **Room Edit** window.

Show dB Coverage Cones

Enable dB coverage cones in the Room Editor.

Frequency / Change

Displays and selects the frequency for display of coverage cones.

3 dB Cov. Cones

Show -3 dB coverage cones

6 dB Cov. Cones

Show -6 dB coverage cones

9 dB Cov. Cones

Show -9 dB coverage cones

1 deg steps

This allows smoothing of the coverage cone from 5-degree increments to 1-degree increments.

Leap

This disables the display of the continuous cone drawing when it terminates in space instead of a surface.

View Tab
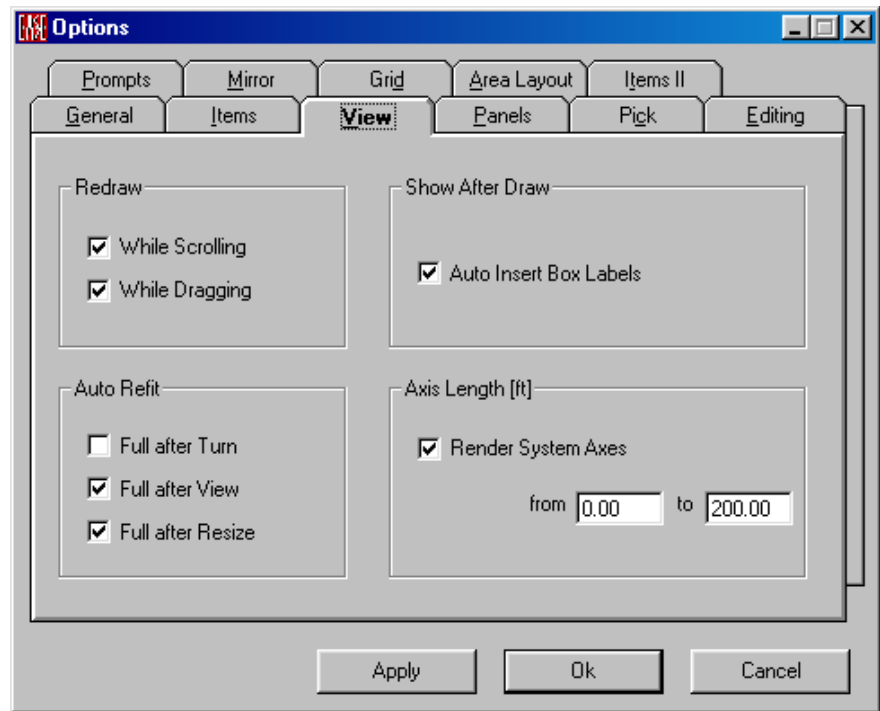
Redraw

This area sets the rules used for redraw of the model.

While Scrolling

If checked, the screen will be redrawn continuously during a scrolling operation.

While Dragging

If checked, the screen will be redrawn continuously during a dragging operation.

Show after Draw

This area allows display of additional information items on the model drawing.

Auto Insert Box Labels

This allows display of the View Label, such as "3D Perspective", in the lower right corner

Auto Refit

This area sets the rules for when the **Edit Room** display should be automatically resized to **Full Size**.

Full after Turn

This redraws to **Full Size** after a Turn operation.

Full after View

This redraws to **Full Size** after changing the View.

Full after Resize

This redraws to **Full Size** after a resizing of the window.

Axis Length (m/ft)

This area allows the configuration of the Room Axes display.

Render System Axes

If checked, this allows the display of the x, y, and z-axes in the main **Edit Room** window.

from/to

These windows allow entry of the length of the axes using the units set by the **Options** Menu in **EASE Main**.

Panels Tab

This tab allows selection of the parameters displayed on the status bar at the bottom of the window.
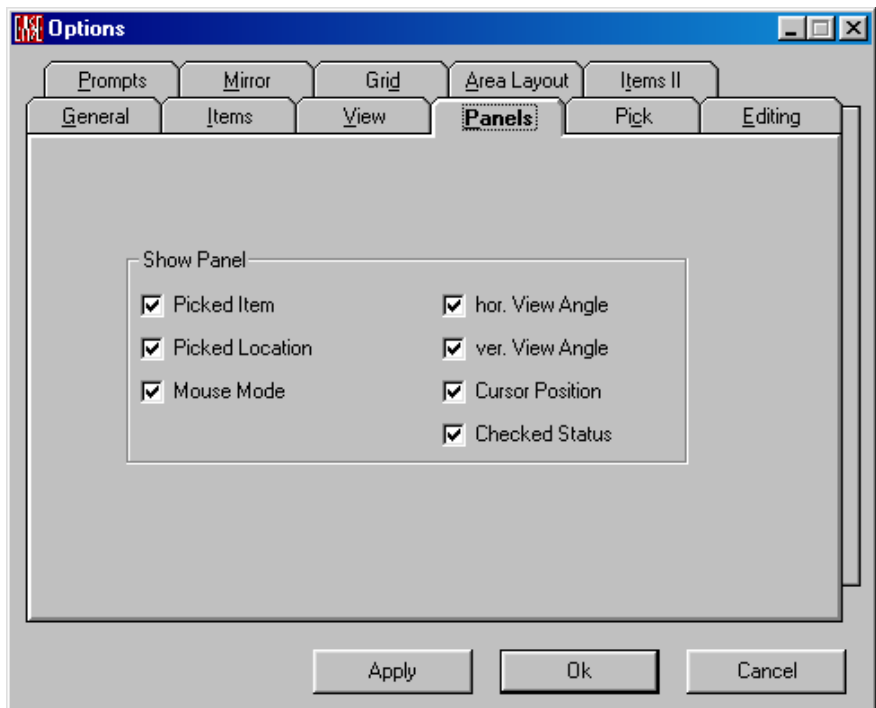
Show Panel

Picked Item

This shows the name/number of the **Picked Item**.

Picked Location

This shows the location of the **Picked Item**.

Mouse Mode

This shows the current **Mouse Mode**.

Hor. View Angle

This shows the current **Horizontal Viewing Angle.**

Ver. View Angle

This shows the current **Vertical Viewing Angle.**

Cursor Position

This /shows the current **Cursor Position** continuously**.**

Checked Status

This shows whether Data is **Checked** or not. **True** for **Checked** and **False** for **Not Checked.**

Pick Tab
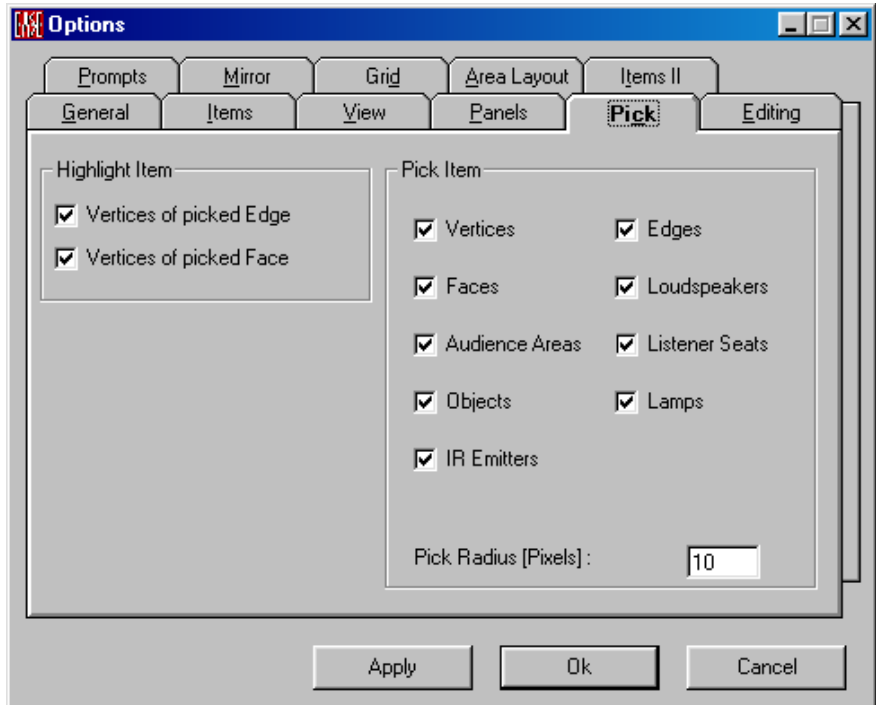
Highlight Item

This area allows the selection of how highlighting shall be applied to picked items.

Vertices of Picked Edge

If checked, this will show all of the **Vertices** for a picked **Edge**.

Vertices of Picked Face

If checked, this will show all of the **Vertices** for a picked **Face**.

Pick Item

This area will allow the selection of **Items** that may be **Picked.**

Vertices

If checked, this will allow the selection of **Vertices** with the **Mouse Pick** function.

Edges

If checked, this will allow the selection of **Edges** with the **Mouse Pick** function.

Faces

If checked, this will allow the selection of **Faces** with the **Mouse Pick** function.

Loudspeakers

If checked, this will allow the selection of **Loudspeakers** with the **Mouse Pick** function.

Audience Areas

If checked, this will allow the selection of **Audience Areas** with the **Mouse Pick** function.

Listener Seats

If checked, this will allow the selection of **Listener Seats** with the **Mouse Pick** function.

Objects

If checked, this will allow the selection of **Objects** with the **Mouse Pick** function.

Lamps

If checked, this will allow the selection of **Lamps** with the **Mouse Pick** function.

IR Emitters

If checked, this will allow the selection of **IR Emitters** with the **Mouse Pick** function.

Pick Radius (Pixels)

Sets the **Radius** of a square area in Pixels that the **Pick** function will search for an **Item**.

Editing Tab
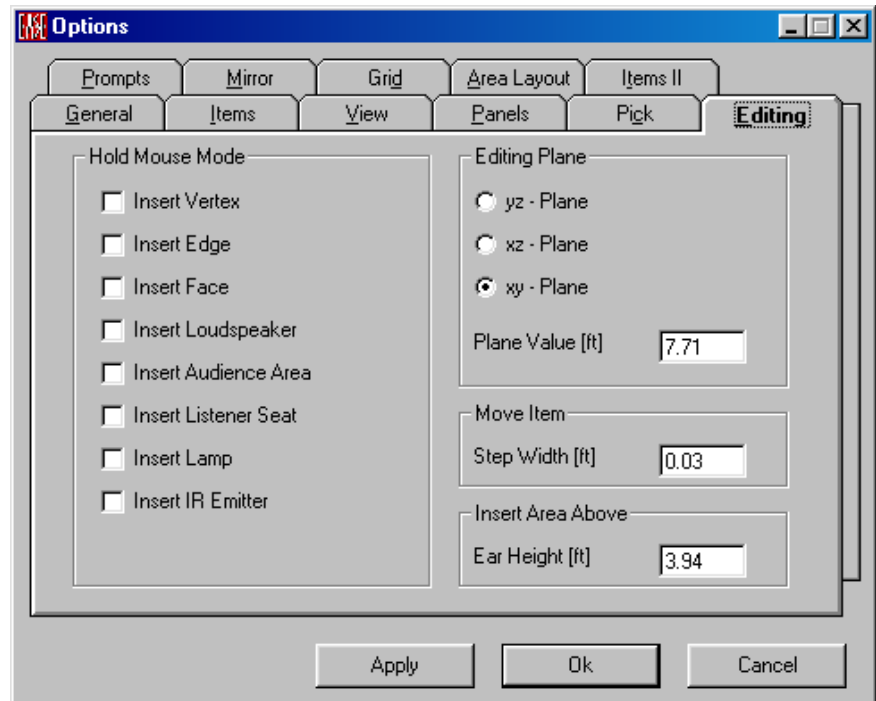
Hold Mouse Mode

This mode is used as a latch to hold a function "On". Normally the menu function or toolbar button has to be selected every time an item is inserted. The hold function allows continuous insertion until the check is removed.

Insert Vertex

A check here sets the **Hold Mode** for insertion of **Vertices**.

Insert Edge

A check here sets the **Hold Mode** for insertion of **Edges**.

Insert Face

A check here sets the **Hold Mode** for insertion of **Faces**.

Insert Loudspeaker

A check here sets the **Hold Mode** for insertion of **Loudspeakers**.

Insert Audience Area

A check here sets the **Hold Mode** for insertion of **Audience Areas**.

Insert Listener Seat

A check here sets the **Hold Mode** for insertion of **Listener Seats**.

Insert Lamp

A check here sets the **Hold Mode** for insertion of **Lamps**.

Insert IR Emitter

A check here sets the **Hold Mode** for insertion of **IR Emitters.**

Editing Plane

This defines the **Editing Plane**, where all editing and insertions will take place by default.

YZ-Plane

A check here makes the **Editing Plane** parallel to the YZ plane.

XZ-Plane

A check here makes the **Editing Plane** parallel to the XZ plane.

XY-Plane

A check here makes the **Editing Plane** parallel to the XY plane.

Plane Value (ft, m)

This sets the displacement of the **Editing Plane** from the origin (0,0,0)

Move Item

This area allows the setting of parameters for the movement of **Items** in the project.

Step Width (ft, m)

This sets the distance increment for movements controlled by keystrokes. For example, **Shift+Up Arrow** moves the selected item in +Y by the distance of the step width.

Insert Area Above

This area allows setting of **Audience Areas** parameters of areas that are automatically inserted.

Ear Height (ft, m)

This is the height above the floor where the **Audience Areas** are automatically inserted. 1.2 meters and 4 ft are commonly used values for a seated audience, but any value can be used.

Prompts Tab
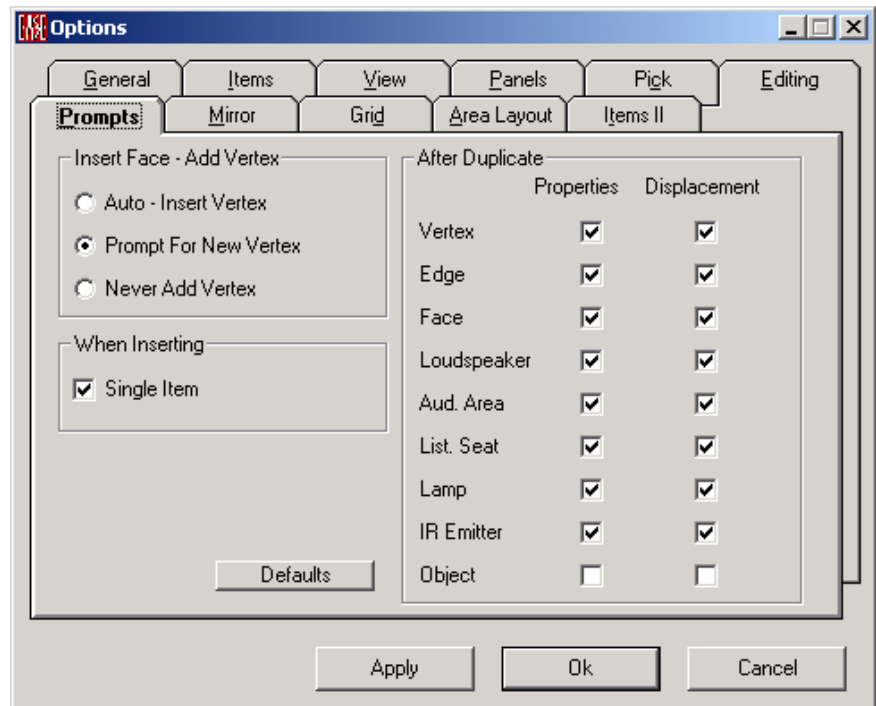
Insert Face-Add Vertex

This area allows the selection of whether and how EASE will automatically insert vertices if the mouse clicks on an open background when inserting Faces.

Auto-Insert Vertex

A check here allows the generation and automatic insertion of **Vertices** whenever the mouse button is pushed during graphical insertion of a **Face**. The action is immediate.

Prompt for New Vertex

A check here allows the generation and automatic insertion of **Vertices** whenever the mouse button is pushed during graphical insertion. The action occurs after a prompt is given and answered affirmatively.

Never Add Vertex

A check here allows the drawing of a face with existing **Vertices** and leaves out the chance of selecting a non-**Vertices** spot during graphical insertion.

When Inserting

This area allows settings of General Insertion parameters.

Single Item

A checkmark here allows the user to be asked after inserting a **Face**, if the **Face** should be created.

Defaults

This resets all settings on this tab to a default setup.

After Duplicate

This area allows the selection of the method(s) of placement of the duplicated **Item**. The choices are of delta displacement or of absolute placement.

Vertex

Sets whether the **Properties** or **Displacement** window opens after the insertion of a **Vertex.** If neither is chosen, the **Vertex** is created immediately.

Edges

Sets whether the **Properties** or **Displacement** window opens after the insertion of an **Edge.** If neither is chosen, the **Edge** is created immediately.

Faces

Sets whether the **Properties** or **Displacement** window opens after the insertion of a **Face.** If neither is chosen, the **Face** is created immediately.

Loudspeakers

Sets whether the **Properties** or **Displacement** window opens after the insertion of a **Loudspeaker.** If neither is chosen, the **Loudspeaker** is created immediately.

Audience Areas

Sets whether the **Properties** or **Displacement** window opens after the insertion of an **Audience Area.** If neither is chosen, the **Audience Area** is created immediately.

Listener Seats

Sets whether the **Properties** or **Displacement** window opens after the insertion of a **Listener Seat.** If neither is chosen, the **Listener Seat** is created immediately.

Lamps

Sets whether the **Properties** or **Displacement** window opens after the insertion of a **Lamp.** If neither is chosen, the **Lamp** is created immediately.

IR Emitters

Sets whether the **Properties** or **Displacement** window opens after the insertion of an **IR Emitter.** If neither is chosen, the **IR Emitter** is created immediately.

Objects

Sets whether the **Properties** or **Displacement** window opens after the insertion of an **Object.** If neither is chosen, the **Object** is created immediately.

Properties	If a check mark is here then a **Properties** window will appear ready to edit after insertion of an **Item**.
Displacement	If a check mark is here then a **Displacement** window will appear ready to edit after an

insertion of an **Item**. This require entry of delta figures into the x, y or z boxes

Mirror Tab

This controls mirrored insertion of items. This mirroring can be done in X, Y and Z modes. (Mirror is only used in asymmetrical rooms)
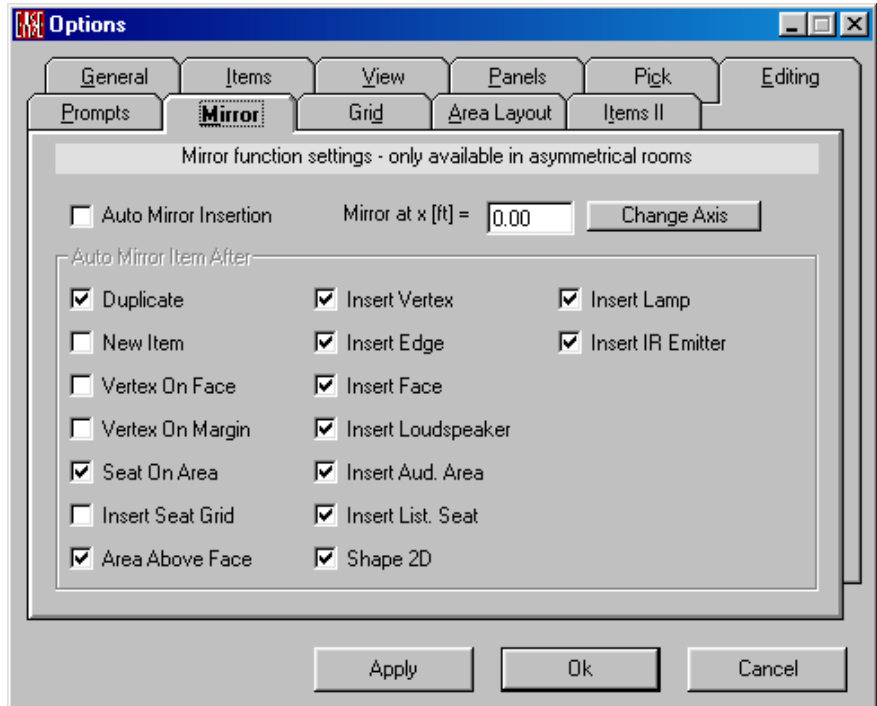
Auto Mirror Insertion

When checked, every item will be created in mirrored pairs. Note: Editing of mirrored items will <u>not</u> be mirrored.

Mirror at x (m or ft) Window

This label changes to show the axis (x, y or z) selected for mirroring by the "**Change Axis**" button. You may also insert into the window an offset from the main axis position for the mirror to be applied.

Change Axis

This allows **Changing** the **Axis** about which newly inserted items are be mirrored.

Auto Mirror Image After

Duplicate

A check here will allow a mirror insertion after a duplicate function.

New Item

A check here will allow a mirror insertion of the new **Item**.

Vertex on Face

A check here will allow a mirror insertion of a **Vertex** on a **Face** that is a mirror of the original.

Vertex on Margin

A check here will allow a mirror insertion of a **Vertex** on the margin of a **Face** that is a mirror of the original.

Seat on Area

A check here will allow the mirror insertion of a **Listener Seat.**

Insert Seat Grid

A check here will allow the mirror insertion of a grid of **Listener Seats**.

Area Above Face

A check here will allow the mirror insertion of an **Audience Area**.

Insert Vertex

A check here will allow mirroring of an inserted **Vertex.**

Insert Edge

A check here will allow mirroring of an inserted **Edge.**

Insert Face

A check here will allow mirroring of an inserted **Face.**

Insert Loudspeaker

A check here will allow mirroring of an inserted **Loudspeaker.**

Insert Audience Area

A check here will allow mirroring of an inserted **Audience Area.**

Insert Listener Seat

A check here will allow mirroring of an inserted **Listener Seat.**

Insert Lamp

A check here will allow mirroring of an inserted **Lamp.**

Insert IR Emitter

A check here will allow mirroring of an inserted **IR Emitter.**

Shape 2D

A check here will allow mirroring of an inserted **2D Shape.**

Grid Tab

This tab controls the functioning of **Grids** on the drawing area.
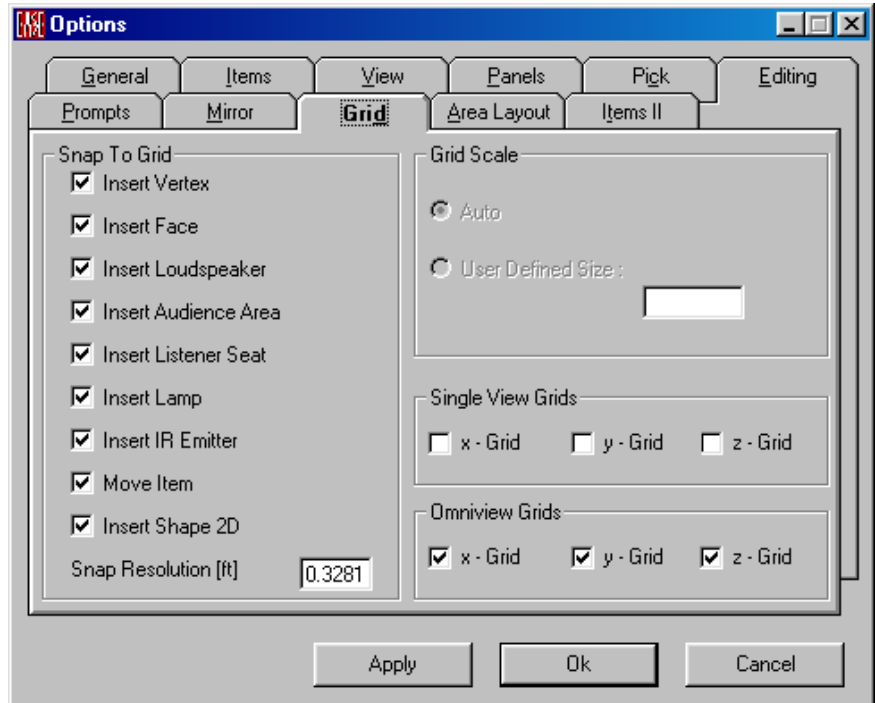
Snap To Grid

This area defines what items or actions will snap to grid points.

Insert Vertex

If checked, all graphically inserted **Vertices** will snap to the nearest grid points.

Insert Face

If checked, all graphically inserted **Faces** will snap to the nearest grid points.

Insert Loudspeaker

If checked, all graphically inserted **Loudspeakers** will snap to the nearest grid points.

Insert Audience Area

If checked, all graphically inserted **Audience Areas** will snap to the nearest grid points.

Insert Listener Seat

If checked, all graphically inserted **Listener Seats** will snap to the nearest grid points.

Insert Lamp

If checked, all graphically inserted **Lamps** will snap to the nearest grid points.

Insert IR Emitter

If checked, all graphically inserted **IR Emitters** will snap to the nearest grid points.

Move Item

If checked, then all graphically moved items would position themselves at the nearest grid snap points automatically after release.

Insert Shape 2D

If this is checked all graphically inserted **Faces** created using the **Shape 2D** commands will snap to the nearest grid points.

Snap Resolution (ft, m) Window

This window sets the spacing between grid points.

Grid Scale

This is where the configuration of the grid scales is set.

Auto

This is the default setting. The grid has no fixed size, and is adjusted continuously as the zoom moves in or out.

User Defined Size Window

Not Available Yet

Single View Grids

Single view windows are the standard viewing windows, both in 3D mode and for the X, Y and Z views.

X-Grid

A check here activates a y-z Grid in the Single view or 3D window.

Y-Grid

A check here activates an x-z Grid in the Single view or 3D window.

Z-Grid

A check here activates an x-y Grid in the Single view or 3D window.

Omniview Grids

Omniview mode divides the screen into four quadrants, which display a 3D perspective view and the three orthogonal views. This controls the use of grids in the x, y, and z window (but not the 3D window) in **Omniview**. The Single View Grid setting controls the grid in the 3D window.

X-Grid

A check here turns on the **Y-Z Grid** in the X-window in **Omniview** mode.

Y-Grid

A check here turns on the **X-Z Grid** in the Y-window in **Omniview** mode.

Z-Grid

A check here turns on an **X-Y Grid** in the Z-window in **Omniview** mode.

Area Layout Tab

This tab sets the display of **Items** and **Labels** in the **Status Bar** of the **Area Layout Window**.
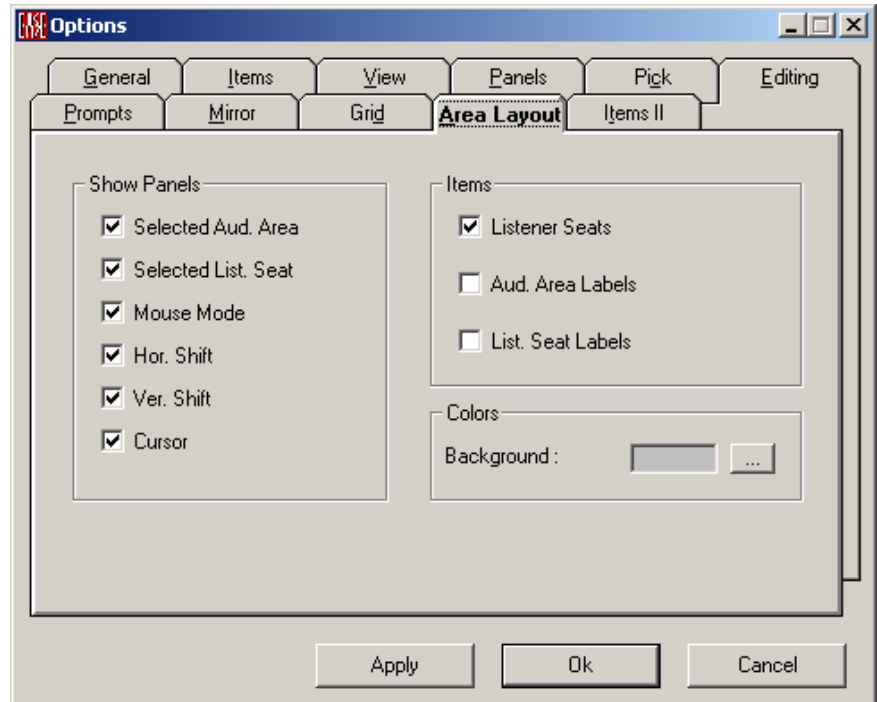
Show Panels

Check marks in the selected boxes will cause listing of selected data in the status bar of the **Area Layout Window.**

Selected Aud. Area

If checked, the selected **Audience Area** will be displayed in the status bar of the **Area Layout Window**.

Selected List. Seat

If checked, the selected **Listener Seat** will be displayed in the status bar of the **Area Layout Window**.

Mouse Mode

If checked, the current **Mouse Mode** will be displayed in the status bar of the **Area Layout Window**.

Hor. Shift

If checked, the **Status Bar** of the **Area Layout Window** will display the **Horizontal Shift** for a selected **Audience Area. Horizontal Shift** moves the display of an **Audience Area** so that **Audience Areas** that lie on top of each other in plan do not obscure one another in the display (as, for example, when seating in a balcony is on top of seating on a main floor). This field defines the shift along the X-axis. Shifting does not affect calculations.

Ver. Shift

If checked, the status bar of the **Area Layout Window** will display the **Vertical Shift** for a selected **Audience Area. Vertical Shift** moves the display of an **Audience Area** so that **Audience Areas** that lie on top of each other in plan do

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not obscure one another in the display (as, for example, when seating in a balcony is on top of seating on a main floor). This field defines the shift along the Y-axis. Shifting does not affect calculations.

Cursor

If checked, cursor position will be displayed in the status bar of the **Area Layout Window** when the cursor is on an **Audience Area.**

Items

Listener Seats

A check here enables viewing of **Listener Seats** on **Audience Areas**.

Aud. Area Labels

A check here enables the display of **Audience Area Labels**

List. Seat Label

A check here enables the display of **Listener Seat Labels**

Colors

Background/…

This allows assignment of a specific color to the background of the **Audience Area** layout.

Items II Tab
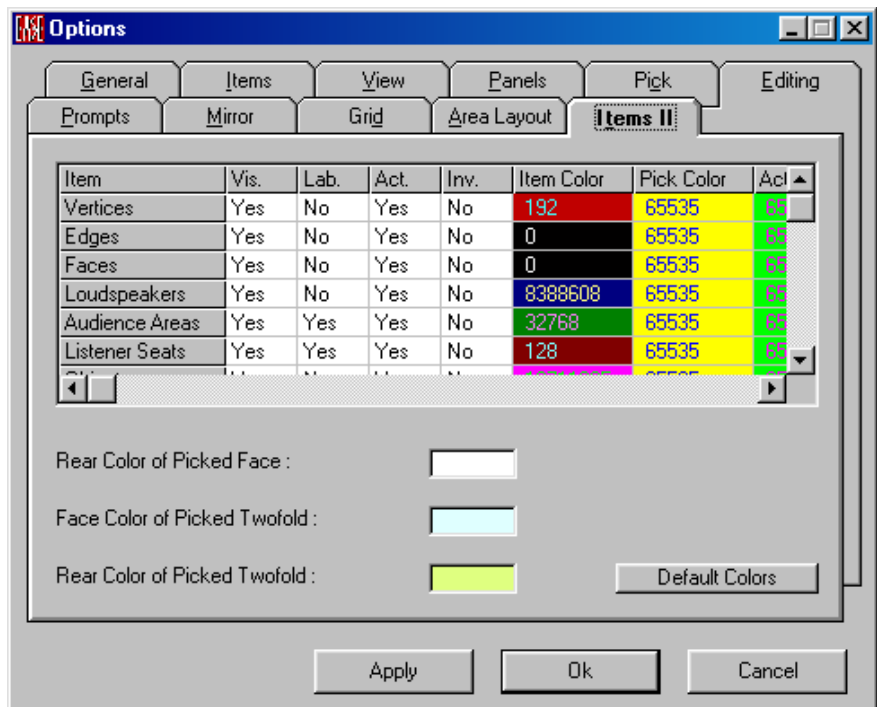
Items

Shows the list of Items that can be edited and customized. These items are **Vertices, Edges, Faces, Loudspeakers, Audience Areas, Listener Seats, Objects, Lamps,** and **IR Emitters.**

Vis(ible)

Yes enables visibility of Items in the **Edit Room** window.

Lab(el)

Yes enables the visibility of **Labels** in the **Edit Room** window.

Act(ive)

Yes enables the visibility of an Item's **Active** status in the **Edit Room** window.

Inv(isible)

Yes here allows to globally overrule the item property **Visible** and sets all items visible regardless of their property setting.

Item Color

This sets the color for standard display of the **Item**.

Pick Color

This sets the **Color** for display of the **Item** when **Picked**.

Active Color

This sets **Color** for an **Item** that has been made **Active** .

Rear Color of Picked Face

This set the **Color** for the inactive side of a picked **Face**.

Face Color of Picked Twofold

This sets the **Color** for the front side of a **Picked Two-Sided Face**.

Rear Color of Picked Twofold

This sets the **Color** for the back side of a **Picked Two-Sided Face**.

Default Colors

Restores all **Color** choices to their defaults.

Optimize RT Window

This window allows searching for and selection of **Wall Materials** in a room with a specific RT curve.
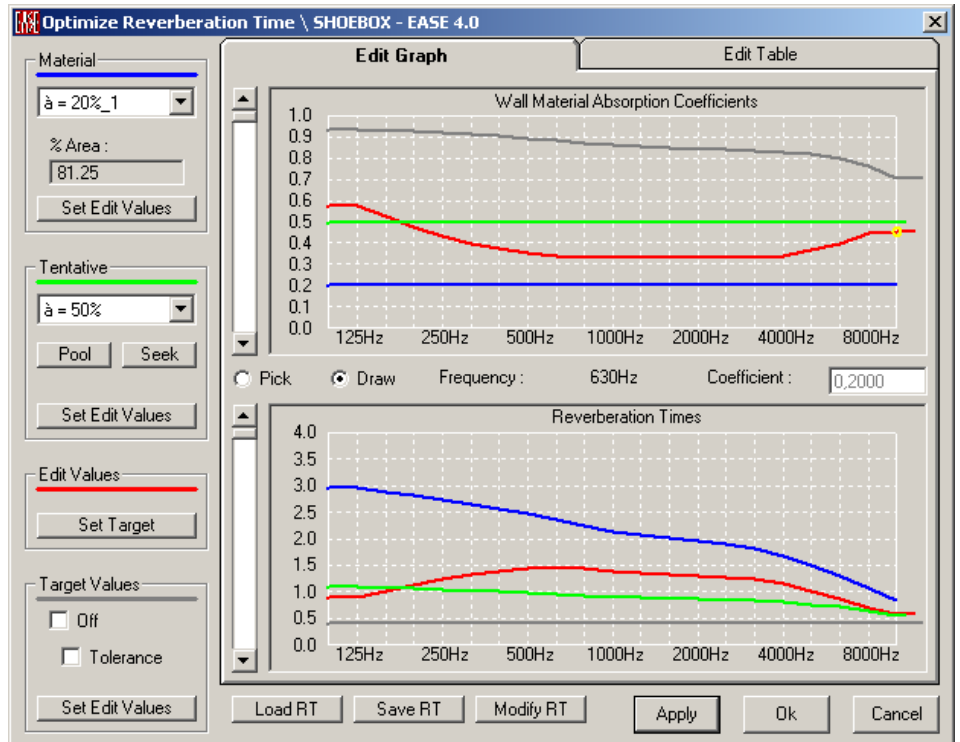
Apply

Applies changes and leaves the window open.

OK

Applies changes and closes the window.

Cancel

Closes the window without saving or **Applying** changes.

Load RT

This opens a window to load a RT curve file (.exr) for use as an edit or a target curve.

Save RT

This opens a window to save a RT curve file (.exr) for use as an edit, tentative, room or a target curve.

Modify RT

This opens a window to modify an edit or a target curve in RT differentials.

Material (blue color)

This data window allows the selection of the **Wall Material** in the room to be replaced by a tentative material to adjust the reverberation time.

% Area

This window shows the percentage of the total area of the room this **Wall Material** comprises

Set Edit Values

This resets the tables to the absorption values currently in place for the selected **Wall Material.**

Tentative (green color)

This window allows the selection of or shows the **Wall Material** selected by the window for substitution. When a **Wall Material** is selected as tentative the green curve will display the curve of the **Wall Material** in the upper graph and the green curve will show the new Room RT curve in the lower graph.

Pool

This allows the selection of **Wall Materials** for consideration as a substitute **Wall Material**.

To use this command:

1. Left click on the **Pool** button to open the **Select Pool** window. **All Wall Materials** are highlighted as default.

2. De-select an individual **Wall Material** by left clicking on it

3. De-select more than one **Wall Material** by LMB click the first one, then LMB clicking or dragging additional **Wall Material.**

4. De-select all by clicking the **RMB** on **Cancel**

5. Select all by clicking the **RMB** on **OK.**

Seek

After an edit curve has been set Left Clicking the **Seek** button will start the search process to find a material inside the pool matching the absorption coefficients of the edit curve.

Set Edit Values

This resets the tables to the room RT values currently in place

Edit Values (red color)

The edit curves (for room RT or for absorption coefficients) are curves you can get by picking values or moving the cursor and drawing. This allows the user to draw in the upper field an absorption coefficient curve to see how the room RT curve will be changed. But on the other hand the user also can draw a desired room RT curve in the field below and the upper absorption coefficient curve will show the coefficient values of the wanted material. It happens that with a change of a material a change of the desired RT cannot be realized. This is the case if the **Faces** are too small to create a significant change of the material. Then you have to consider other **Faces** to change the RT.

Set Target

This replaces the values of the target RT by the values of the edit RT.

Target Values (grey color)

Off

This switches the display of the target values on and off.

Tolerance

This shows the tolerance range within the room graph.

Set Edit Values

This replaces the values of the edit RT by the values of the target RT.

Edit Graph Tab

The top graph shows absorption coefficients of the selected material. The bottom graph shows the Reverberation time. Both graphs can be edited graphically or by typing values in the table.

Pick

The top graph shows absorption coefficients of the selected material. The bottom graph shows the Reverberation time. Both graphs can be edited graphically or by typing values in the table.

To use this command:

1. Left click on Pick.
2. Using the mouse move the cursor over the junction of the frequency desired and the absorption curve or Reverberation time
3. Left click will highlight the desired position with a yellow circle.
4. Using the slider move the level of the curve up or down as desired.
5. The resulting change in the Room RT or Absorption Curve will be shown in the opposite graph.
6. Repeat steps 2-5 until the RT curve or absorption curve looks like the desired ideal curve.

Draw

This allows a freehand editing of the absorption curve or RT curve.

To use this command:

1. Left click on Draw
2. Left click on the graph where the desired starting place is and hold the left mouse button while drawing the desired curve.

Edit Table Tab

This tab allows direct editing of the data in tabular form. If a desired value is entered in the **RT** column**,** EASE will search materials for a **Wall Material** that most closely matches the needed **Wall Material**. If a desired absorption coefficient is entered in the **Alpha** column EASE will search for find the closest **Wall Material** match.
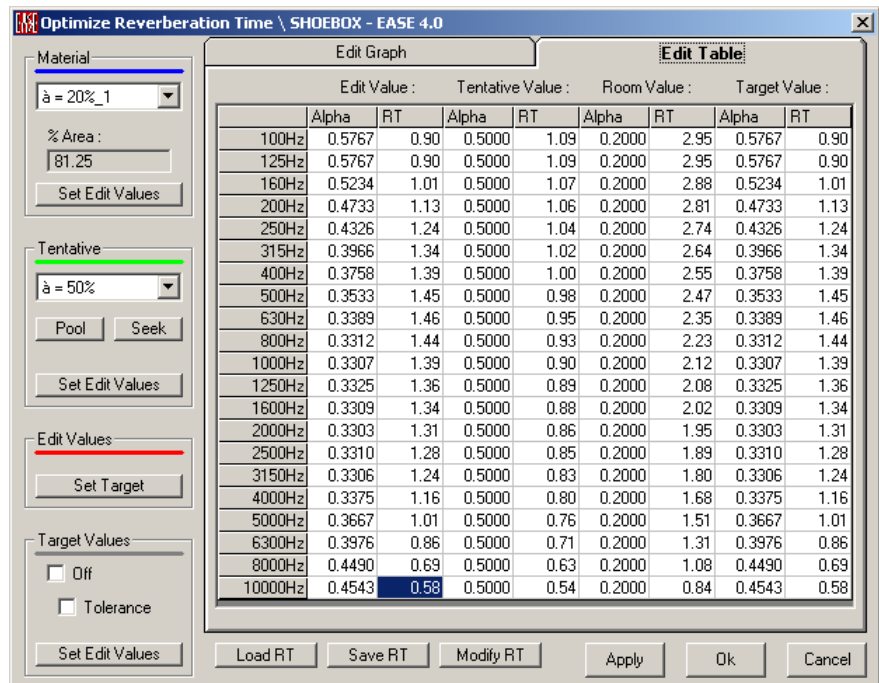
Create Shape 3D Window

This window allows the selection of a 3D shape to be inserted that is close to the basic type of room desired. There are five possible 3D shapes to choose from in the program.

To use this command:

1. Left click on **Create shape 3D**

2. This opens the **Create shape** window

3. The left top data window allows selection of a 3D shape type by use of the mouse. Highlight the correct shape and left click on it.

4. To change the physical parameters of the shape, highlight the dimension to be changed and re-enter the new dimension. Do this until all dimensions have been changed.

5. When satisfied with the shape, press the **OK** button. The shape will be drawn in Project Data Window.

6. Or escape with nothing by pressing the **Cancel** button.

Window

This window allows selection of the 3D shape.
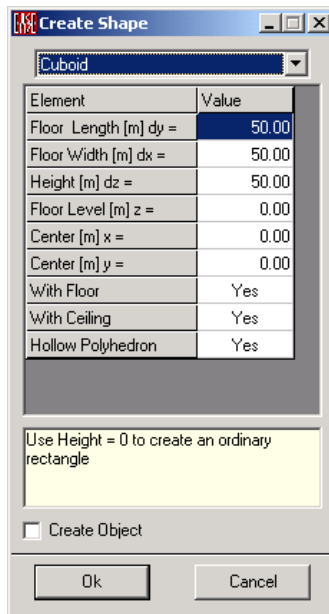
3D shape window

Allows selecting the wanted 3D shape.

Element

This list shows the corresponding variables to build the shape.

Value

Here the values for the variables are to be changed.

(Hint table)

Gives hints in setting values.

Create Object

If check marked the selected **3D shape** will be inserted together with an **Object** definition containing all items of the **3D Shape**. This will allow moving and turning the shape using standard **Object** functions as a second step.

Cancel

Discards changes and closes window.

OK

Applies changes and closes window.

Explanations for the different element settings of the shapes:

Cuboid

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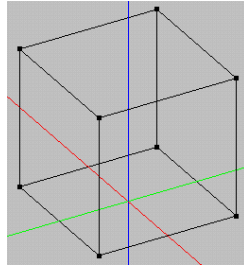
1. Allows entering values for **Floor Length, Floor Width**, **Height, and Floor Level**.

2. **Center x** / **Center y** allows shifting of the origin of the cuboid in the +/-x or +/- y directions. The origin is centered when the entered values equal 0.

3. **With Floor** / **With Ceiling** toggles the creation of the cuboid with or without a face in the floor / ceiling position.

4. **Hollow Polyhedron** toggles the orientation of the faces. E.g. unchecked **Hollow Polyhedron** creates an object such as a speaker's podium inside the room.

Pyramid
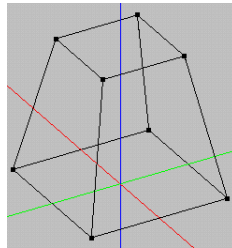
1. Allows to enter values for **Floor Length, Floor Width**, **Height, and Floor Level**.

2. **Center x** / **Center y** allows shifting of the origin of the pyramid in the +/-x or +/- y directions. The origin is centered when the entered values equal 0.

3. **With Floor** / **With Ceiling** toggles the creation of the pyramid with or without a face in the floor / ceiling position.

4. **Hollow Polyhedron** toggles the orientation of the faces. E.g. unchecked **Hollow Polyhedron** creates an object such as an object inside the room.

5. **Ceiling Length** / **Ceiling Width** describe the ceiling shape and size.

    If both equal 0 then the shape will be a classical pyramid.

    If one equals 0 and the other is equal to the related floor length then the shape will be a pitched roof.

    If both are equal to the related floor length the shape will be a cuboid.

Cupola
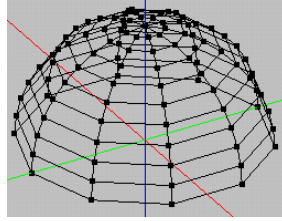
1. Allows to enter values for **Floor Radius, Height, and Floor Level**.

2. Setting **Ceiling Radius** cuts the top of the cupola and allows the addition of another shape on the top.

3. Setting **Floor Radius** and **Ceiling Radius** to 0 will create a full sphere with the radius equal to the **Height** value.

4. **Center x** / **Center y** allows shifting of the origin of the cupola in the +/-x or +/- y directions. The origin is centered when the entered values equal 0.

5. **With Floor** / **With Ceiling** toggles the creation of the cupola with or without a face in the floor / ceiling position. If **the Ceiling Radius** is not set then a ceiling will be not created.

6. **Hollow Polyhedron** toggles the orientation of the faces. E.g. unchecked **Hollow Polyhedron** creates an object inside the room.

7. **Vertical Steps** / **Horizontal Steps** determine the resolution of the cupola vertically and horizontally. E.g. the higher the number the more circular the shape

Cylinder
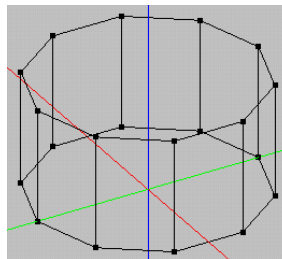
1. Enter values for **Floor Radius, Height** and **Floor Level**. Setting the **Height** to 0 will create a regular polygon or with enough **Horizontal Steps** a circle will be created.

2. **Center x** / **Center y** allows shifting of the origin of the cylinder in the +/-x or +/- y directions. The origin is centered when the entered values equal 0.

3. **With Floor** / **With Ceiling** toggles the creation of the cylinder with or without a face in the floor / ceiling position.

4. **Hollow Polyhedron** toggles the orientation of the faces. E.g. unchecked **Hollow Polyhedron** creates a column inside the room.

5. **Horizontal Steps** determine the resolution of the cylinder horizontally. E.g. the higher the number the more circular the shape.

Cone
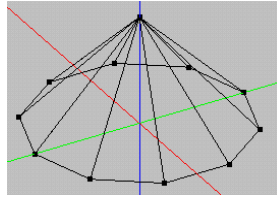
1. Allows entering values for **Floor Radius, Height** and **Floor Level**.

2. Setting **Ceiling Radius** cuts the top of the cone and allows the addition of another shape on the top or the creation of a column.

3. **Center x** / **Center y** allows shifting of the origin of the cone in the +/-x or +/- y directions. The origin is centered when the entered values equal 0.

4. **With Floor** / **With Ceiling** toggles the creation of the cone with or without a face in the floor / ceiling position. If **the Ceiling Radius** is not set then a ceiling will not be created.

5. **Hollow Polyhedron** toggles the orientation of the faces. E.g. unchecked **Hollow Polyhedron** creates an object inside the room.

6. **Horizontal Steps** determine the resolution of the cone horizontally. E.g. the higher the number the more circular the shape.

Load Prototype Window

This window allows the selection of a room to be inserted that is close to the type of room desired. There are thirty-three possible Prototype rooms to choose from in the program.

To use this command:

1. Left click on **Load Prototype**

2. This opens the **Load Prototype** window

3. The left top data window allows selection of a generic type of room by use of the mouse. Highlight the correct prototype and left click on it.

4. Left click on the **Assemble Room** button

5. This will draw the room in the **Edit Project Data** window

6. This will also fill in the chart of values in the **Load Prototype** window

7. To change the physical parameters of the building, highlight the dimension to be changed and re-enter the new dimension. Do this until all dimensions have been changed.

8. You can see the results of your changes at any time by pressing the **Apply** button.

9. If the changes are not to your liking you can remove them by pressing the **Undo** button.

10. When satisfied with the room, press the **OK** button or escape with nothing by pressing the **Cancel** button.

Window

This window allows selection of the prototype
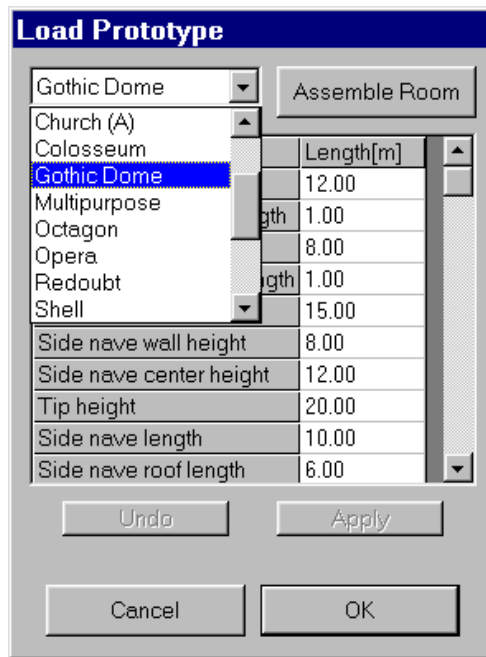
Assemble Room

This command builds the room in a default size.

Undo

This command reverses the previous action performed.

Apply

Applies changes and keeps window open.

Cancel

Discards the prototype and closes window.

OK

Accepts the prototype and closes window.

Item View Window

After picking an item or the spot of an item the **Item View Window** can be used for a perspective view from that location.
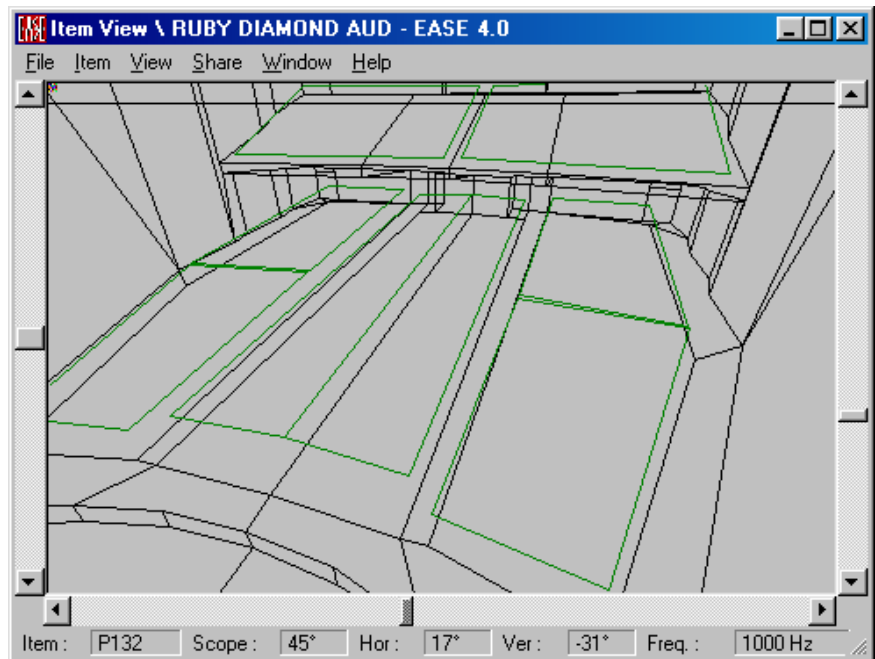
Key Conventions

F1	Help
F11	Zoom In
F12	Zoom out

Shift+

F11	Pick next item of the project
F12	Pick previous item of the project

Mouse Conventions

LMB	This allows picking of a spot and centering that spot on the screen.

Statusbar Conventions

Item	This displays the Item label
Scope	This displays the viewing cone angle
Hor	This displays the horizontal aiming angle with 0 degrees looking in the Y direction
Ver	This displays the vertical aiming angle with 0 degrees being level horizontally
Freq	This displays the frequency selected for the current display

File Menu

This menu gives access to file management functions and program settings.

Apply

This command sends the data to the parent window.

Send Picture To

This allows the current active picture to be sent to the Clipboard, a File, or EASE Page Designer.

Clipboard

This copies the picture to the clipboard for use in other applications.

File

This saves the picture to a file. The files can be saved in many formats, including:

Windows Bitmap……………………………*.BMP
JPEG…………………………………………*.JPG
CompuServe GIF……………………………*.GIF
Portable Network Graphics…………………*.PNG
Tagged File Format…………………………*.TIF
LuRa Tech Wavelet…………………………*.LWF
Zsoft Paintbrush……………………………*.PCX
Windows Icon………………………………*.ICO
Enhanced Windows Metafile…………………*.EMF
Truevision Targa……………………………*.TGA.

EASE Page Designer

This opens the current active picture in the **EASE Page Designer** module, allowing modifications to and annotations of the picture before printing.

Print

This prints the open window, pixel for pixel, without the window frame, e.g. without the command buttons and scroll bars.

Exit

This exits the window.

Item Menu

Select or modify **Items** to be displayed or to be used in computation.

Vertices

A check here makes **Vertices** visible. A change causes an immediate redraw.

Edges

A check here makes **Edges** visible. A change causes an immediate redraw.

Faces

A check here makes **Faces** visible. A change causes an immediate redraw.

Loudspeakers

A check here makes **Loudspeakers** visible. A change causes an immediate redraw.

Audience Areas

A check here makes **Audience Areas** visible. A change causes an immediate redraw.

Listener Seats

A check here makes **Listener Seats** visible. A change causes an immediate redraw.

Lamps

A check here makes **Lamps** visible. A change causes an immediate redraw.

IR Emitters

A check here makes **IR Emitters** visible. A change causes an immediate redraw.

Label Loudspeaker

A check here makes **Loudspeaker labels** visible.

Label Aud Areas

A check here makes **Audience Area labels** visible.

Label List Seats

A check here makes **Listener Seat labels** visible

Label Lamps

A check here makes **Lamp labels** visible.

Label IR Emitters

A check here makes **IR Emitter labels** visible.

View Menu

Render Lspk Mapping

This is enabled <u>only</u> when in **Loudspeaker View** or **Aiming**. This opens **Room Mapping** to show a rendered view of the room from the perspective of the selected **Loudspeaker**, and allows mapping of the room.

To use this option having Checked Data is necessary.

3D Perspective

This command has four preset angles, e.g. (60 deg X –30 deg). In **Item View** the selected viewpoint is referenced as the origin.

Side View (x)

This command turns the view to a look along the x-axis.

End View (y)

This command turns the view to a look along the y-axis.

Plan View (z)

This command turns the view to a look along the z-axis.

Redraw

This forces a drawing update.

Full View

This forces the drawing to fit the window to a fixed tolerance and causes immediate redraw.

Zoom In

The scope angle decreases as the zoom increases.

ShortCuts: **PgUp** or **F11**.

Zoom Out

The scope angle increases as the zoom decreases.

ShortCuts: **PgDown** or **F12**.

Frequency Band

This opens a popup menu allowing the selection of the frequency to be used for mapping or calculation. The frequency resolution of the program is 1/3 octave starting at 100 Hz and ending at 10 kHz.

Loudspeaker Coverage

This toggles <u>only</u> in **Loudspeaker View** the display of coverage lines.

3 dB

This toggles the display of the 3dB coverage line.

6 dB

This toggles the display of the 6dB coverage line.

9 dB

This toggles the display of the 9dB coverage line.

Listener Seat View Angle

This toggles <u>only</u> in **Listener Seat View** the display of scope view lines.

15

This toggles the display of the 15-degree angle of view line.

30

This toggles the display of the 30-degree angle of view line.

45

This toggles the display of the 45-degree angle of view line

Lamp Opening Angle

This toggles <u>only</u> in **Lamp View** the display of **Lamp** opening angle lines.

15

This toggles the display of the 15-degree angle of view line from the radiation point of the **Lamp**.

30

This toggles the display of the 30-degree angle of view line from the radiation point of the **Lamp**.

45

This toggles the display of the 45-degree angle of view line from the radiation point of the **Lamp**.

IR Emitter Opening Angle

This toggles <u>only</u> in **IR Emitter View** the display of **IR Emitter** opening angle lines.

15

This toggles the display of the 15-degree angle of view line from the radiation point of the **IR Emitter**.

30

This toggles the display of the 30-degree angle of view line from the radiation point of the **IR Emitter**.

45

This toggles the display of the 45-degree angle of view line from the radiation point of the **IR Emitter**.

Share Menu

Frequency

A check here enables frequency as a common viewing parameter.

Hor. Angle

A check here enables the horizontal angle as a common viewing parameter.

Ver. Angle

A check here enables the vertical angle as a common viewing parameter.

Window Menu

This menu allows access to different commands that affect the open window.

Screen Quarter

This allows placement of the active window into any of 5 positions.

Center

This places the open window in the center of the screen.

Upper Left

This places the open window in the upper left corner of the screen.

Upper Right

This places the open window in the upper right corner of the screen.

Lower Left

This places the open window in the lower left corner of the screen.

Lower Right

This places the open window in the lower right corner of the screen.

Cascade Windows

This makes all open windows appear in a stacked format.

Help Menu

Help Topics

This shows a list of help topics applicable to Item View.

About

This displays information about your EASE program.

Memory Used

This displays the current status of memory use in your computer.

Check Holes Window
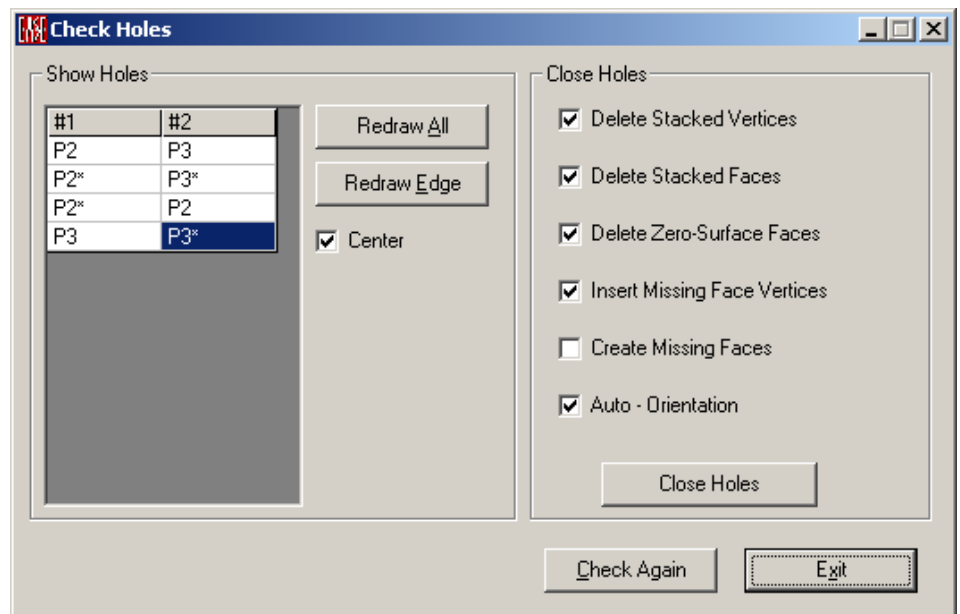
The window will open when selecting the command **Tools | Check Holes** and when your model has holes.

The table to the left of this window lists the **Vertices** of the model edges along which holes exist. Clicking any **Vertex** of the table will cause highlighting the corresponding edge in red in the model. To the right of the window the user can find the following buttons:

Check Again

Pressing this button will perform a new check for holes after any recent changes to the model, e.g. inverting or modifying **Faces** definition.

Redraw All

When this button is pressed, all model edges that contain holes will be highlighted in red.

Redraw Edge

When this button is pressed, the model edge that contains holes selected in the table will be highlighted in red.

The check box Center when checked will locate the highlighted edge in the center of the display.

Close Holes

This option allows removing obsolete vertices or faces, to insert missing ones and to keep the right orientation of the faces

The button *Close Holes* processes the selected options.

Exit

This button will exit from **Check Holes Window**.

If the user checks for holes and there are no holes in the model, the Check Holes Window will not open and the user will receive a message box confirming the room being closed:
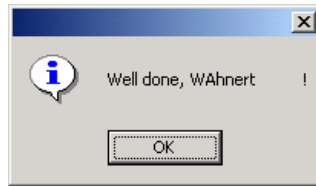
Cluster Info Window
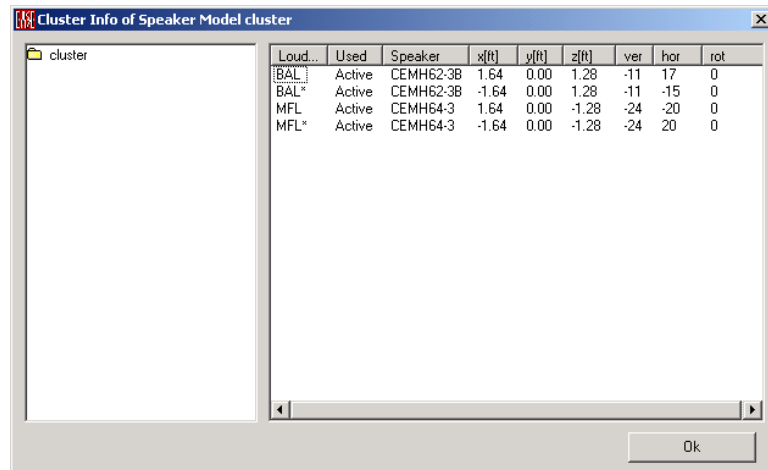
Under Cluster Info you may view the components of the cluster and the location and angle data.

Displacement Window
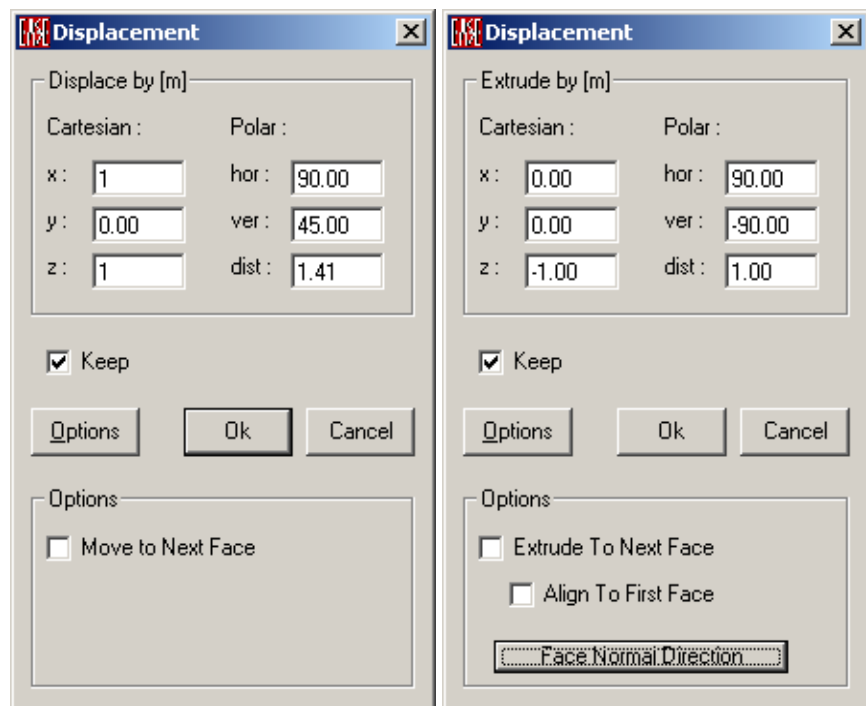
The Displacement Window allows for the entry of the differential coordinates for displacement or extrusion either in a **Cartesian** or a **Polar** format. To let the program remember the last coordinate values and settings switch **Keep** on.

Clicking the **Options** button allows for additional selections. These options are available for the Displacement of **Vertices** and the Extrusion of **Vertices**, **Edges**, **Faces**. The selected item can be moved in the chosen direction to the next intersection with a **Face**.

Move to Next Face (Vertices only): This will move the vertex to the next face if it exists in the direction chosen by the sign of a single X, Y, or Z displacement vector. Otherwise it will move the exact distances entered.

Extrude to Next Face (Faces only): This will extrude the vertices to the next face if it exists in the direction chosen by the sign of a single X, Y, or Z displacement vector. Otherwise it will extrude the exact distances entered.

Face Normal Direction: For Faces the direction of the normal vector can be used as the axis of extrusion.

Align To First Face: Also for **Faces** it can be selected whether intersecting **Vertices** will be located on a common **Face** or individually.

Insert Regular Polygon Window
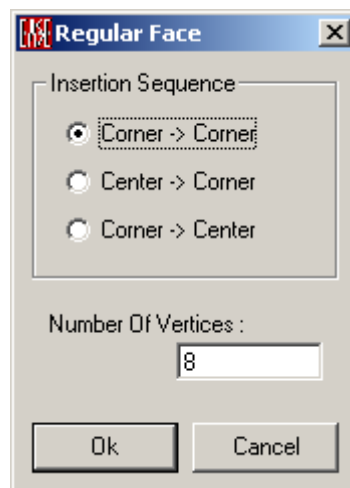
The window will open when selecting the command **Insert | Create Shape 2D | Regular Polygon** (or by using a corresponding toolbar button)**.** You may choose now from three ways to enter a polygon**:**

Corner → Corner: The picked spot is selected as one of n points (default: 8) on the circumference. To create the polygon left click to set the opposite corner point after closing the window.

Center → Corner: The picked spot is selected as the center point of the polygon with n corner points (default: 8). To create the polygon left click to set the corner point.

Corner → Center: The picked spot is selected as one of n points (default: 8) on the circumference. To create the polygon left click to set the center point.

Chapter III : Ease Eyes

EASE Eyes

Room Mapping is one of two 3D-rendering tools in EASE (the other is **Architectural Rendering** in the **Vision** module). **Room Mapping** provides a parallel and central perspective view onto room models. The distribution of selected acoustical properties on **Faces** and/or **Audience Areas** and/or **Listener Seats** can be shown. The **Walker** module allows the user to step through a series of viewing perspectives as if walking through the room, and to select of a viewing perspective from any desired location inside or outside the room.

For users who have **AURA**, **Room Mapping** now includes the **AURA Mapping** module (based on CAESAR algorithms), a powerful acoustical simulation engine, new in EASE 4.0. In addition, **AURA Mapping** computes and maps echograms throughout selected **Audience Areas** and on selected **Listener Seats**. **AURA** uses a hybrid image source / ray tracing algorithm that includes diffuse scattering. **AURA** can compute Early Decay Time (EDT), Reverberation Time (T10, T20, T30), Lateral Fraction (LF), Lateral Fraction Coefficient (LFC), Clarity (C80), Definition (D50, C50), Sound Strength (G), Center Time, STI, Direct and Total SPL, and Echo Criteria for Speech and Music according to the method of Dietsch and Kraak.

The EASE **Ray Tracing** module or the **AURA Response** calculation can be used to compute a response file at any **Listener Seat,** and at a selected point within **Audience Areas**. This response (21 1/3 octave band reflectograms) can be displayed as a simple monophonic Reflectogram (in the **EASE Probe** module), or it can be sent to **EASE EARS**. There it can be used to compute a **Binaural Impulse Response File** by convolving it with a suitable **Head Related Transfer Function,** and that BIR file is used for **Auralization**.

The EASE **Probe** module can be opened to investigate acoustical properties and loudspeaker system performance at any point inside the room. In addition, **AURA** can be called directly from **Room Mapping** to directly compute a **Binaural Impulse Response** for **Auralization** without the need for a separate HRTF convolution, and a **Impulse Response File** for analysis in **Probe**.

The EASE **Auralization** module, EARS (Optional with EASE), can be opened from **Room Mapping**. **Auralization** allows the user to listen to, and to provide to a client, a simulation of what the room will sound like at any selected seat with a given loudspeaker system.

Check Data must be successfully executed before **Room Mapping** can be used.

Eyes Main Window

The scrollbar on the left serves as zoom, at the bottom as horizontal turn, at the right as vertical turn.

Key Conventions

F1	Help
F8	Full View
F9	Options
F10	Status bar settings
F11	Zoom In
F12	Zoom Out
p	Activates the Pick Function Mouse mode
d	Activates the Drag Function Mouse mode
t	Activates Turn Function Mouse Mode
x	x-View
y	y-View
z	z-View
3	3D-View
Left Arrow	Moves the horizontal rotation scrollbar to the left
Right Arrow	Moves the horizontal rotation scrollbar to the right
Up Arrow	Moves the vertical rotation scrollbar upwards
Down Arrow	Moves the vertical rotation scrollbar downwards
PgUp	Zoom In
PgDn	Zoom Out
Home	Full View
Esc	Stop Walker

Ctrl+

	Changes Pick and Turn Mouse Mode to Drag Mouse Mode
O	Open Project (Stand-alone mode) or Acquire Project Data
Left Arrow	Move viewpoint to the left (20%) (External View only)
Right Arrow	Move viewpoint to the right (20%) (External View only)
Up Arrow	Move viewpoint upwards (20%) (External View only)
Down Arrow	Move viewpoint downwards (20%) (External View only)
PgUp	Move the selected Frequency +1/3 Octave (External View only)
PgDn	Move the selected Frequency –1/3 Octave (External View only)
Home	Center (External View only)
Tab	Next Viewpoint (Perspective View only)
BackTab	Previous Viewpoint (Perspective View only)

	Changes Pick and Drag Mouse Mode to Turn Mouse Mode
F11	Next Viewpoint (Perspective View only)
F12	Previous Viewpoint (Perspective View only)

Mouse Conventions

Mouse Mode Center

LMB on picture	In this mode, left click on a point pans the display to center that point in the display.

Mouse Mode Pick

LMB on picture	Opens the Walker Window for the picked position

Mouse Mode Turn

LMB on picture	This allows rotating the viewpoint of the model around on the background
RMB on picture	This allows zooming in and out

Mouse Wheel

Mouse wheel spinning allows zooming in and out.

Statusbar Conventions

View Label	This displays the view position. EXT (external), Walker or Item.
Zoom	This displays the zoom percentage starting at 100% for a Full picture.
Hor	This displays the horizontal viewing angle of the window
Ver	This displays the vertical viewing angle of the window
Cursor	This displays horizontal and vertical viewing angles of the cursor position from the perspective view of a loudspeaker, listener seat or a walker position.
Freq	This displays the frequency selected for the current display

File Menu (child mode)

This menu gives access to file management functions and program settings.

Acquire Project Data

Acquires all current project data from the **Room Editor**. **Acquire Data** should be used when changes have been made to Room Data (for example, addition of **Loudspeakers**, changes to **Loudspeaker** settings, changes to **Wall Material**s, etc.) and the user wants the new data to be used in calculations.

If the user has made changes to the Room Data and these changes have not been transferred to Eyes the user will see a red or yellow border around the Eyes window. The red border shows that changes to Room Data were made and the data are not checked. So the user has to run "Check Data" in Edit Room before the data can be acquired by Eyes. Now, after checking data, a yellow border around the Eyes window is shown and Eyes is open to acquire the data. Then may be started a new calculation based on the current data.

Shortcut: Ctrl+O

Note: There are special instances when **Acquire Data** might not be appropriate. For example, an old set of data can be used for calculations in the current window and compared with a new set of data computed in a different window.

Load Viewer Position

This loads previously saved viewer position data and updates the window view to reflect the new data. This can be used as a starting point for new calculations. To use this command:

1. Left click **Load Viewer Position** to open an **Open File** Window.

2. Browse to the folder for the **Viewer Position (.EYE)** file, select the file, and Left click **Open.**

Save Viewer Position

This **Saves** a **Viewer Position (.EYE) File**. To use this command:

1. Left click on **Save Viewer Position to** open a Save File window.

2. Choose a folder for the **Viewer Position** file, enter a file name, and Left click on **Save.**

Save OpenGL File

This **Saves** an **OpenGL (.EGL) File** for the current display. An **OpenGL** file can be **Viewed** using **EASE View**, a standalone viewer that can be provided to clients. **EASE View** can be accessed from the menu **File | EASE Viewer** in EASE Main. To use this command:

1. Left click **Save OpenGL File** to open a **Save File** window.

2. Choose a folder for the **OpenGL** file, enter a file name, and Left click on **Save.**

OpenGL files are convenient for saving OpenGL views of the room or any maps calculated within the room with the capability of viewing them later from any point of view. These OpenGL files can be demonstrated e.g. for architects only just with the help of a demo version of EASE (includes already the EASE Viewer).

Load EASE Mapping File

This loads a previously saved **EASE Mapping (.EMP) File** and updates the window view to reflect the loaded result data of the mapping calculations. To use this command:

1. Left click on **Load EASE Mapping File** to open the **Open File Window.**

2. Browse to the folder for the **EASE Mapping** file, select the file, and Left click **Open.**

Send Picture To

This **sends** the current **Picture** to the Clipboard, a File, or **EASE Page Designer**.

Clipboard

This copies the current picture to the **Windows Clipboard.**

File

This saves the current picture to a file. Supported formats are:

Windows Bitmap……………………………*.BMP

JPEG…………………………………………*.JPG

CompuServe GIF……………………………*.GIF

Portable Network Graphics…………………*.PNG

Tagged File Format…………………………*.TIF

LuRa Tech Wavelet…………………………*.LWF

Zsoft Paintbrush……………………………*.PCX

Windows Icon………………………………*.ICO

Enhanced Windows Metafile………………*.EMF

Truevision Targa……………………………*.TGA.

EASE Page Designer

This opens the current picture in **EASE Page Designer,** allowing text annotations, multiple picture layouts, and editing of the page layout format before printing, or for use in printed reports and presentations.

Print

This prints the current window without the window frame, i.e. without the command buttons and scroll bars.

Options

This opens the Options Window to display and set parameters for **Room Mapping**.

Shortcut: F9

Modify Toolbar

This opens a window for modification and construction of the toolbars. Buttons and commands maybe added or subtracted as needed.

Legend Colors

This opens the **Legend Colors Window**, used to show and modify the color schemes for the display of mapping data.

Exit

This exits **Room Mapping**.

File Menu (standalone mode)

This menu gives access to file management functions and program settings.

Open Project

This allows opening of EASE 3.0, 4.x project files for viewing the **Room** and making calculations.

Shortcut: Ctrl+O

To use this command:

1. Left click on **Open Project**. This opens an **Open File** window.

2. Use **Look In** to find the folder, Left click on the project file (with an **.FRD** extension), and Left click on **Open.**

Open Speaker Case

This allows opening of EASE speaker case files for use in presentations and viewing. To use this command:

1. Left click on **Open Speaker Case** to opens an Open File Window.

2. Use **Look In** to find the folder, Left click on the **Speaker Case File**, and Left click on **Open**.

Load Viewer Position

This **Loads** a previously saved **Viewer Position (.EYE) File** and updates the window view to reflect the new data. This can be used as a starting point for new calculations. To use this command:

1   Left click **Load Viewer Position** to open an **Open File** Window.

2. Browse to the folder for the **Viewer Position** file, select the file, and Left click **Open.**

Save Viewer Position

This **Saves** a **Viewer Position (.EYE) File**. To use this command:

1. Left click on **Save Viewer Position to** open a Save File window.

2. Choose a folder for the **Viewer Position** file, enter a file name, and Left click on **Save.**

Save OpenGL Mapping File

This **Saves** an **OpenGL (.EGL) File** for the current display. An **OpenGL** file can be **Viewed** using **EASE View**, a standalone viewer that can be provided to clients. **EASE View** can be accessed from the menu **File | EASE Viewer** in EASE Main. To use this command:

1. Left click **Save OpenGL File** to open a **Save File** window.

2. Choose a folder for the **OpenGL** file, enter a file name, and Left click on **Save.**

OpenGL files are convenient for saving OpenGL views of the room or any maps calculated within the room with the capability of viewing them later from any point of view. These OpenGL files can be demonstrated e.g. for architects only

just with the help of a demo version of EASE (includes already the EASE Viewer).

Load EASE Mapping File

This loads a previously saved **EASE Mapping File** and updates the window view to reflect the loaded result data of the mapping calculations. To use this command:

1. Left click on **Load Mapping File** to open the **Open File** Window.

2. Browse to the folder for the **EASE Mapping** file, select the file, and Left click **Open.**

Send Picture To

This **sends** the current **Picture** to the Clipboard, a File, or **EASE Page Designer.**

Clipboard

This copies the current picture to the **Windows Clipboard.**

File

This saves the current picture to a file. Supported formats are:

Windows Bitmap……………………………*.BMP

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Portable Network Graphics…………………..*.PNG

Tagged File Format…………………………*.TIF

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Zsoft Paintbrush……………………………*.PCX

Windows Icon………………………………*.ICO

Enhanced Windows Metafile…………………*.EMF

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This prints the open window without the window frame, e.g. without the command buttons and scroll bars

Options

This opens the Options Window to display and set parameters for **Room Mapping**.

Shortcut: F9

Modify Toolbar

This opens a window for modification and construction of the toolbars. Buttons and commands maybe added or subtracted as needed.

Legend Colors

This opens the **Legend Colors** Window, used to show and modify the color schemes for the display of mapping data.

Fast Open

This area of the menu stores the paths of the last open projects. A left click will open the selected project directly.

Exit

This exits **Room Mapping**.

Item Menu

This sets visibility of Items in the Room Mapping window and allows Items to be set Active. A change causes immediate redraw.

Vertices

A check here makes **Vertices** visible. A change causes a redraw.

Edges

A check here makes **Edges** visible. A change causes a redraw.

Faces

A check here makes **Faces** visible. A change causes a redraw.

Loudspeakers

A check here makes sound sources (e.g. **Loudspeakers**) visible. A change causes a redraw.

Audience Areas

A check here makes **Audience Areas** visible. A change causes a redraw.

Listener Seats

A check here makes **Listener Seats** visible. A change causes a redraw.

IR Emitters

A check here makes **IR Emitters** visible. A change causes a redraw.

Show dB Coverage Lines

When **Room Mapping** is in **Loudspeaker View** mode, a check here makes the **Loudspeaker's dB Coverage Lines** visible.

Without Me

When checked, a viewpoint object (**Loudspeaker** symbol/case or **Listener Seat** symbol) will not be visible in **Loudspeaker View** or **Listener Seat View**.

Outline All Faces

If checked, **Outlines** of **All Faces** including rendered **Faces** will be visible. A change causes a redraw. The **Outline Colors** are the same as the **Dye Colors** if the command **Item | Colored Outlines** is unchecked.

Colored Outlines

If checked, **Outlines** of all Faces will be visible in the color chosen under **Options | General**. A change causes a redraw.

Select Active

Select **Loudspeakers, Audience Areas** and **IR Emitters** to be used in calculations.

Loudspeakers

This selects **Loudspeakers** used in calculations. To use this command:

1. Left click on **Loudspeakers On.** This lists **Loudspeakers** that have been defined.

2. Select Loudspeakers using the LMB. Right click on **OK** selects all or on **Cancel** deselects All.

3. Left click on **OK**.

Audience Areas

This selects **Audience Areas** where calculations should be performed. To use this command:

1. Left click on **Audience Areas On.** This lists **Audience Areas** that have been defined.

2. Select **Audience Areas** using the LMB. Right click on **OK** selects All or on **Cancel** deselects All.

3. Left click on **OK**.

IR Emitters

This selects **IR Emitters** to be used for calculations. To use this command:

1. Left click on **IR Emitters On.** This lists **IR Emitters** that have been defined.

2. Select **IR Emitters** using the LMB. Right click on **OK** selects All, or **Cancel** deselects All.

3. Left click on **OK**.

Display Active only

This sets the visibility of **Loudspeakers, Audience Areas** and **IR Emitters** as a function of whether they are **Active** for use in **Calculations**.

Loudspeakers

If checked, only **Active Loudspeakers** for use in **Calculations** will be visible.

Audience Areas

If checked, only **Active Audience Areas** for use in **Calculations** will be visible.

IR Emitters

If checked, only **Active IR Emitters** for use in **Calculations** will be visible.

View Menu

This menu allows access to all viewing tools.

3D Perspective

This command has four preset angles, e.g. (-60 deg X –30 deg). This displays the object isometrically in **External View** (i.e., from outside the **Room**). In **Perspective View** (inside the **Room**) the same four preset viewing angles are used for viewing from the selected viewpoint.

Side View (x)

This command has two preset angles; 90ºx0º and -90ºx0º. This displays the object in the YZ-Domain in **External View** (i.e., from outside the **Room**). This is otherwise known as the X-View. In **Perspective View** (inside the **Room**) the same two preset viewing angles are used for viewing from the selected viewpoint, the view is along ±X-axis.

End View (y)

This command has two preset angles; 180ºx0º and 0ºx0º. This displays the object in the XZ-Domain in **External View** (i.e., from outside the **Room**). This is otherwise known as the Y-View. In **Perspective View** (inside the **Room**) the same two preset viewing angles are used for viewing from the selected viewpoint, the view is along ±Y-axis.

Plan View (z)

This command has two preset angles; 90ºx90º and 90ºx-90º. This displays the object in the XY-Domain in **External View** (i.e., from outside the **Room**). This is otherwise known as the Z-View. In **Perspective View** (inside the **Room**) the same two preset viewing angles are used for viewing from the selected viewpoint, the view is along ±Z-axis.

Redraw

This redraws the window.

Full View

This forces the drawing to fit the window to a fixed tolerance and causes immediate redraw.

Zoom In

This increases the zoom percentage in **External View**. In **Perspective View** the scope angle decreases to provide a more "close-up" view. This can also be accessed using PgUp or F11.

Zoom Out

This decreases the zoom percentage in **External View**. In **Perspective View** the scope angle increases to provide a wider view (i.e., more of the room). This can also be accessed using PgDn or F12.

Frequency Band

This selects the 1/3 octave frequency band for calculation and mapping starting at 100 Hz and ending at 10 kHz.

Perspective View

This provides a view of the **Room** from the perspective of a selected **Loudspeaker, Listener Seat, or IR Emitter.** Other viewpoints can be chosen from the **Walker**.

Loudspeaker View

This provides a **Perspective** view of the **Room** looking from the **Loudspeaker's** reference point along the **Loudspeaker's** aiming axis, and sets the **Walker** position to the selected **Loudspeaker**. To use this command:

1. Left click on **Loudspeaker**. This displays a list of **Loudspeakers** that have been defined.

2. Select a **Loudspeaker** using the LMB.

3. Left click on **OK**.

Listener View

This provides a Perspective view of the **Room** looking from the **Listener Seat** along its observation axis, and sets the **Walker** position to the selected **Listener Seat**. To use this command:

1. Left click on **Listener View**. This displays a list of **Listener Seats** that have been defined.

2. Select a **Listener Seat** using the LMB.

3. Left click on **OK**.

IR Emitter View

This provides a Perspective view of the **Room** looking from the **IR Emitter's** center along the **IR Emitter's** aiming axis, and sets the **Walker** position to the selected **IR Emitter**. To use this command:

1. Left click on **IR Emitter View**. This displays a list of IR Emitters that have been defined.

2. Select a **IR Emitters** using the LMB.

3. Left click on **OK**.

External View

This provides a view of the **Room** from a point outside the **Room**.

Walker

This provides a **Perspective View** of the **Room** from the current walker position and allows calculations at this position. See also

<<Back

Moves to the previous **Settings Tab**.

Next>>

Moves to the next **Settings Tab**.

Start Simulation

Accepts parameter settings and starts the calculation.

Quit

This aborts the calculation and closes the window.

Memory Warning Window

At the beginning of an **AURA** Calculation, **EASE** determines how much temporary memory is required to complete it. Make sure you have enough RAM and hard disk space available. AURA may crash if it runs out of memory. The **Memory Used** window on the **Help Menu** can monitor memory use.
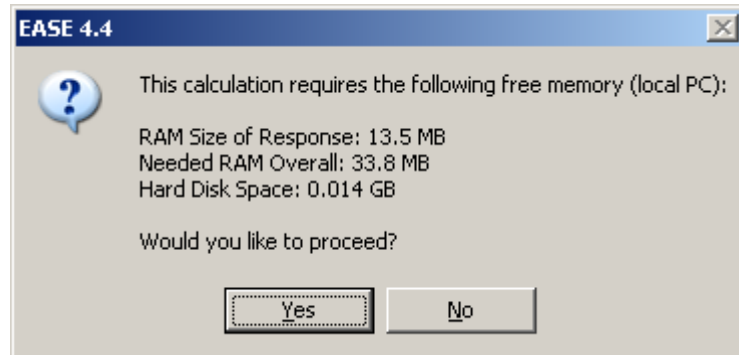
Invert Faces

This toggles on and off the transparency of the first faces that block "seeing through" the inside of the room and causes immediate redraw.

Solid Rendering

A check here causes Room Mapping to display a solid rendering of the Room. No check causes Room Mapping to display a wire frame model. A change causes a redraw.

Dye Menu

This menu allows a choice between various protocols that use color to display the characteristics of Items, to make one Item stand from another, and to provide a more realistic visual image of the Room.

White Faces

When checked, all faces will be white or a light shade of gray (OpenGL standard). A change will cause a redraw.

Face Color

When checked, the color of each **Face** will be as assigned in the **Room Editor**. A change will cause a redraw. This can be used to show the room using the architect's color design.

Material Color

When checked, the color of each **Face** will be that assigned to the assigned **Wall Material.** A change will cause a redraw.

Material Alpha

When checked, the color of each **Face** will indicate the **Absorption Coefficient** (**Alpha**) of the assigned **Wall Material**, and will vary with frequency according to the characteristics of the assigned **Wall Material**. A change will cause a **Redraw**.

Alpha Spectrum

When checked, this toggles the dye colors to average absorption impression, which gives an overall response of absorption/reflection behavior of the room, with lighter colors indicating lower the absorption (just like in the optical world). A change will cause a redraw.

Random Grey

When checked, each **Face** will be assigned a random shades of grey. This can be used to show the degree of modeling **Resolution**. A change will cause a redraw.

Random Color

When checked, each **Face** will be assigned a random color. This can be used to show the degree of modeling resolution. A change will cause a redraw.

Vertex Color

If checked, **Vertex** colors will be those set on each individual **Vertex's** property sheet. If not checked, **Vertices** will have the default color for **Vertices**.

Edge Color

If checked, **Edge** colors will be those set on each individual **Edge's** property sheet. If not checked, **Edges** will have the default color for **Edges**.

Loudspeaker Color

If checked, **Loudspeaker** colors will be those set on each individual **Loudspeaker's** property sheet. If not checked, **Loudspeakers** will have the default color for **Loudspeakers**.

Audience Area Color

If checked, **Audience Area** colors will be those set on each individual **Audience Area's** property sheet. If not checked, **Audience Areas** will have the default color for **Audience Areas**.

Listener Seat Color

If checked, **Listener Seat** colors will be those set on each individual **Listener Seat's** property sheet. If not checked, **Listener Seats** will have the default color for **Listener Seats**.

IR Emitter Color

If checked, **IR Emitter** colors will be those set on each individual **IR Emitter's** property sheet. If not checked, **IR Emitters** will have the default color for **IR Emitters**.

Mapping Menu

This menu holds the tools that allow calculation of acoustic parameters on selected areas, faces and listener seats

Standard

See [Chapter V Mapping Calculations]

Standard with Reflections

See [Chapter V Mapping Calculations]

Aura

See [Chapter V Mapping Calculations](#)

Local Decay Time

See [Chapter V Mapping Calculations](#)

IR Simulation

Left click opens the **IR Simulation Menu**, allowing setup of parameters for **IR Simulation** and subsequent calculations.

See [Chapter V Mapping Calculations](#)

Recalculate Map F5

This opens a window to view current **Calculation Parameters**, accept or change them, and begin a new calculation.

Tools Menu

This menu accesses **Tools** for viewing, calculation, acoustic investigations, and auralization. The Tools provide access to the **Probe, to Auralization,** and **AURA response calculations**. .

Move View Point

This opens the **Walker** Window and sets the viewpoint to the last "saved" viewpoint or most recently picked point . The **Walker** Window gives full control of the **View Point** origin to the user, with the ability to move the **Viewpoint** left, right, up, down, forwards and backwards. The viewpoint may be changed using arrows, or by entering it as x, y, and z coordinates.

Invoke Probe

To start the acoustical **Probe** function, Left click on **Invoke Probe**, then Left click on a point where **Probe** should perform its calculations. To use the **Probe** at another point, Left click on that point. See also Probe module.

Save Direct Sound Response

This saves the direct sound information at the last selected walker/probe location such as frequency, delay, direction and level to a response file (.RSP) To use this command:

1. Left click on **Save Direct Sound Response** to open a **Save File** window.

2. Select a folder, enter a name for the new .**RSP** file, and Left click on **Save**.

Invoke Ears

This is a 2-function command. When **Ears** starts, a dialog box will ask "Save Direct Sound Response?"

A **Yes** answer will open a Save File dialog and then load the file directly into **Ears**. A **No** answer will open **Ears** without any related file being loaded.

See also EARS module.

Auralize Direct Sound

This opens a window to begin the **Auralization** of **Direct Sound** at the last selected walker/probe location. First, the direct sound response must be computed and convolved with a head related transfer functions (HRTF) to get a **Binaural Impulse Response** (BIR). The resulting BIR file can be convolved with a sound (.WAV) file to hear the sequence of direct sound of all selected speakers or other sources. This makes it possible to hear effects such as delay, comb filtering, and precedence. Default settings for **Auralize Direct Sound** are set using **Keep To Auralize** on the **Tools Menu** in **EASE Auralization** (called **EARS**).

Local Ray Tracing

See Chapter V Mapping Calculations

Calculate Aura Response

See Chapter V Mapping Calculations

Utilities Menu

This menu hold tools useful in viewing, labeling, and saving of window displays.

Spin

This rotates the view of the model about the current picked location at a speed set in **Options**. If no spot is picked, the view will **Spin** about the center of the display.

Record Spinning

This **Records** the **Spinning** view of the room to a file for later viewing. The file is made up of .BMP pictures, saved for each position as a bit-map and added to the file. The resulting file is saved as a compressed (.ZIP) file. For an animation of the bitmaps, previously saved files can be converted to AVI formatted files using third party shareware. To use this command:

1. Left click on **Record Spinning**. This opens a **Save File** window.

2. Using **Save In,** select a folder, enter a name for the new file, and Left click on **Save**

3. The view will start **Spinning**. To end, left click **Record Spinning**.

Show Legend

When a mapped calculation is displayed, **Show Legend** opens a window to show the **Color Scale** used to map the calculations. This window differs from the **Legend** included in the mapping window in that the Show Legend window can show a wider range of values through the buttons **Maximum** and **Minimum**.

Insert Legend

When a mapped calculation is being displayed, this **Inserts** a color scale **Legend** into the drawing for printing and presentations.

Insert Parameters

This inserts text annotations identifying the displayed data in the upper left corner of the window for printing and presentations.

Average and R.M.S.

This displays the value of the mapped measure averaged over the selected **Audience Areas** in the selected frequency band(s), and the statistical deviation for all data points.

Lights On

This enables the use of a simple light source providing a dynamic change of the shading of faces depending on the view angle.

Mouse Menu

This menu allows the selection of different mouse functions.

Pick

When the **Pick** mode is enabled, Left click places a cursor at a selected point on a displayed **Face** or **Audience Area**, opens the **Walker** Window at that point, and makes that point the default for viewpoint for **Perspective View**.

If the Mapping Evaluation Window is switched on for connecting with the **Walker** (i.e. the Walker button in the Mapping Evaluation Window is pressed), then picking a location will switch the current mapping point displayed in the Mapping Evaluation Window to the mapping point that is closest to the 3D location picked. This makes it easier for a computed mapping to investigate certain spots in detail.

Peek

When **Peek** mode is enabled, Left click displays the **Face** or **Audience Area** number and the x, y, z coordinate of the picked spot on the item.

Center

When **Center** mode in enabled, Left click at a point pans the display to center that point in the window.

Drag

When **Drag** mode in enabled, Left mouse button can drag the model around the window. RMB aborts the action.

Turn

This allows rotating the viewpoint of the model around on the background. Click on the part of the screen you want to rotate and hold the LMB and move the mouse to where you want the point to be. With holding down the RMB you can Zoom In and Out.

Shortcut: **t**

Zoom In

A check enables Zoom In mode. To **Zoom In**, left click on where one corner of the new zoom window should be and hold the LMB while dragging to the opposite corner of the new window. When the LMB is released the zoom will activate.

Shortcut: F11

Zoom Out

A check enables **Zoom Out** mode. To **Zoom Out**, left click on the part of the screen where one corner of the new zoom window should be and hold the LMB while dragging to the point on the screen where the current window should fit into. When the LMB is released the zoom will activate.

Shortcut: F12

Share Menu

This function allows different windows to automatically share selected setup parameters. In general, those parameters that can be displayed in the status bar for a window will be **Shared** if set to do so.

Frequency

When checked, **Frequency** is a common investigation parameter.

Hor. Angle

When checked, the **Horizontal Angle** is a common viewing parameter.

Ver. Angle

When checked, the **Vertical Angle** is a common viewing parameter.

Zoom / Scope

When checked, the **Zoom %** or the **Scope Angle** is a common viewing parameter.

Settings

Allows sharing settings for **AlCons, Interference, Bandwidth** and **Loudspeakers ON**

Window Menu

This menu sets display layout for the **Room Mapping**.

Screen Quarter

This allows placement of the active window into any of 5 positions.

Center

This places the open window in the center of the screen.

Upper Left

This places the open window in the upper left corner of the screen.

Upper Right

This places the open window in the upper right corner of the screen.

Lower Left

This places the open window in the lower left corner of the screen.

Lower Right

This places the open window in the lower right corner of the screen.

Cascade Windows

This makes all open windows appear in a stacked format.

Help Menu

This menu allows access to all forms of help.

Help Topics

This offers a list of commonly asked help subjects. We have made a concerted effort to develop the Help files and the manual together. If you need an answer as to what a particular command does go to the help files. You will likely find your answer there.

About

This displays information about your EASE program.

About OpenGL

Information about OpenGL.

Memory Used

This tests and dynamically displays the computer memory actually used.

RMB Menu

Loudspeakers On

This allows selection of Loudspeakers used in calculations. To use this command:

1. Left click on **Loudspeakers On.** This displays all sound sources (e.g. **Loudspeakers**) that have been defined.

2. Select **Loudspeakers** using the LMB. Right click on **OK** selects all or on **Cancel** deselects All.

3. Left click on **OK**.

Redraw

This **Redraws** the display.

Show Legend

When a mapped calculation is being displayed, this opens a window to **Show** the color **Legend** used. This window differs from the legend included in the mapping window in that the **Show Legend** window can be resized to show a wider range of values.

Average and R.M.S.

This displays the value of the mapped measure averaged over the selected **Audience Areas** in the selected frequency band(s), and the statistical deviation for all data points.

Legend Colors

This opens the **Legend Colors** Window, used to show and modify the color schemes for the display of mapping data.

Background Color

This opens a **Color Palette** for selection of a **Background Color** for the **Room Mapping** window.

Options

This opens the Options Window to allow setting of parameters for use in **Room Mapping**.

Shortcut: F9

Options Window

This displays current settings for the **Room Mapping** module and allows changing those settings.
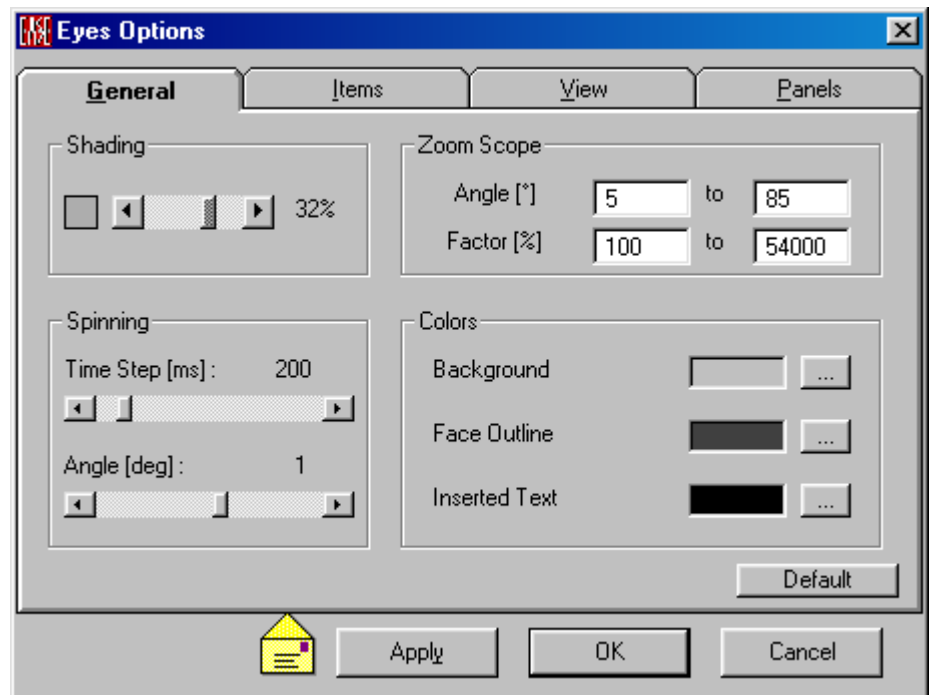
OK

Applies changes and closes window.

Cancel

Discards changes and closes window.

Apply

Applies changes and keeps window open.

Yellow Envelope Icon

This indicates setting changes have been made but have not been **Applied**.

General Tab
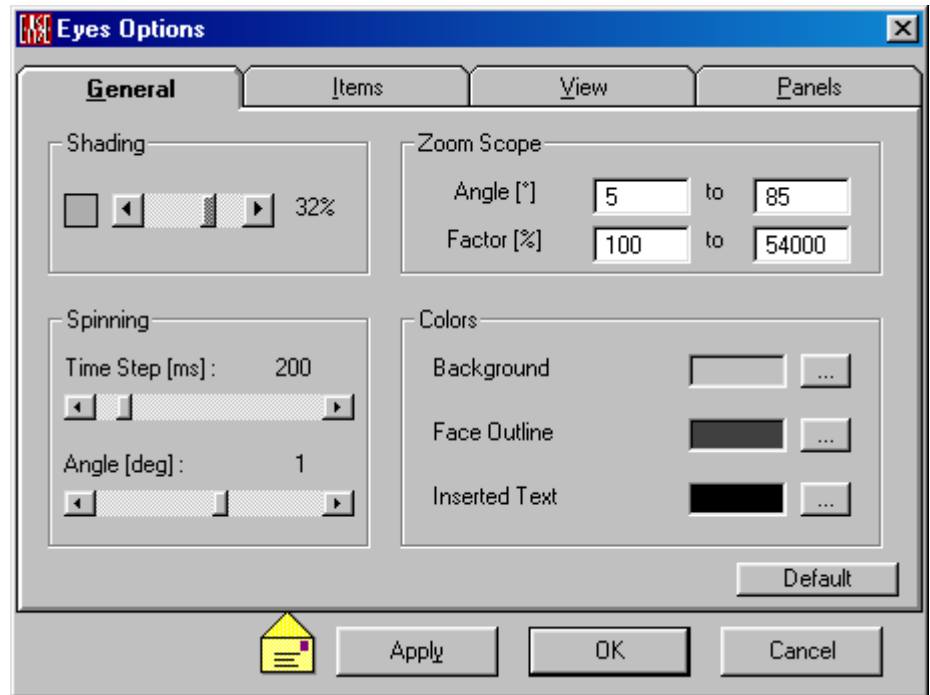
Shading

This slider sets the darkness of the darkest part of the rendered model. A color chip to the left of the slider shows the selected "darkest" level.

Zoom Scope

Angle:

Sets the range of viewing angles controlled by of the zoom scrollbar.

Factor:

Sets the limit magnification controlled by the zoom scrollbar. 100% is a full view with 1% being minimum.

Spinning

Sets the parameters for the Spin function in the **Room Mapping** window.

Time Step(ms)

Sets the time interval between steps when **Spinning**.

Angle(deg)

Sets the increment in degrees from one step to another when **Spinning**

Colors

These tabs each open a Color Palette for setting Colors for rendering the background, the lines that outline **Faces**. and Inserted Text.

Items Tab

This tab allows selection and description of symbols and axes used in rendering.
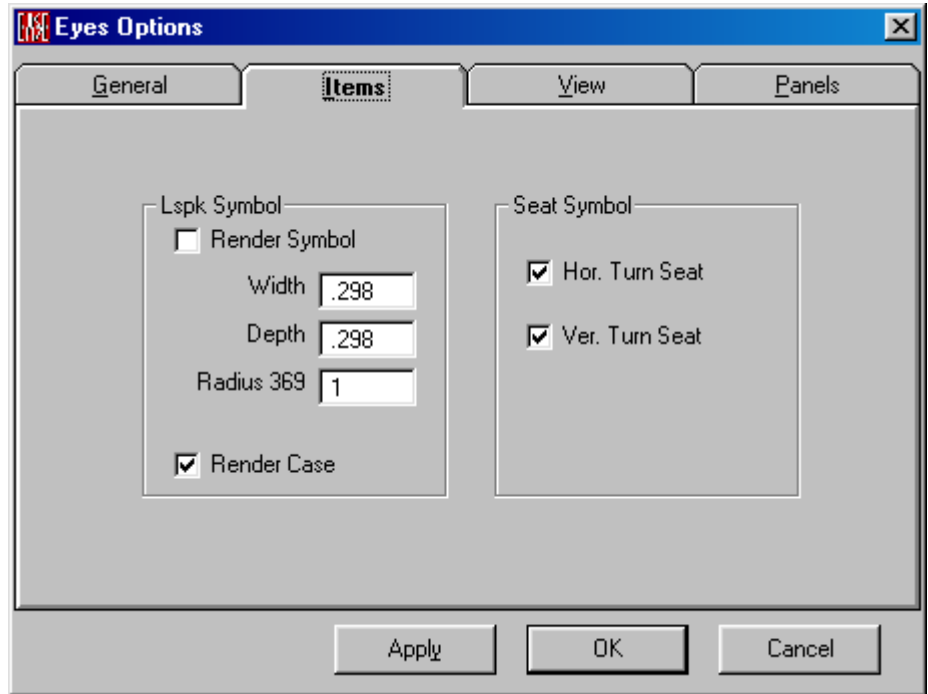
Lspk Symbol

Render Symbol

If checked, loudspeakers will be Rendered with their symbol.

Width

This sets the width of the loudspeaker symbol (using meters or feet as set by **Global Options**).

Depth

This sets the depth of the loudspeaker symbol (using meters or feet as set by **Global Options**).

Radius 369

This sets the **Radius** of the balloon that the 3, 6, and 9 dB isolines would be projected onto while looking from the **Speaker Model's** reference point.

Render Case

A check here allows rendering of Loudspeakers with their **Speaker Cases,** if they are available**.**

Seat Symbol

Sets how a **Listener Seat** will be displayed to show its orientation.

Hor. Turn Seats

A check here causes Listener Seats to be shown turned horizontally to the Dummy Head angle.

Ver. Turn Seats

A check here causes Listener Seats to be shown turned vertically to the Dummy Head angle.

View Tab

Sets parameters for the visual display in the **Room Mapping** window.
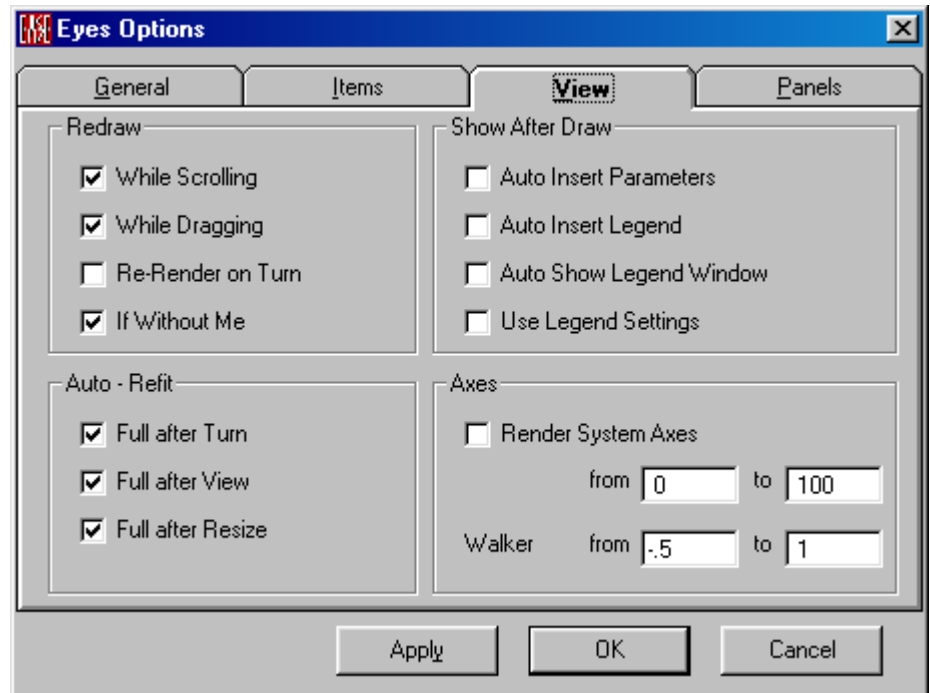
Redraw

Set the rules for **Redraw**.

While Scrolling

If checked, the screen will be redrawn dynamically during a **Scrolling** operation.

While Dragging

If checked, the screen will be redrawn dynamically during a **Dragging** operation.

Re-Render on Turn

If checked, the screen will be re-rendered at every view turning. This is slower, but it insures correct rendering and shading. If not checked, turning is fast, but may show wrong renderings (if e.g. **Face** outline is switched on). An incorrect view may be corrected with a **Redraw**.

If Without Me

If checked, the screen redraws immediately with the change of the **Without Me** Menu Button, if not, view redraws after releasing the button.

Show After Draw

Auto Insert Parameter

If checked, project information is automatically inserted into the map.

Auto Insert Legend

If checked, the **Color Legend** is automatically inserted into the map after a calculation.

Auto Show Legend Window

If checked, the Color Legend window is automatically shown after a calculation.

Use Legend Settings

Automatically uses the settings individually made in the **Legend Colors** Window after the calculation.

Auto Refit

Set the rules for when **Room** Mapping should be automatically resized.

Full after Turn

If checked, Refit to **Full** Size after a **Turn** operation.

Full after View

If checked, Refit to **Full** Size after a changing **View**.

Full after Resize

If checked, Refit to **Full** Size after **Resizing**.

Axes

Display room coordinate axes along with the rendered object.

Render System Axes

If checked, display the x, y, and z axes in the **Room Mapping** window.

from/to Windows

Sets the length of the axes in the units m or ft

Walker

Sets the length of the cursor axes showing the location of the **Walker**.

from/to Windows

Sets the length of the cursor axes showing the location of the **Walker**.

Panels Tab

This tab allows selection of the parameters displayed on the status bar at the bottom of the window.
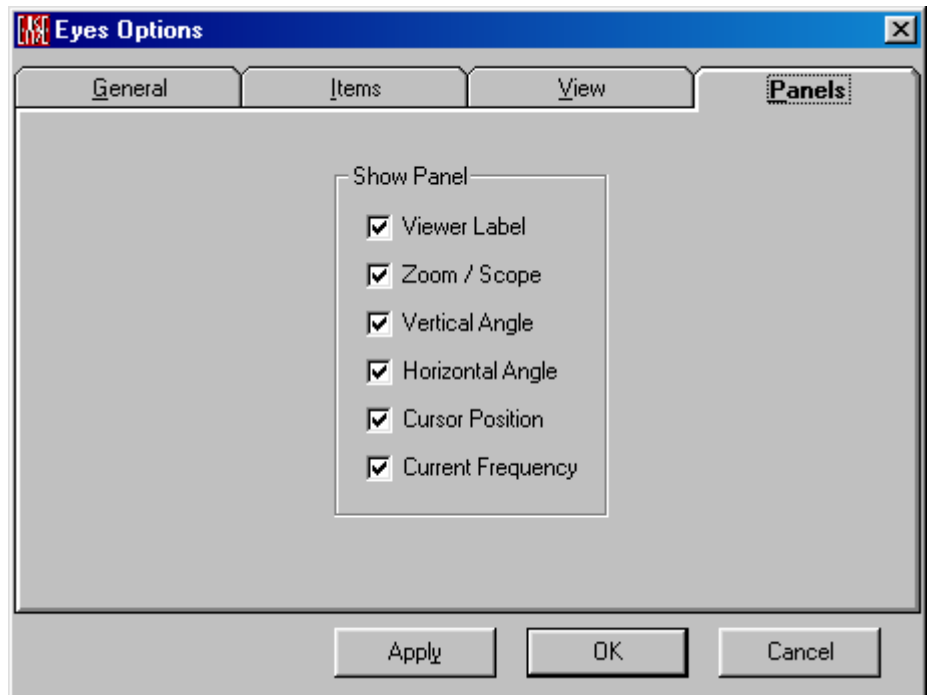
Show Panel Viewer Label

If checked, show the **Viewer type** at the left of the status bar.

Zoom/Scope

If checked, show the **Zoom Percentage / Scope**.

Vertical Angle

If checked, show the **Vertical Viewing Angle**

Horizontal Angle

If checked, show the **Horizontal Viewing Angle**

Cursor Position

If checked, show the **Cursor Position**.

Current Frequency

If checked, show the **Frequency** of the current data.

Walker Window

Key Conventions

F7	Invoke Probe
F8	Auralize Direct Sound
F9	Toggle Perspective/External View
Home	Go to (0,0,0)
Esc	Stop Walking

Left Arrow	Step Left (Standing)
	Turn Left 10° (Walking)
Right Arrow	Step Right (Standing)
	Turn Right 10° (Walking)
Up Arrow	Step Ahead (Standing)
	Move Forward (Walking)
Down Arrow	Step Back (Standing)
	Move Backward (Walking)
PgUp	Step Up (Standing)
	Turn Up 10° (Walking)
PgDn	Step Down (Standing)
	Turn Down 10° (Walking)

Window

Walk/Stop (Green Walking Man Icon)

Toggle between moving and a stopped walker.

Save every Picture (Movie Film Icon)

This starts the film function allowing the storage of images to be used for a movie (.AVI) file.

Invoke Probe (Microphone Icon)

This invokes EASE Probe for calculation of local acoustic properties.

Auralize Direct Sound (Ear Icon)

This opens a window to begin the **Auralization** of **Direct Sound** at the current **Walker** position. The direct sound response for the selected listening position is convolved with the measured head related transfer functions (HRTF) to get a **Binaural Impulse Response** (BIR). The resulting BIR file can be convolved with a .WAV file to hear the total sound of all selected speakers or other sources. This makes it possible to hear effects such as delay, comb filtering, and precedence. Default settings for **Auralize Direct Sound** are set using **Keep To Auralize** on the **Tools Menu** in **EASE Auralization** (called **EARS**).

Toggle Orthographic/Perspective View (Eye Icon)

This toggles between the **External View** (from outside the **Room**) and the **Perspective View** (from inside the **Room**).

Compute Reflections (Lightning Bolt Icon)

This starts a Local Ray tracing **Computation** at the current **Walker** position, see Local Ray Tracing Window.

Start Calculate Aura Response (Aura IR Icon)

If the user has AURA, this starts a **Response Computation with AURA** at the current **Walker** position.

Forward/Left/Right/Backward

When stopped, this moves **Walker** by distance shown in the step field.

When walking, this turns **Walker** view and direction by 10°.

Up/Down

This moves the **Walker** up and down.

Go To (Pointing Finger Icon)

This moves the **Walker** to the location entered at x,y,z.

X,Y,Z

These coordinates of the current **Walker** position can be edited by typing new values.

Step

This sets the **Step Size** for stopped or moving **Walker**.

Chapter IV : Ease Area Mapping

Area Mapping

Area Mapping computes most standard sound system performance parameters for **Audience Areas** and at multiple locations throughout one or more **Listener Seats,** then displays the result on a two dimensional map of those **Areas or single seat "areas"**.

If the user has **AURA**, **Area Mapping** now includes the **AURA Mapping** module (based on CAESAR algorithms), a powerful acoustical simulation engine, new in EASE 4.0. **AURA** uses a hybrid image source / ray tracing algorithm that includes diffuse scattering. **AURA** can compute Early Decay Time (EDT), Reverberation Time (T10, T20, T30), Lateral Fraction (LF), Lateral Fraction Coefficient (LFC), Clarity (C80), Definition (C50, D50), Sound Strength (G), Center Time, Direct and Total SPL, and Echo Criteria for Speech and Music and STI and ALCons. See also Chapter V, AURA Mapping.

The EASE **Ray Tracing** module or the **AURA** Response Calculation can be used to compute a 3D response file at any **Listener Seat**. The response can be displayed as a simple monophonic Reflectogram (in the **EASE Probe** module), or it can sent to **EASE EARS**. There it can be used to compute a **Binaural Response File** by convolving it with a suitable **Head Related Transfer Function,** and that BIR file used for **Auralization**.

In addition, the **AURA** Response Calculation can be called directly from **Area Mapping** to compute a **Binaural Impulse Response** for **Auralization** without the need for a separate HRTF convolution, and an **Impulse Response File** for analysis in **Probe**.

The EASE **Probe** module can be opened to investigate acoustical properties and loudspeaker system performance at any Listener Seat. Probe works by analyzing Response Files created by **AURA** and Rays.

The EASE **Auralization** module, EARS (Optional with EASE), can be called from **Area Mapping**. **Auralization** allows the user to listen to, and to provide to a client, a simulation of what the room will sound like at any selected seat with a given loudspeaker system.

Check Data must be successfully executed before **Area Mapping** can be used.

Area Mapping Main Window

This maps sound system performance on **Audience Areas** and **Listener Seats**, and allows accesses the **Probe** and **Auralization** modules.

Key Conventions

F1	Help
F9	Options
F10	Status Bar Options
F11	Zoom In
F12	Zoom Out
p	Activates the Pick Function Mouse mode
d	Activates the Drag Function Mouse mode
t	Activates Turn Function Mouse Mode
x	x-View
y	y-View
z	z-View
3	3D-View
Left Arrow	Moves the horizontal rotation scrollbar to the left
Right Arrow	Moves the horizontal rotation scrollbar to the right
Up Arrow	Moves the vertical rotation scrollbar upwards
Down Arrow	Moves the vertical rotation scrollbar downwards
PgUp	Zoom In
PgDn	Zoom Out
Home	Full View

Ctrl+

	Changes Pick to Drag Mouse Mode
O	Open Project (Stand-alone mode) or Acquire Project Data
PgUp	Move the selected Frequency +1/3 Octave
PgDn	Move the selected Frequency –1/3 Octave

Mouse Conventions

Mouse Mode Peek

Mouse cursor	If cursor is dragged over the mapped areas Value on the status bar will display the instant data. The map has to be in the z-view for this function to work.
LMB on mapped areas	This will Display Value at that spot
RMB on mapped areas	This will Write Value on the spot
RMB on background	This accesses window options

Mouse Mode Center

LMB on picture	This will make the selected spot of the picture the center of the display.

Mouse Wheel

Mouse wheel spinning allows zooming in and out.

Statusbar Conventions

Freq	This is the Frequency of the current display
Aud. Area	This displays the Audience Area label
Value	This is the value of the mapped measure (e.g. dB SPL, ALCons, Time) at the cursor position.
Cursor	These are the current x, y, and z coordinates in the selected Audience Area.

File Menu (child mode)

This accesses **File** management, **Printing**, and **Area Mapping Options**.

Acquire Project Data

This **Acquires** all current project data from the **Room Editor**. **Acquire Data** should be used when changes have been made to Room Data (for example, addition of **Loudspeakers**, changes to **Loudspeaker** settings, changes to **Wall Material**s, etc.) and the user wants the new data to be used in calculations.

If the user made changes to the Room Data and these changes are not transferred to Area Mapping the user will see a red or yellow border around the Mapping window. The red border shows that changes to Room Data were made and the data are not checked. So the user has to run "Check Data" in Edit Room before the data can be acquired by Area Mapping. Now, after checking data, a yellow border around the Mapping window is shown and Area Mapping is open to acquire the data. Then may be started a new calculation based on the current data.

Shortcut: Ctrl+O

Note: There are special instances when **Acquire Data** might not be appropriate. For example, an old set of data can be used for calculations in the current window and compared with a new set of data computed in a different window.

Load EASE Mapping File

This loads a previously saved **EASE Mapping File** and updates the window view to reflect the saved data. To use this command:

Left click on **Load EASE Mapping File.** This will open the Open File Window.

1. Using **Look In,** find the folder holding the viewer position file.

2. Left click on the **Map File** (it should have an .emp extension).

3. Left click on **Open**.

Save Open GL Mapping File

This **Saves** an **OpenGL Mapping (.EGL) File** for the current display. An **OpenGL** file can be **Viewed** using **EASE View**, a standalone viewer that can be provided to clients. **EASE View** can be accessed from the menu **File | EASE Viewer** in EASE Main. To use this command:

1. Left click **Save Open GL Mapping File** to open a **Save File** window.

2. Choose a folder for the **Open GL Mapping** file, enter a file name, and Left click on **Save.**

OpenGL files are convenient for saving OpenGL views of the room or any maps calculated within the room with the capability of viewing them later from any

point of view. This OpenGL files can be demonstrated e.g. for architects only just with the help of a demo version of EASE (includes already the EASE Viewer).

Send Picture To

This allows the current active picture to be sent to the **Clipboard**, a **File**, or **EASE Page Designer**.

Clipboard

This copies the current picture to the **Windows Clipboard.**

File

This saves the current picture to a file. Supported formats are:

Windows Bitmap……………………………*.BMP

JPEG………………………………………*.JPG

CompuServe GIF……………………………*.GIF

Portable Network Graphics………………….*.PNG

Tagged File Format………………………….*.TIF

LuRa Tech Wavelet………………………….*.LWF

Zsoft Paintbrush……………………………*.PCX

Windows Icon……………………………….*.ICO

Enhanced Windows Metafile……………….*.EMF

Truevision Targa……………………………*.TGA.

EASE Page Designer

This opens the current picture in **EASE Page Designer,** allowing text annotations, multiple picture layouts, and editing of the page layout format before printing, or for use in printed reports and presentations.

Print

This allows printing of the open window without the window frame, e.g. without the command buttons and scroll bars)

Options

This opens the Options Window to display and set parameters for **Area Mapping**.

Shortcut: F9

Modify Toolbar

This command opens a window allowing modification and construction of the toolbars. Buttons and commands maybe added or subtracted as needed.

Legend Colors

This opens the **Legend Colors Window**, used to show and modify the color schemes for the display of mapping data.

Exit

This exits the window and/or the program.

File Menu (standalone mode)

This accesses **File** management, **Printing**, and **Area Mapping Options**.

Open Project

This opens EASE 3.0, 4.x project files, to allow viewing the areas of the **Room** and make calculations.

Shortcut: Ctrl+O

To use this command:

1. Left click on **Open Project**. This opens the **Open File** window.

2. Using **Look In** find the folder, Left click on the project file name, and Left click on **Open**.

Load EASE Mapping File

This loads a previously saved **EASE Mapping (.EMP) File** and updates the window view to reflect the saved data. To use this command:

1 Left click on **Load EASE Mapping File** to open an **Open File** Window.

2. Using **Look In,** find the folder with the .EMP file, Left click on the **Map (.EMP) File, and** Left click on **Open**.

Save Open GL Mapping File

This **Saves** an **OpenGL Mapping (.EGL) File** for the current display. An **OpenGL** file can be **Viewed** using **EASE View**, a standalone viewer that can be provided to clients. **EASE View** can be accessed from the menu **File | EASE Viewer** in EASE Main. To use this command:

1. Left click **Save Open GL Mapping File** to open a **Save File** window.

2. Choose a folder for the **Open GL Mapping** file, enter a file name, and Left click on **Save.**

OpenGL files are convenient for saving OpenGL views of the room or any maps calculated within the room with the capability of viewing them later from any point of view. This OpenGL files can be demonstrated e.g. for architects only just with the help of a demo version of EASE (includes already the EASE Viewer).

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Windows Bitmap……………………………*.BMP

JPEG…………………………………………*.JPG

CompuServe GIF………………………….*.GIF

Portable Network Graphics………………….*.PNG

Tagged File Format…………………………..*.TIF

LuRa Tech Wavelet…………………………*.LWF

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This prints the current window without the window frame, e.g. without the command buttons and scroll bars.

Options

This opens the Options Window to view and set parameters for **Area Mapping**.

Shortcut: F9

Modify Toolbar

This opens a window for modification and construction of toolbars. Buttons and commands may be added or subtracted as needed.

Legend Colors

This opens the **Legend Colors Window** to view and edit the color schemes for the display of mapping data.

Fast Open

This area of the menu stores the names and paths of the last open projects. A left click will open the selected project directly.

Exit

This exits **EASE Area Mapping**.

Item Menu

This sets visibility of **Items** in the **Room Mapping** window, allows **Items** to be set **Active**. A change causes immediate redraw.

Listener Seats

A check here makes **Listener Seats Labels** visible. A change causes a redraw.

Audience Area Labels

A check here makes **Audience Area Labels** visible. A change causes a redraw.

Listener Seat Labels

A check here makes **Listener Seat Labels** visible. A change causes a redraw.

Select Active

Loudspeakers On

This allows selection of sound sources (e.g. **Loudspeakers**) used in calculations. To use this command:

1. Left click on **Loudspeakers On.** This opens a window displaying all sound sources (e.g. **Loudspeakers**) that have been defined.

2. Select **Loudspeakers** using the LMB. Right click on **OK** selects all or on **Cancel** deselects All.

3. Left click on **OK**.

Audience Areas On

This allows selection of **Audience Areas** where calculations should be performed. To use this command:

1. Left click on **Audience Areas On.** This displays a list of **Audience Areas** that have been defined.

2. Select **Audience Areas** using the LMB. Right click on **OK** selects All or on **Cancel** deselects All.

3. Left click on **OK**.

Listener Seats On

This allows selection of **Listener Seats** where calculations should be performed. To use this command:

1. Left click on **Listener Seats On.** This displays a list of **Listener Seats** that have been defined.

2. Select **Listener Seats** using the LMB. Right click on **OK** selects All or on **Cancel** deselects All.

3. Left click on **OK**.

View Menu

This menu allows access to viewing tools.

3D Perspective

This command has four preset angles, e.g. (60 deg x –30 deg). This displays the object isometrically in **External View** (i.e., from outside the **Room**). In **Perspective View** (inside the **Room**) the same four preset viewing angles are used for viewing from the selected viewpoint

Side View (x)

This command has two preset angles; 90ºx0º and -90ºx0º. This displays the object in the YZ-Domain in **External View** (i.e., from outside the **Room**). This is otherwise known as the X-View. In **Perspective View** (inside the **Room**) the same two preset viewing angles are used for viewing from the selected viewpoint, the view is along X-axis.

End View (y)

This command has two preset angles; 180ºx0º and 0ºx0º. This displays the object in the XZ-Domain in **External View** (i.e., from outside the **Room**). This is otherwise known as the Y-View. In **Perspective View** (inside the **Room**) the same two preset viewing angles are used for viewing from the selected viewpoint, the view is along Y-axis.

Plan View (z)

This command has two preset angles; 90ºx90º and 90ºx-90º. This displays the object in the XY-Domain in **External View** (i.e., from outside the **Room**). This is otherwise known as the Z-View. In **Perspective View** (inside the **Room**) the same two preset viewing angles are used for viewing from the selected viewpoint, the view is along Z-axis.

Redraw

This **Redraws** the window.

Full View

This **Redraws** and **Zooms** the display so that the **Room** fits within the Window.

Zoom In

This increases the zoom percentage in **External View**. In **Perspective View** the scope angle decreases to provide a more "close-up" view. This can also be accessed using PgUp or F11.

Zoom Out

This decreases the zoom percentage in **External View**. In **Perspective View** the scope angle increases to provide a wider view (i.e., more of the room). This can also be accessed using PgDn or F12.

Frequency Band

This selects the 1/3 octave frequency band to be used for calculation and mapping.

Isoline Plot

 When checked, the **Isoline** mode is set. Results will be mapped as contours of equal value (isolines).

Patch Grid

When checked, the **Patch Grid** mode is set. Calculations will first divide audience areas into equal patches having dimensions as set on the **Mapping Tab of the Calculation Parameters dialog box**.

Painted

When checked, the **Patch** mode and isoline maps will be filled with colors, with each level increment assigned a different color. The **Color Palette** can be edited from the **Options** menu.

Labeled

When checked, the **Isoline** mode will have contour value **Labels**.

Mapping Menu

This menu holds the tools that allow calculation of acoustic parameters on selected **Audience Areas** and **Listener Seats**.

Aiming

When checked, the map will show the speaker 3, 6, and 9dB coverage lines projected onto Audience Area. The coverage lines are selected in options. By demand overlapping ratios can be shown too.

Standard

See Chapter V Mapping Calculations

Standard with Reflections

See Chapter V Mapping Calculations

Aura

See Chapter V Mapping Calculations

Local Decay Time

See Chapter V Mapping Calculations

IR Simulation

Left click opens the **IR Simulation Window**, allowing setup of parameters for **IR Simulation** and subsequent calculations.

See Chapter V Mapping Calculations

Recalculate Map F5

This opens a window to view current Calculation Parameters, accept or change them, and begin a new calculation.

Tools Menu

This menu accesses **Tools** for viewing, calculation, acoustic investigations, and auralization. The Tools provide access to the **Probe, to Auralization,** and **AURA response calculations**.

Invoke Probe

The Probe can compute and display frequency response, arrival times, and directionality of sound arrivals from multiple sources, an impulse response file,

and other data. To start the **Probe**, Left click on Invoke Probe, then Left click on a point where Probe should perform its calculations. To use the Probe at another point, Left click on that point.

Save Direct Sound Response

This saves the direct sound information at the last selected probe location such as frequency, delay, direction and level to a response file (.RSP). To use this command:

1. Left click on **Save Direct Sound Response**.

2. Left click on picked spot will open a Save File Window

3. Select the folder for the saved the **Response (.RSP) File**, enter a name for the file, and Left click on **Save**.

Invoke Ears

This is a 2-function command. When EARS starts, a dialog box will ask "**Save Direct Sound Response**?" **Yes** will open a **Save File** dialog and then load the file directly into **EARS**. **No** will open **EARS** without any related file being loaded.

Auralize Direct Sound

This opens a window to begin the **Auralization** of **Direct Sound** at the last selected probe location. First, the direct sound sequence (response) must be computed and convolved with a head related transfer functions (HRTF) to get a **Binaural Impulse Response** (BIR). The resulting BIR file can be convolved with a sound (.WAV) file to hear the total sound of all selected speakers or other sources. This makes it possible to hear effects such as delay, comb filtering, and precedence. Default settings for **Auralize Direct Sound** are set using **Keep To Auralize** on the **Tools Menu** in **EASE Auralization** (also called **EARS**).

Local Ray Tracing

See Chapter V Mapping Calculations

Calculate Aura Response

See Chapter V Mapping Calculations

Utilities Menu

This menu hold tools for viewing, labeling, and saving of window displays

Spin

This rotates the view of the model about the current picked location at a speed set in **Options**. If no spot is picked, the view will **Spin** about the center of the display.

Show Legend

When a mapped calculation is displayed, **Show Legend** opens a window to show the **Color Scale** used to map the calculations. The **Show Legend** window can show a wide range of values through the buttons **Maximum** and **Minimum**.

Insert Legend

When a mapped calculation is being displayed, this **Inserts** a **Color Scale Legend** into the drawing for printing and presentations.

Insert Parameters

This inserts text annotations identifying the displayed data in the upper left corner of the window for printing and presentations.

Average and R.M.S.

This displays the value of the mapped measure averaged over the selected **Audience Areas** in the selected frequency band(s), and the statistical deviation for all data points.

Mouse Menu

This menu allows the selection of different mouse functions.

Pick

When the **Pick** mode is enabled, right click enables RMB mode.

If the Mapping Evaluation Window is switched on for connecting with the **Walker** (i.e. the Walker button in the Mapping Evaluation Window is pressed), then picking a location will switch the current mapping point displayed in the Mapping Evaluation Window to the mapping point that is closest to the 3D location picked. This makes it easier for a computed mapping to investigate certain spots in detail.

Peek

When **Peek** mode is enabled, Left click displays the **Value** of the mapped measure at that clicked spot, Right click writes the **Value** of the mapped measure at that clicked spot.

Center

This allows picking of a spot and centering that spot on the screen.

Drag

When **Drag** mode is enabled, Left mouse button can drag the model around the window. RMB aborts the action.

Zoom In (F11 or PgUp)

This sets up for a graphic **Zoom In** function. Click on one point where the zoom window should start and hold the LMB while dragging the window around the area to be zoomed to. When the LMB is released the zoom will occur.

Zoom Out (F12 or PgDn)

A check enables **Zoom Out** mode. To **Zoom Out**, left click on the part of the screen where one corner of the new zoom window should be and hold the LMB while dragging to the point on the screen where the current window should fit into. When the LMB is released the zoom will occur.

Share Menu

This function allows different windows to automatically **Share** selected setup parameters. In general, those parameters that can be displayed in the **Status Bar** for a window will be **Shared** if set to do so.

Frequency

When checked, **Frequency** is a common investigation parameter.

Settings

Allows sharing settings for **ALCons, Interference, Bandwidth** and **Loudspeakers ON**

Window Menu

This menu sets display layout for the **Area Mapping**.

Screen Quarter

This allows placement of the active window into any of 5 positions.

Center

This places the open window in the center of the screen.

Upper Left

This places the open window in the upper left corner of the screen.

Upper Right

This places the open window in the upper right corner of the screen.

Lower Left

This places the open window in the lower left corner of the screen.

Lower Right

This places the open window in the lower right corner of the screen.

Cascade Windows

This makes all open windows appear in a stacked format.

Help Menu

This menu allows access to all forms of help.

Help Topics

This offers a list of commonly asked help subjects. We have made a concerted effort to develop the Help files and the manual together. If you need an answer as to what a particular command does go to the help files. You will likely find your answer there.

About

This displays information about your EASE program.

About OpenGL

Information about OpenGL

Memory Used

This tests and dynamically displays the computer memory actually used.

RMB Menu

Background Color

This opens a **Color Palette** to select a **Background Color** for the **Area Mapping** window.

Options

This opens the Options Window to view and set parameters for **Area Mapping**.

Shortcut: F9

Options Window

This displays current settings for **Area Mapping** and allows changing those settings.
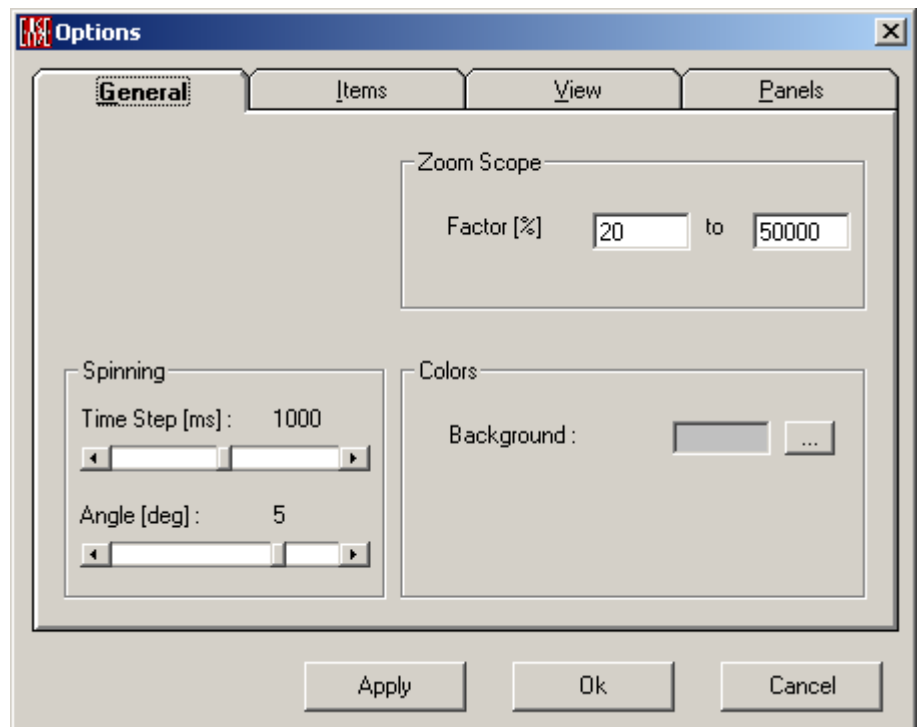
OK

Applies changes and closes window.

Cancel

Discards changes and closes window.

Apply

Applies changes and keeps window open.

General Tab
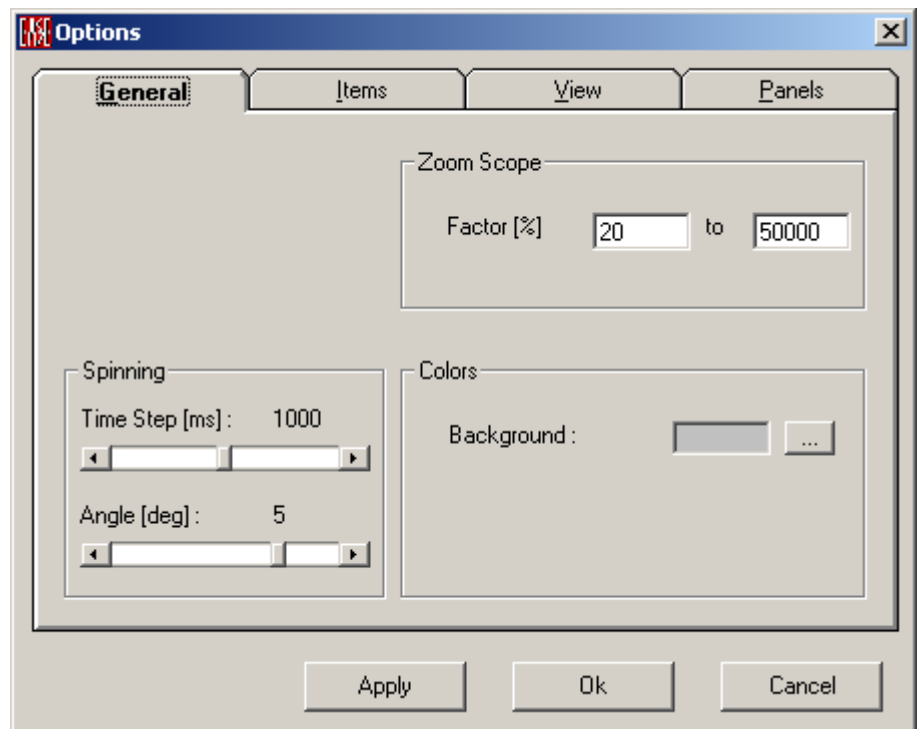
Zoom Scope

Factor:

Sets the limit of magnification controlled by the zoom scrollbar. 100% is a full view with 1% being minimum.

Spinning

Sets the parameters for the **Spin** function in the **Area Mapping** window.

Time Step (ms)

Sets the time interval between steps when **Spinning**.

Angle (deg)

Sets the increment in degrees from one step to another when **Spinning**.

Colors

Background

This opens a **Color Palette** for selection of a **Background Color** for the **Area Mapping** window.

Items Tab

This controls the visibility of **Loudspeaker Coverage Lines** and **Overlap**.
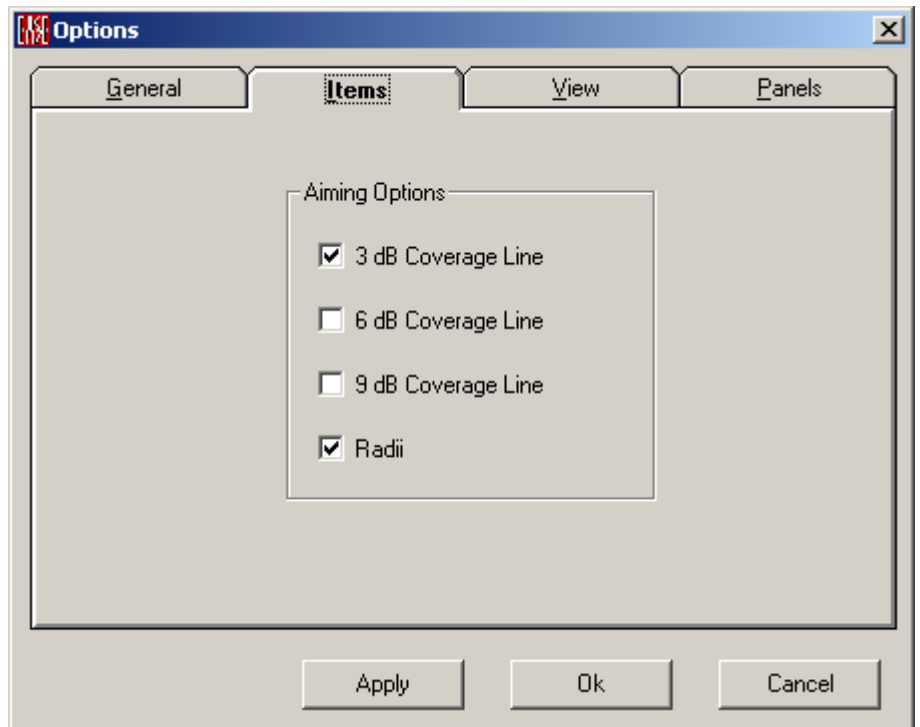
Aiming Options

3dB Coverage Line

A check here makes 3 dB coverage lines visible.

6dB Coverage Line

A check here makes 6 dB coverage lines visible.

9dB Coverage Line

A check here makes 9 dB coverage lines visible.

Radii

A check here makes visible radius lines centered at the **Loudspeaker Aim Point**.

Loudspeaker Overlap

A check here makes lines visible to show overlap between **Loudspeakers**.

View Tab

Sets parameters for the visual display in the **Area Mapping** window.
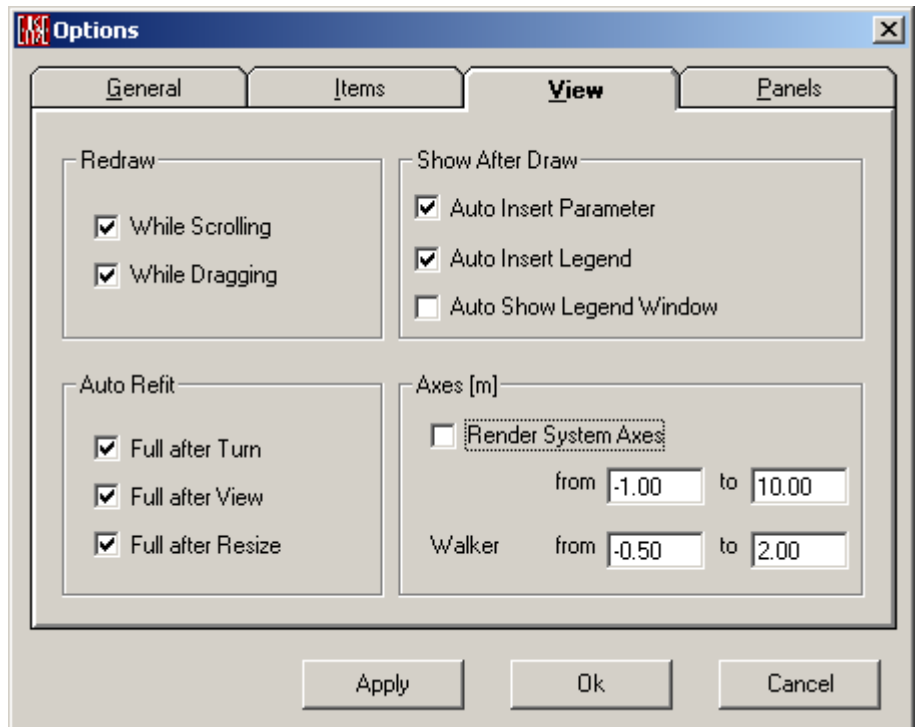
Redraw

Set the rules for **Redraw**.

While Scrolling

If checked, the screen will be redrawn dynamically during a **Scrolling** operation.

While Dragging

If checked, the screen will be redrawn dynamically during a **Dragging** operation.

Show After Draw

Auto Insert Parameter

If checked, project information is automatically inserted into the map window.

Auto Insert Legend

If checked, the **Color Legend** is automatically inserted into the map after a calculation.

Auto Show Legend Window

If checked, the **Color Legend** window is automatically shown after a calculation.

Auto Refit

Set the rules for when **Edit Room** should be automatically resized.

Full after Turn

If checked, Refit to **Full** Size after a **Turn** operation.

Full after View

If checked, Refit to **Full** Size after a changing **View**.

Full after Resize

If checked, Refit to **Full** Size after **Resizing**.

Axes (m, ft)

Display room coordinate axes along with the rendered map.

Render System Axes

If checked, display the x, y, and z axes in the **Area Mapping** window.

from/to Windows

Sets the length of the axes in the units m or ft.

Walker from/to Windows

Sets the length of the Walker axes in the units m or ft.

Panels Tab

This tab sets parameters for display on the **Area Mapping** window **Status Bar.**
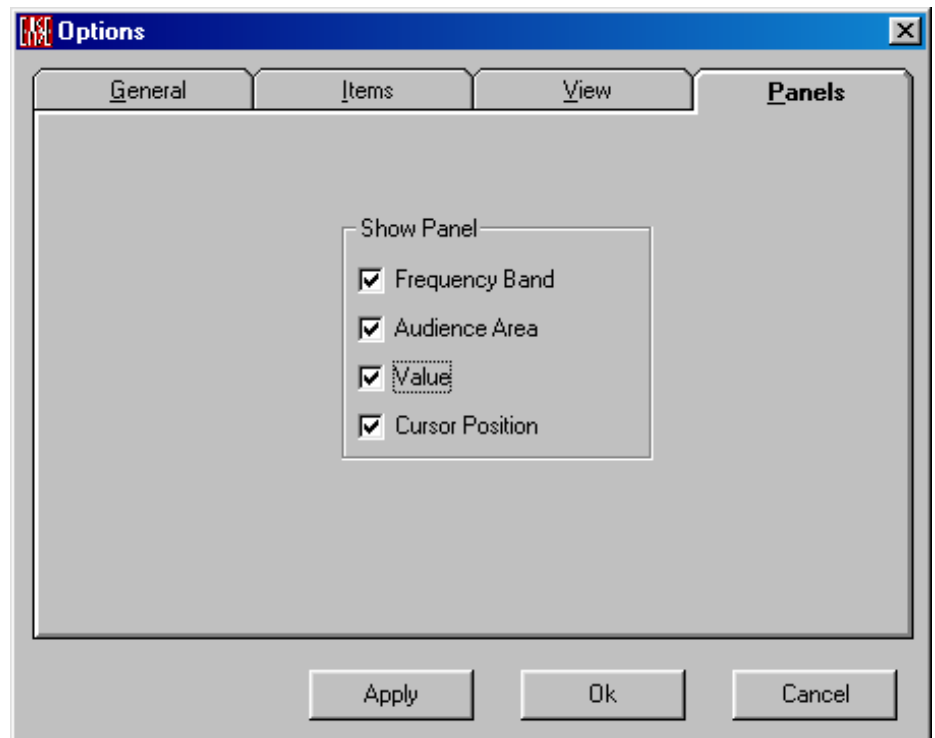
Show Panel

This sets parameters for display on the **Area Mapping** window **Status Bar.**

Frequency Band

If checked, show the **Frequency** of the current data on the **Status Bar**.

Audience Area

If checked, show the **Audience Area** for the current cursor on the **Status Bar**.

Value

If checked, show the **Value** of the current data at the cursor on the **Status Bar**.

Cursor Position

If checked, show the **Cursor Position** on the **Status Bar**.

Chapter V : Mapping Calculations

General Comments

All options and functions available for **Faces** only apply to Room Mapping (EASE Eyes), not to Area Mapping.

Mapping Menu

This menu holds the tools that allow calculation of acoustic parameters on selected **Audience Areas**, **Faces** and **Listener Seats**.

Standard

This menu accesses traditional EASE calculations of direct and total sound parameters. Maps of system performance can be created for **Audience Area**s and **Faces**, and calculations can be made for selected **Listener Seats**. See Standard Mapping.

Standard with Reflections

This menu accesses traditional EASE calculations of direct sound and reflections. Maps of system performance can be created for **Audience Area**s and **Faces**, and calculations can be made for selected **Listener Seats**. See Standard Mapping with Reflections.

AURA

If the user has AURA, this opens the **AURA Mapping** module, a powerful acoustical simulation engine that is new in EASE 4.0. AURA uses a hybrid image source / ray tracing algorithm that includes diffuse scattering. The AURA ray tracing engine used for mapping collects only rough directional information - - it provides a monophonic echogram comparable to what would be measured with a combined ∞ (figure eight)/omnidirectional microphone. To compute complex 3D impulse responses having directional information, Binaural Impulse Responses and B-format files for auralization, use **Tools / Calculate Aura Response**.

These echograms are then post processed to compute standard room acoustical parameters according to ISO3382. AURA can compute Early Decay Time (EDT), Reverberation Time (T10, T20, T30), Lateral Fraction (LF), Lateral Fraction Coefficient (LFC), Clarity (C80), Definition (D50, C50), Sound Strength (G), Center Time, Direct and Total SPL, and Echo Criteria for Speech and Music and STI and ALCons.

Local Decay Time

This opens the **Local Decay Time** mapping module, allowing calculation of Reverberation Time at various points within selected **Audience Areas** or at selected **Listener Seats** as a function of frequency.

IR Simulation

Left click opens the **IR Simulation Window**, allowing setup of parameters for **Infrared Simulation** and subsequent calculations. This function is only available when the InfraRed module of EASE has been licensed.

Recalculate Map

This opens a window to view current Calculation Parameters, accept or change them, and begin a new calculation.

Tools Menu

This menu accesses **Tools** for viewing, calculation, acoustic investigations, and auralization. The Tools provide access to the **Probe, to Auralization,** and **AURA response calculations**.

Local Ray Tracing

Local Ray Tracing begins a **Ray Tracing** calculation for the last selected walker/probe location and sends the result to the **Probe** or **Auralization**. To use **Local Ray Tracing**:

1. Left click on **Local Ray Tracing**. If no location is selected, a **Listener Seat** selection window will open.

2. Choose a **Listener Seat** and Left click OK. The Ray Tracing window will open.

3. Click on **Loudspeaker** to list all **Loudspeakers** that have been defined.

4. Select **Loudspeakers** using the LMB. Right click on **OK** selects all or on Cancel deselects All.

5. Left click on **OK**.

6. Use **Lspk Group** for group selection in the same way.

7. Enter the number of **Rays** to use (typically less than 1000 for a simple reflection study, 100,000 or more for Auralization).

    Note: In EASE JR, the maximum is 1000.

8. Control by : Select the cutoff parameters by marking each

a. Order: This is the maximum number of reflections for any ray to be included in the calculation.
    Note: In EASE JR, the maximum is 3.

b. Delay (ms): This is the maximum arrival time for any ray to include in the calculation.

9. Select the computation Method

*   **Mirror Image Impacts**: Check here to use the Mirror Image model. This computation is more accurate, but takes much longer.

*   **Ray Tracing Impacts**: Use a **Ray Tracing** model.

10. Choose a Destination for the results of the Calculation.

- **Probe**: Check here to use the **Probe** to view the results.

- **Ears**: Check here to use **Ears** to **Auralize** the results of the calculation. Default parameters for this **Auralization** are set using **Keep to Auralize** from the **Tools Menu** in **Ears**.

- **Only Save To File:** Saves result into a *.rsp file

11. Left click **OK** to begin the calculation, or cancel to abandon it.

12. A **Save File** window will open. Enter a folder and file name for the **Response File (.RSP)** to contain the computed result, and Left click **OK** to begin the calculation.

Calculate Aura Response

This configures and initiates an **AURA** calculation of a Reflectogram at a single point for one or more selected sound sources (e.g. **Loudspeakers**) as excitation for the room and this in a batch mode at one or more selected listener seats.

The **AURA** Response Calculation can be used to compute a 3D response file at any **Listener Seat**. The 3D response can be displayed as a simple monophonic Reflectogram (in the **EASE Probe** module), or it can be sent to **EASE EARS**. There it can be used to compute a **Binaural Response File** by convolving it with a suitable **Head Related Transfer Function,** and that BIR file used for **Auralization**.

In addition, the **AURA** Response Calculation can be used to directly compute a **Binaural Impulse Response** or a B-format set of files for **Auralization** without the need for a separate HRTF convolution.

Standard Mapping

Enables the setup of parameters for each mapped calculation based on statistical assumptions partly (see Appendix A).

Room Mapping:
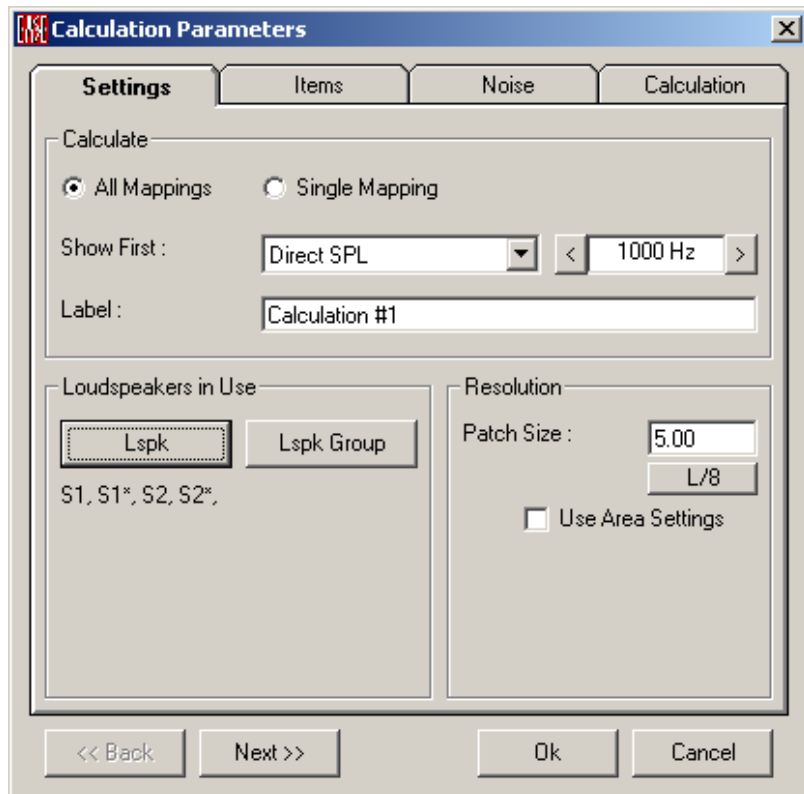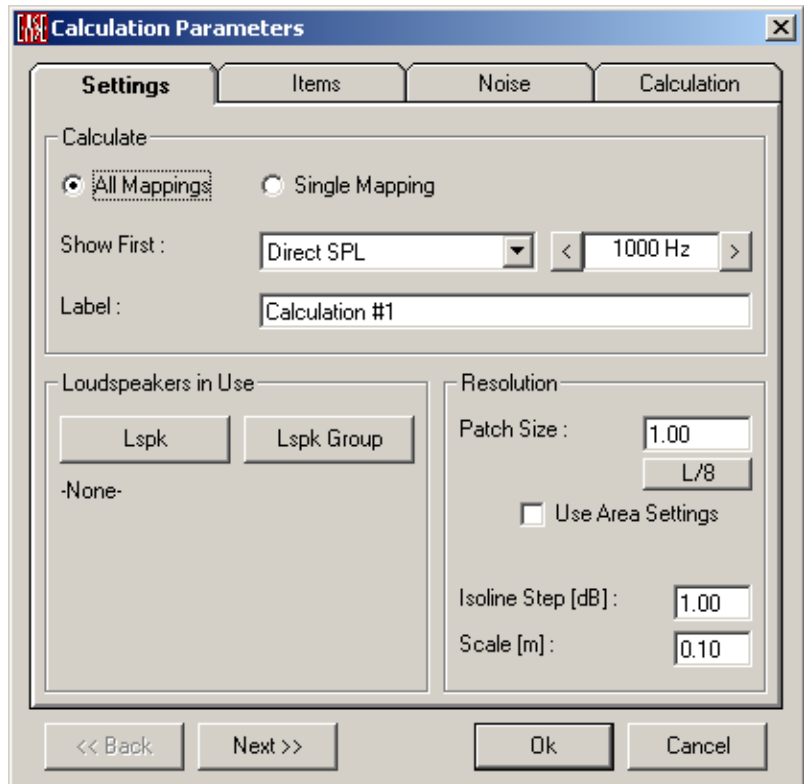
Area Mapping:

<<Back

Moves to the previous tab.

Next>>

Moves to the next tab.

OK

Accept all parameters and begin the calculation.

Cancel

Cancel the calculation.

Settings Tab

Sets the **Type(s) Of Calculation**, **Loudspeakers In Use**, and **Resolution** of the calculation.

Calculate

All Mappings

If checked, all **Maps** will be calculated for all **Frequencies**.

Single Mapping

If checked, only one **Map Type** and **Frequency** will be calculated.

Show First

Selects the **Type(s) Of Calculations** to be performed. If **All Mappings** is checked, the calculation chosen in the **Type of Map** and **Frequency** window will be the first displayed.

Direct SPL

This map shows the direct sound pressure level in dBSPL of the **Loudspeakers** that are **On**. See Appendix A, Direct SPL

Total SPL

This map shows the sum of **Direct** and **Reverberant** sound pressure level in dBSPL of the **Loudspeakers** that are **On**.

Lspk Overlap

This map shows the number of **Loudspeakers** of comparable intensity at a given location.

The value 1 indicates areas without any overlap between **Loudspeakers**. If the value exceeds 1.5 (maximum is the number of all **Loudspeakers** at full overlap) comb filtering or other undesirable interference behaviors should be expected.

Critical Distance

This map shows the ratio of direct to reverberant sound in terms of distance. **Critical Distance** is a distance from the source where the direct sound equals the reverberant sound. This is displayed in the map as 1. A value of 2 is twice critical distance etc.

D/R Ratio

This map shows the ratio of direct to reverberant sound in decibels.

The relationship between **D/R Ratio** and **Critical Distance r**$_C$ is:

D/R Ratio = 20 log r$_C$ **dB – 20 log r dB**

(where **r** is the distance from the source to the point of investigation)

Arrival Time

This map shows the sum of the electrical delay and the acoustic travel time for the first front arrivals in milliseconds. The displayed times include any electrical **Alignment** or **Delay Times** set for those sound sources (e.g. **Loudspeakers)** used in the calculation. This map can be used to set delay times between clusters.

ITD Gap

This map shows the arrival time difference between the first two direct sound arrivals at each point.

Clarity Measures

This map shows the ratio of energy, in decibels, before and after a certain split time. The scaling of all C-Plots is in dB .

See Appendix A, Clarity Measures

C7

This plot shows the ratio of energy before and after 7 milliseconds in decibels. This map is used to predict the strength of direct sound of sources.

C50

This plot shows the ratio of energy before and after 50 milliseconds in decibels. This map is used to predict speech intelligibility.

C80

This plot shows the ratio of energy before and after 80 milliseconds in decibels. This map is used to predict the articulation of different modes of music.

C-Split

This plot shows the ratio, in decibels, of energy before and after a user specified split time in milliseconds.

Pressure Levels

This map shows the sum of the sound pressure levels in dBSPL of the **Loudspeakers** within a limited arrival time. See Appendix A, Pressure Levels

L7

This is the sum of the direct and reverberant sound energy in dBSPL within the first 7 ms.

L50

This is the sum of the direct and reverberant sound energy in dBSPL within the first 50 ms.

L80

This is the sum of the direct and reverberant sound energy in dBSPL within the first 80 ms.

L-Split

This is the sum of the direct and reverberant sound energy in dBSPL, within the user specified split time in ms.

Articulation Loss

This map shows the **Articulation Loss of Consonants** in percent. The calculation is based on IEC 60268-16 for the determination of STI and uses the Farrel Becker equation to derive ALCons. See Appendix A, ALCons

STI

This map shows the **Speech Transmission Index** and optionally related measures such as RaSTI or STIPa. This calculation is based on IEC 60268-16. See Appendix A, STI

Articulation Index

This map shows the **Articulation Index**. See: ANSI S3.5-1997 "Methods for Calculation of Speech Intelligibility Index"

Privacy Index

This map shows the **Privacy Index** in percent. See Appendix A, Privacy Index

Frequency Selection Window

Displays and sets the **Frequency** for each calculation. If **All Mappings** is checked, the set **Frequency** will be the first displayed.

Label

This window allows entering a user-defined label for this calculation of mappings.

Loudspeakers In Use

Loudspeakers In Use are the System Input for EASE calculations.

Lspk

Left click for a list of **Loudspeakers**, with **Loudspeakers In Use** highlighted. Left click to select a **Loudspeaker**, <CTRL> Left click to select additional **Loudspeakers**.

Lspk Group

Left click for a list of **Loudspeaker Groups**, with **Loudspeaker Groups In Use** highlighted. Left click to select a **Loudspeaker Group**, <CTRL> Left click to select additional **Loudspeaker Groups**.

Resolution

This is the maximum distance (in feet or meters) between adjacent sample points used to compute the mapping on **Faces** and **Audience Areas**. There is an interaction between **Resolution** and calculation speed. If the **Resolution** value is doubled, calculation time drops by a factor of four because only one-fourth as many points or areas must be calculated.

Note: Any **Resolution** setting that causes an **Audience Area** to be divided into fewer than four segments per side can result in that area not being computed. This can happen with very large resolution numbers and/or with relatively small **Audience Areas**.

Patch Size

This sets the resolution in distance (feet or meters as set in EASE Main Options) or recalculated Pixel values, depending on the settings below or on **Use Area Settings**. The smallest patch size that EASE can compute is 1 cm (0.03 ft.).

L/8

This computes 1/8 wavelength for the selected frequency and sets the **Resolution** to that distance. 1/8 wavelength resolution is needed to fully show interference at a given frequency.

Use Area Settings

This changes the definition and use of resolution settings.

If **Use Area Settings** is checked:

1. The Resolution set in the Patch Size box is in this case only valid for faces

2. Isoline and patch calculations on areas will use the Scanning P3>P2 and Scanning P2>P1 values set in the Properties window for each Audience Area.

If **Use Area Settings** is not checked the resolution set in the **Patch Size** box (in feet or meters) will be used for both **Patch** and **Isoline** calculations and here for faces as well as areas.

Isoline Step (dB) Window (Area Mapping Only)

This sets the amplitude resolution for displays using **Isolines** (lines of equal SPL). Default is 1dB steps.

Scale (Area Mapping Only)

The right scroll bar in the **Area Mapping** window can be used to rotate the display to show a 3D display of plotted results. **Scale** sets the vertical displacement corresponding to an **Isoline Step**.

Items Tab

Selects the **Audience Areas, Faces,** and **Listener Seats** where calculations will be made.

Room Mapping:

Area Mapping:

Mapping

Calculations can be performed for selected **Audience Areas**, **Listener Seats**, and **Faces**.

On Areas

If checked, calculations will be performed for, and mapped onto, **Audience Areas** and **Area Groups in Use**.

On Seats

If checked, calculations will be performed for **Listener Seats** and **Seat Groups in Use**.

On Faces (Eyes Only)

If checked, calculations will be performed for, and mapped onto, **Faces in Use**.

Faces in Use (Eyes Only)

If **Mapping On Faces** is checked, calculations will be Mapped to **Faces in Use**.

Face

Left click for a list of **Faces**, with **Faces In Use** highlighted. Left click to select a **Face**, <CTRL> Left click to select additional **Faces**.

Audience Areas in Use

If **Mapping On Audience Areas** is checked, calculations will be mapped to **Audience Areas in Use**.

Aud. Area

Left click for a list of **Audience Areas**, with **Audience Areas In Use** highlighted. Left click to select an **Audience Area**, <CTRL> Left click to select additional **Audience Areas**.

Area Group

Left click for a list of **Audience Area Groups**, with **Audience Area Groups In Use** highlighted. Left click to select an **Audience Area Group**, <CTRL> Left click to select additional **Audience Area Groups**.

Listener Seats in Use

If **Mapping On Listener Seats** is checked, calculations will be Mapped to **Listener Seats in Use**.

List. Seat

Left click for a list of **Listener Seats**, with **Listener Seats In Use** highlighted. Left click to select a **Listener Seat**, <CTRL> Left click to select additional **Listener Seats**.

Seat Group

Left click for a list of **Listener Seat Groups**, with **Listener Seat Groups In Use** highlighted. Left click to select a **Listener Seat Group**, <CTRL> Left click to select additional **Listener Seat Groups**.

Noise Tab

This allows entry of measured or predicted noise levels for the Room for use in intelligibility calculations.

Chart

The unweighted noise levels are shown here in a tabular form. They can be entered as a function of frequency.

Levels

+10 dB, +1 dB, -1 dB, -10 dB

By means of these buttons you increase or decrease the noise level for all frequencies at the same time.

All to Sel.

This will set the noise level at all frequencies to the selected level of a single frequency band.

Interpolate

This allows interpolating for example octave band values to 1/3rd octave band ones.

All Off

This command will switch off the noise for all frequencies and for all types of calculation.

Load File

Opens a file dialog window to load a file with user defined noise curves (*.exn).

Save File

Opens a file dialog window to save a file with user defined noise curves (*.exn).

Calculation Tab

This tab establishes various rules and conditions for calculations.

Map with Shadow

If checked, Listener Seats, and parts of Audience Areas or Faces that are shadowed by a Face from a given Loudspeaker will receive no direct sound from that Loudspeaker in the calculation.

Split Time

Split Time (ms) Window

Sets the time that delineates **Direct** and **Reverberant Sound**. This value is used for energy-fraction measures C-Split and L-Split.

Interference

These selections dictate whether **Complex Addition** of wavefronts from multiple **Loudspeakers** are used to compute the resulting sound intensity, and how that addition should take place. If no boxes are checked, simple **Power Summation** will be used. See Appendix A for a discussion of how these computations are made.

Interference Sum

If checked, direct sound will be calculated in a manner that shows interference between **Loudspeakers** due to different phase shifts. See Appendix A for a discussion how this computation is made.

Pot. Energy

If checked, the pressure part of the energy will be used to compute resulting sound intensity in a manner that shows interference between **Loudspeakers**. See Appendix A for a discussion how this computation is made.

Kin. Energy

If checked, the velocity part of the energy will be used to compute resulting sound intensity in a manner that shows interference between **Loudspeakers**. See Appendix A for a discussion how this computation is made.

1/3rd Octave

If checked, calculations will be made for one one-third octave bands of white noise. A single band will be calculated if **Single** is checked on the **Mapping Tab,** otherwise all bands will be calculated**.**

Sinusoidal Only

If checked, calculations will be made for a single sine wave at the center frequency of the frequency band chosen on the **Mapping Tab**.

Standard Mapping with Reflections

This window sets parameters for mapping considering rays reflections in addition to statistical diffuse field assumptions (see Appendix A).

Room Mapping:

Area Mapping:

<<Back

Moves to the previous tab.

Next>>

Moves to the next tab.

OK

Accept all parameters and begin the calculation

Cancel

Cancel the calculation.

Settings Tab

Sets the **Type(s) Of Calculation**, **Loudspeakers In Use,** and **Resolution** of the calculation.

Calculate

Show First

Selects the **Type(s) Of Calculations** to be the first displayed.

Direct SPL

This map shows the direct sound pressure level in dBSPL of the **Loudspeakers** that are **On**. See Appendix A, Direct SPL

Total SPL

This map shows the sum of the **Direct** and **Reverberant** sound pressure level in dBSPL of the **Loudspeakers** that are **On**.

Lspk Overlap

This map shows the number of **Loudspeakers** of comparable intensity at a given location.

The value 1 indicates areas without any overlap between **Loudspeakers**. If the value exceeds 1.5 (maximum is the number of all Loudspeakers at full overlap, see Appendix A) comb filtering or other undesirable interference behaviors should be expected.

Critical Distance

This map shows the ratio of direct to reverberant sound in terms of distance. **Critical Distance** is a distance from the source where the direct sound equals the reverberant sound. This is displayed in the map as 1. A value of 2 is twice critical distance etc.

D/R Ratio

This map shows the ratio of direct to reverberant sound in decibels.

The relationship between **D/R Ratio** and **Critical Distance r**$_C$ is:

D/R Ratio = 20 log r$_C$ dB – 20 log r dB

(where **r** is the distance from the source to the point of investigation)

Arrival Time

This map shows the sum of the electrical delay and the acoustic travel time for the first front arrivals in milliseconds. The displayed times include any electrical

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Alignment or **Delay Times** set for those sound sources (e.g. **Loudspeakers)** used in the calculation. This map can be used to set delay times between clusters.

ITD Gap

This map shows the arrival time difference between the first two direct sound arrivals at each point.

Clarity Measures

This map shows the ratio of energy, in decibels, before and after a certain split time. The scaling of all C-Plots is in dB.

See Appendix A, Clarity Measures

C7

This plot shows the ratio of energy before and after 7 milliseconds in decibels. This map is used to predict the strength of direct sound of sources.

C50

This plot shows the ratio of energy before and after 50 milliseconds in decibels. This map is used to predict speech intelligibility.

C80

This plot shows the ratio of energy before and after 80 milliseconds in decibels. This map is used to predict the articulation of different modes of music.

C-Split

This plot shows the ratio, in decibels, of energy before and after a user specified split time in milliseconds.

Pressure Levels

This map shows the sum of the sound pressure levels in dBSPL of the Loudspeakers within a limited arrival time. See Appendix A, Pressure Levels

L7

This is the sum of the direct and reverberant sound energy in dBSPL within the first 7 ms.

L50

This is the sum of the direct and reverberant sound energy in dBSPL within the first 50 ms.

L80

This is the sum of the direct and reverberant sound energy in dBSPL within the first 80 ms.

L-Split

This is the sum of the direct and reverberant sound energy in dBSPL, within the user specified split time in ms.

Articulation Loss

This map shows the **Articulation Loss of Consonants** in percent. The calculation is based on IEC 60268-16 for the determination of STI and uses the Farrel Becker equation to derive ALCons. See Appendix A, ALCons

STI

This map shows the **Speech Transmission Index** and optionally related measures such as RaSTI or STIPa. This calculation is based on IEC 60268-16. See Appendix A, STI

Articulation Index

This map shows the **Articulation Index**. . See: ANSI S3.5-1997 "Methods for Calculation of Speech Intelligibility Index"

Privacy Index

This map shows the **Privacy Index** in percent. See Appendix A, Privacy Index

Frequency Selection Window

Displays and sets the **Frequency** that will be the first displayed.

Label

This window allows entering a user-defined label for this calculation of mappings.

Loudspeakers In Use

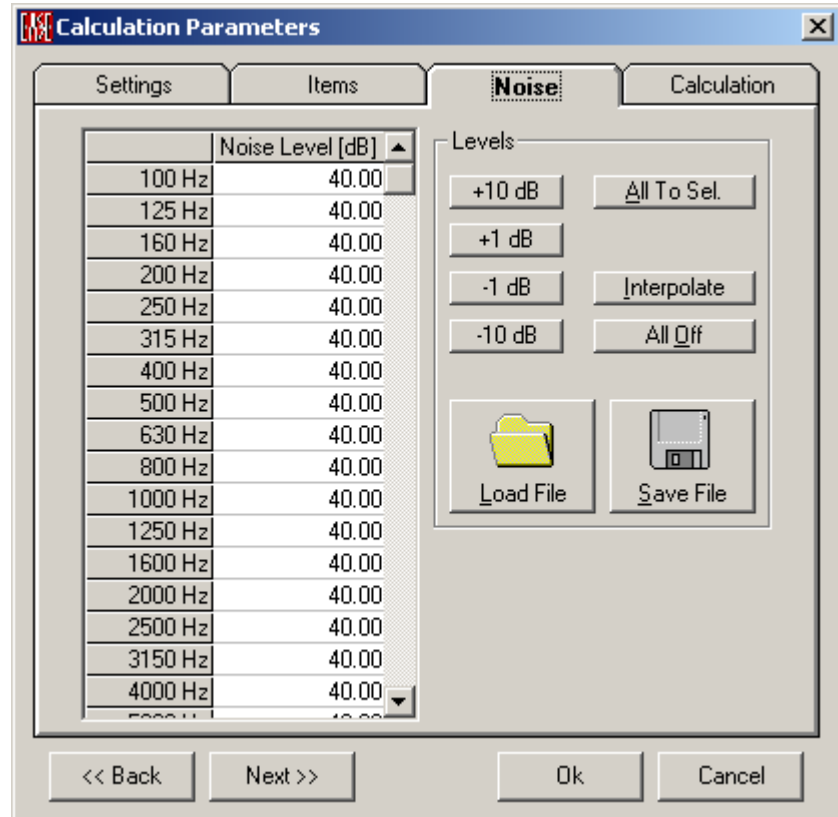**Loudspeakers In Use** are the System Input for EASE calculations.

Lspk

Left click for a list of **Loudspeakers**, with **Loudspeakers In Use** highlighted. Left click to select a **Loudspeaker**, <CTRL> Left click to select additional **Loudspeakers**.

Lspk Group

Left click for a list of **Loudspeaker Groups**, with **Loudspeaker Groups In Use** highlighted. Left click to select a **Loudspeaker Group**, <CTRL> Left click to select additional **Loudspeaker Groups**.

Resolution

This is the maximum distance (in feet or meters) between adjacent sample points used to compute the mapping on **Faces** and **Audience Areas**. There is an interaction between **Resolution** and calculation speed. If the **Resolution** value is doubled, calculation time drops by a factor of four because only one-fourth as many points or areas must be calculated.

Note: Any **Resolution** setting that causes an **Audience Area** to be divided into fewer than four segments per side can result in that area not being computed. This can happen with very large resolution numbers and/or with relatively small **Audience Areas**.

Patch Size

This sets the resolution in distance (feet or meters as set in EASE Main Options) or Pixels, depending on the setting of **Use Area Settings**. The smallest patch size that EASE can compute is 1 cm (0.03 ft.).

L/8

This computes 1/8 wavelength for the selected frequency and sets the **Resolution** to that distance. 1/8 wavelength resolution is needed to fully show interference at a given frequency.

Use Area Settings

This changes the definition and use of resolution settings.

If **Use Area Settings** is checked:

1. The Resolution set in the Patch Size box is in this case only valid for faces

2. Isoline and patch calculations on areas will use the Scanning P3>P2 and Scanning P2>P1 values set in the Properties window for each Audience Area.

If **Use Area Settings** is <u>not</u> checked the resolution set in the **Patch Size** box (in feet or meters) will be used for both **Patch** and **Isoline** calculations and here for faces as well as areas.

Isoline Step (dB) Window (Area Mapping Only)

This sets the amplitude resolution for displays using **Isolines** (lines of equal SPL). Default is 1 dB steps.

Scale (Area Mapping Only)

The right scroll bar in the **Area Mapping** window can be used to rotate the display to show a 3D display of plotted results. **Scale** sets the vertical displacement corresponding to an **Isoline Step**.

Items Tab

Selects the **Areas, Faces,** and **Listener Seats** where calculations will be made.

Room Mapping:

Area Mapping:

Mapping

Calculations can be performed for selected **Audience Areas**, **Listener Seats**, and **Faces**.

On Areas

If checked, calculations will be performed for, and mapped onto, **Audience Areas** and **Area Groups in Use**.

On Seats

If checked, calculations will be performed for **Listener Seats** and **Seat Groups in Use**.

On Faces (Eyes Only)

If checked, calculations will be performed for, and mapped onto, **Faces in Use**.

Faces in Use (Eyes Only)

If **Mapping On Faces** is checked, calculations will be Mapped to **Faces in Use**.

Face

Left click for a list of **Faces**, with **Faces In Use** highlighted. Left click to select a **Face**, <CTRL> Left click to select additional **Faces**.

Audience Areas in Use

If **Mapping On Audience Areas** is checked, calculations will be mapped to **Audience Areas in Use**.

Aud. Area

Left click for a list of **Audience Areas**, with **Audience Areas In Use** highlighted. Left click to select an **Audience Area**, <CTRL> Left click to select additional **Audience Areas**.

Area Group

Left click for a list of **Audience Area Groups**, with **Audience Area Groups In Use** highlighted. Left click to select an **Audience Area Group**, <CTRL> Left click to select additional **Audience Area Groups**.

Listener Seats in Use

If **Mapping On Listener Seats** is checked, calculations will be Mapped to **Listener Seats in Use**.

List. Seat

Left click for a list of **Listener Seats**, with **Listener Seats In Use** highlighted. Left click to select a **Listener Seat**, <CTRL> Left click selects additional **Listener Seats**.

Seat Group

Left click for a list of **Listener Seat Groups**, with **Listener Seat Groups In Use** highlighted. Left click to select a **Listener Seat Group**, <CTRL> Left click selects additional **Listener Seat Groups**.

Noise Tab

This allows entry of measured or predicted noise levels for the Room for use in intelligibility calculations.

Chart

The unweighted noise levels are shown here in a tabular form. They can be entered as a function of frequency.

Levels

+10 dB, +1 dB, -1 dB, -10 dB

By means of these buttons you increase or decrease the noise level for all frequencies at the same time.

All to Sel.

This will set the noise level at all frequencies to the selected level of a single frequency band.

Interpolate

This allows interpolating for example octave band values to 1/3rd octave band ones.

All Off

This command will switch off the noise for all frequencies and for all types of calculation.

Load File

Opens a file dialog window to load a file with user defined noise curves (*.exn).

Save File

Opens a file dialog window to save a file with user defined noise curves (*.exn).

Calculation Tab

This tab establishes various rules and conditions for calculations.

Map with Shadow

If checked, Listener Seats, and parts of Audience Areas or Faces that are shadowed by a Face from a given Loudspeaker will receive no direct sound from that Loudspeaker in the calculation.

Split Time

Split Time (ms) Window

Sets the time that delineates **Direct** and **Reverberant Sound**. This value is used for energy-fraction measures C-Split and L-Split.

Interference

These selections dictate whether **Complex Addition** of wavefronts from multiple **Loudspeakers** and reflections are used to compute the resulting sound intensity, and how that addition should take place. If no boxes are checked, simple **Power Summation** of the will be used. See <u>Appendix A</u> for a discussion of how these computations are made.

Interference Sum

If checked, the **Sound** Field will be calculated in a manner that shows interference between **Loudspeakers** and reflections due to different phase shifts. See [Appendix A](#) for a discussion how this computation is made.

Pot. Energy

If checked, the pressure part of the energy will be used to compute resulting sound intensity in a manner that shows interference between **Loudspeakers** and reflections. See [Appendix A](#) for a discussion how this computation is made.

Kin. Energy

If checked, the velocity part of the energy will be used to compute resulting sound intensity in a manner that shows interference between **Loudspeakers** and reflections. See [Appendix A](#) for a discussion how this computation is made.

1/3rd Octave

If checked, interference calculations will be made by averaging over all one-third octave bands and considering runtime phase changes.

Sinusoidal Only

If checked, interference calculations will be made for a single sine wave at the center frequency of each frequency band.

Reflection Mapping Window

This sets the parameters and calculation method for mapping reflections.
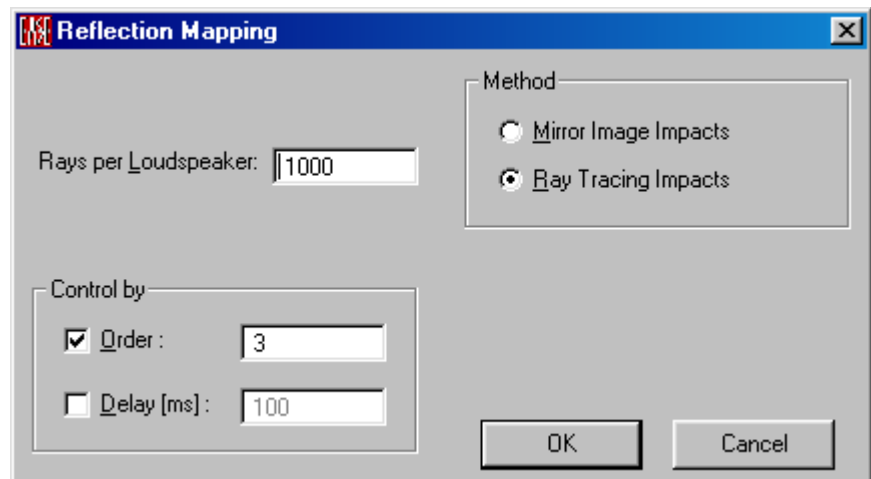
Rays per Loudspeaker Window

This sets the number of **Rays Per Loudspeaker**. A larger number yields greater accuracy but increases computation time.

OK

Accept the settings and begin calculations.

Cancel

Abort the calculation and close the window.

Method

Chooses the calculation method.

Mirror Image Impacts

A check here causes an **Image Model** to be used for calculations. This is a relatively slow, systematic calculation method that finds all occurring reflections up to the selected order or cut-off time. It does not depend on the number of **Rays per Loudspeaker**.

Ray Tracing Impacts

A check here causes **Ray Tracing** to be used for calculations. This is a relatively fast, random-based calculation method that finds some of the occurring reflections up to the selected order or cut-off time. The number of reflections found depends on the number of **Rays per Loudspeaker**.

Control by

Sets the length of time or number of reflections that should be computed.

Order

If checked, the rays of the order number of reflections in the window will be included in the computation.

Delay (ms)

If checked, the response will be computed for the length of time shown in the window.

AURA Mapping

This configures and initiates an **AURA** mapping calculation of **Echograms** at multiple points throughout one or more selected **Audience Areas** and on selected **Listener Seats,** using one or more selected sound sources (e.g. **Loudspeakers)** as excitation for the room. These responses are post processed to yield standard room acoustical parameters according to ISO3382. **AURA** can compute Early Decay Time (EDT), Reverberation Time (T10, T20, T30), Lateral Fraction (LF), Lateral Fraction Coefficient (LFC), Clarity (C80), Definition (C50, D50), Sound Strength (G), Center Time, Direct and Total SPL, and Echo Criteria for Speech and Music and STI and ALCons.

See also , AURA

Room Mapping:

Area Mapping:

<<Back

Moves to the previous tab.

Next>>

Moves to the next tab.

OK

Accept all parameters and begin the calculation

Cancel

Cancel the calculation.

Settings Tab

Sets the **Type(s) of Calculation**, **Loudspeakers In Use**, and **Resolution** of the calculation.

Calculate

Show First

Selects the type(s) of calculations to be the first displayed.

Direct SPL

This map shows the direct sound pressure level in dBSPL of the sound sources (e.g. **Loudspeakers)** that are **On**. See Appendix A, Direct SPL

Total SPL

This map shows the sum of the **Direct** and **Reverberant** sound pressure level in dBSPL of the sound sources (e.g. **Loudspeakers)** that are **On**. See Appendix A, Direct SPL

Early Decay Time (EDT)

This map shows the **Early Decay Time**. EDT is the time required for the first 10dB of decay of sound energy multiplied by 6 to extrapolate to a 60-dB decay.

Reverberation Time (T10)

This map shows the reverberation time T10. T10 is the time required after excluding the first 5dB for the sound energy to decay further 10dB, multiplied by 6 to extrapolate to a 60 dB decay.

Reverberation Time (T20)

This map shows the reverberation time T20. T20 is the time required after excluding the first 5dB for the sound energy to decay further 20dB, multiplied by 3 to extrapolate to a 60 dB decay.

Reverberation Time (T30)

This map shows the reverberation time T30. T30 is the time required after excluding the first 5dB for the sound energy to decay further 30dB, multiplied by 2 to extrapolate to a 60 dB decay.

Arrival Time

This map shows the sum of the electrical delay and the acoustic travel time for the first front arrivals in milliseconds. The displayed times include any electrical **Alignment** or **Delay Times** set for those sound sources (e.g. **Loudspeakers)** used in the calculation. This map can be used to set delay times between clusters.

Definition (D50)

This map shows the Definition function D in %. See <u>Appendix A</u>, Definition Measures.

Definition Measure (C50)

This map shows the Definition Measure function C50 in dB, which is the ratio between the energy in the first 50ms and the energy after 50ms. See <u>Appendix A</u>, Definition Measures

Clarity (C80)

This map shows the Clarity function C80 in dB, which is the ratio between the energy in the first 80ms and the energy after 80ms. See <u>Appendix A</u>, Clarity Measures.

Center Time (t_s)

This map shows the Center Time which is defined as the ratio between the summed-up products of the energy components of the arriving reflections and their corresponding delays to the total energy component. See <u>Appendix A</u>, Center Time Measure.

Lateral Fraction (LF)

This map shows the Lateral Fraction in percentage. LF is a measure of the perception of the spatial extension of sources. See <u>Appendix A</u>, Lateral Fraction Measures.

Lateral Fraction Coefficient (LFC)

This map shows the Lateral Fraction Coefficient in percentage. LFC is a measure of the perception of the spatial extension of sources. See <u>Appendix A</u>, Lateral Fraction Measures.

Sound Strength (G)

This map shows the Sound Strength Measure G in dB. G is ratio between the energy in a room at given location to the energy at 10m from the same source in free field. See <u>Appendix A</u>, G.

Speech Transmission Index (STI)

This map shows the calculated Modulation Transfer Indices MTI and the derived Speech Transmission Indices for different weighting factors. The calculation is based on IEC 60268-16. See <u>Appendix A</u>, STI.

Articulation Loss of Consonants (AlCons)

This map shows the **Articulation Loss of Consonants**. This calculation is based upon the STI calculations and converted to ALCons using the Farrel Becker's equations. See <u>Appendix A</u>, STI.

Echo Speech

This map shows a calculation that applies a weighting function (proposed by Dietsch and Kraak) to the Energy Time Curve to predict how seriously late

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energy will degrade speech intelligibility. Computed values greater than 1 are likely to be problematic, and values greater than 0.9 are marginal. See Appendix A, Echo Criteria.

Echo Music

This map shows a calculation that applies a weighting function (proposed by Dietsch and Kraak) to the Energy Time Curve to predict how seriously late energy will degrade the quality of music. Computed values greater than 2 are likely to be problematic, and values greater than 1.5 are marginal. See Appendix A, Echo Criteria.

Frequency Selection Window

Sets the **Frequency** to be displayed first.

Label

This window allows entering a user-defined label for this calculation of mappings.

Loudspeakers In Use

Loudspeakers In Use are the System Input for EASE calculations.

Lspk

Left click for a list of **Loudspeakers**, with **Loudspeakers In Use** highlighted. Left click to select a **Loudspeaker**, <CTRL> Left click to select additional **Loudspeakers**.

Lspk Group

Left click for a list of **Loudspeaker Groups**, with **Loudspeaker Groups In Use** highlighted. Left click to select a **Loudspeaker Group**, <CTRL> Left click to select additional **Loudspeaker Groups**.

Resolution

This is the maximum distance (in feet or meters) between adjacent sample points used to compute the mapping on **Faces** and **Audience Areas**. There is an interaction between **Resolution** and calculation speed. If the **Resolution** value is doubled, calculation time drops by a factor of four because only one-fourth as many points or areas must be calculated.

Patch Size

This sets the resolution in distance (feet or meters as set in EASE Main Options) or Pixels, depending on the setting of **Use Area Settings**. The smallest patch size that EASE can compute is 1 cm (0.03 ft.).

L/8

This computes 1/8 wavelength for the selected frequency and sets the **Resolution** to that distance. 1/8 wavelength resolution is needed to fully show interference at a given frequency.

Use Area Settings

This changes the definition and use of resolution settings.

If **Use Area Settings** is checked:

1   The Resolution set in the Patch Size box is in this case only valid for faces

2.   Isoline and patch calculations on areas will use the Scanning P3>P2 and Scanning P2>P1 values set in the Properties window for each Audience Area.

If **Use Area Settings** is <u>not</u> checked the resolution set in the **Patch Size** box (in feet or meters) will be used for both **Patch** and **Isoline** calculations and for faces as well as areas.

Isoline Step (dB) Window (Area Mapping Only)

This sets the amplitude resolution for displays using **Isolines** (lines of equal SPL). Default is 1 dB steps.

Scale (Area Mapping Only)

The right scroll bar in the **Area Mapping** window can be used to rotate the display to show a 3D display of plotted results. **Scale** sets the vertical displacement corresponding to an **Isoline Step**.

Items Tab

Selects the **Areas, Faces,** and **Listener Seats** where calculations will be made.

Room Mapping:

Area Mapping:

Mapping

Calculations can be performed for selected **Audience Areas**, **Listener Seats**, and **Faces**.

On Areas

If checked, calculations will be performed for, and mapped onto **Audience Areas** and **Area Groups in Use**.

On Seats

If checked, calculations will be performed for **Listener Seats** and **Seat Groups in Use**.

On Faces (Eyes Only)

If checked, calculations will be performed for, and mapped onto, **Faces in Use**.

Faces in Use (Eyes Only)

If **Mapping On Faces** is checked, calculations will be Mapped to **Faces in Use**.

Face

Left click for a list of **Faces**, with **Faces In Use** highlighted. Left click to select a **Face**, <CTRL> Left click to select additional **Faces**.

Audience Areas in Use

If **Mapping On Audience Areas** is checked, calculations will be mapped to **Audience Areas in Use**.

Aud. Area

Left click for a list of **Audience Areas**, with **Audience Areas In Use** highlighted. Left click to select an **Audience Area**, <CTRL> Left click to select additional **Audience Areas**.

Area Group

Left click for a list of **Audience Area Groups**, with **Audience Area Groups In Use** highlighted. Left click to select an **Audience Area Group**, <CTRL> Left click to select additional **Audience Area Groups**.

Listener Seats in Use

If **Mapping On Listener Seats** is checked, calculations will be Mapped to **Listener Seats in Use**.

List. Seat

Left click for a list of **Listener Seats**, with **Listener Seats In Use** highlighted. Left click to select a **Listener Seat**, <CTRL> Left click to select additional **Listener Seats**.

Seat Group

Left click for a list of **Listener Seat Groups**, with **Listener Seat Groups In Use** highlighted. Left click to select a **Listener Seat Group**, <CTRL> Left click to select additional **Listener Seat Groups**.

Noise Tab

This allows entry of measured or predicted noise levels for the Room for use in intelligibility calculations.

Chart

The unweighted noise levels are shown here in a tabular form. They can be entered as a function of frequency.

Levels

+10 dB, +1 dB, -1 dB, -10 dB

By means of these buttons you increase or decrease the noise level for all frequencies at the same time.

All to Sel.

This will set the noise level at all frequencies to the selected level of a single frequency band.

Interpolate

This allows interpolating for example octave band values to 1/3rd octave band ones.

All Off

This command will switch off the noise for all frequencies and for all types of calculation.

Load File

Opens a file dialog window to load a file with user defined noise curves (*.exn).

Save File

Opens a file dialog window to save a file with user defined noise curves (*.exn).

Calculation Tab

This tab establishes various rules and conditions for calculations.

Parameters for Standard Options

Sets the conditions for the calculation.

Particles Window

Recommends or sets the number of particles (or in other terms rays) to be analyzed for each sound source (e.g. **Loudspeaker**). The recommended numbers are derived by EASE automatically based on the room volume and a desired particle detection rate at the receiver. Usually the very low and low resolution settings are sufficient to obtain an overview, but the intermediate or high resolution settings should be used for final calculations.

Length (ms) Window

Recommends or sets the **Length** of the echogram to be calculated. The recommended lengths are derived by EASE automatically based on the reverberation time of the statistical Eyring model. For most cases the recommended standard setting should be sufficient unless one expects a significantly atypical decay behavior, like for example in coupled rooms.

Default Value [%] for Surfaces without Scattering Data

This setting determines the broadband default value for the scattering coefficient that is used for all Wall Materials that have no scattering properties defined.

With AURA 4.0 a new default was introduced, the so-called S-curve. For this selection the scattering coefficient is 10% for frequencies below 1 kHz and 40% above 1 kHz. The crossover centered at 1 kHz has a width of two octaves. Based on recent research this generic curve seems to best represent typical room geometries, because surfaces are usually more strongly structured looking at high frequencies (short wavelengths) than at low frequencies (long wavelengths).

Other available default settings include 10%, 20%, 40% and 80% broadband scattering. For rooms where very smooth surfaces are dominant a coefficient of 10% may be used. If the surfaces of a room are very rough or strongly structured, a coefficient of 40% or higher should be used.

However, when using dedicated acoustic materials and diffusers one should rather refer to measurement data. You may also utilize the scattering calculation function included in the EASE Material Base software or the more flexible Reflex software available from AFMG.

Number of Calculation Threads

Recommends or sets the number of simultaneous ray-tracing processes used by AURA. AURA supports multiple processors and multi-threading. For the shortest calculation time, select the number of threads that is equivalent to the number of processors in your PC. Select a lower number if the computer should stay responsive during the calculation or if you wish to work with other software applications in the meantime. The maximum allowed value is 100 threads even if you have more available in the computer.

Parameters for Advanced Options

Sets the advanced conditions for the calculation.

Options

This chooses the method to be used for calculation of the effect of **Wall Materials** as well as air absorption.

Particle Loss

Computes the loss of energy at a Face using the Particle Loss method. This method is faster, but is less accurate for small numbers of particles than Energy Loss. Each time a ray reaches an impact point, a random number between 0 and

1 is generated. If this number is greater than the absorption coefficient, then the ray is discarded and no longer followed for additional impacts.

If this option is switched off (default), the loss of energy at a **Face** is computed using the **Energy Loss** method. This method is generally more accurate for calculations of moderate length than Particle Loss. The amount of lost energy is dependent only on the absorption coefficients.

Diffuse Rain

The use of diffuse rain assumes the presence of scattering coefficients for the wall materials. Without diffuse rain, at every impact point on a wall surface either a specular reflection or a scattered reflection is created. The latter only happens if a random number between 0 and 1 is
greater than the scattering coefficient. Then a single scattered ray is originated. In the case where diffuse rain is switched on, a different algorithm is used: at the impact point the scattered energy is not distributed randomly via a single ray but scattered to all existing listener seats uniformly. So it acts like a diffuse shower or rain. The more seats or area points are included in the AURA calculation, the more time the calculation takes. So you can obtain very realistic impulse responses with a high tail density. Use the histogram option to verify that a sufficient density has been achieved.

Note: Because the diffuse rain creates a particle shower at every reflection point it is much slower when compared to the classical method. However, better results can be achieved more quickly, because the particle density (see histogram) is increased significantly. It is recommended to use only 1/10th of the number of particles normally used for the method without diffuse rain.

Orientation Point

Sets the orientation point. This is equivalent to the "looking point" for a human observer or dummy head -- i.e., the direction the head is facing. (Applies only to specific measures, such as LF, that need to know which direction the listener is facing.)

X,Y and Z Window

Sets the coordinates of the orientation point. This is equivalent to the "looking point" for a human observer or dummy head.

Lspk

This opens a window to choose a sound source (e.g. **Loudspeaker)** as the "looking point.". The X, Y, and Z values will be set to the location of the Loudspeaker.

Memory Warning Window

At the beginning of an **AURA** Calculation, **EASE** determines how much temporary memory is required to complete it. Make sure you have enough RAM and hard disk space available. With AURA 4.0, the software can utilize more than 1 GB of RAM when run on 64-bit operating systems. All of the RAM available can be used up to the limit of what is physically installed.
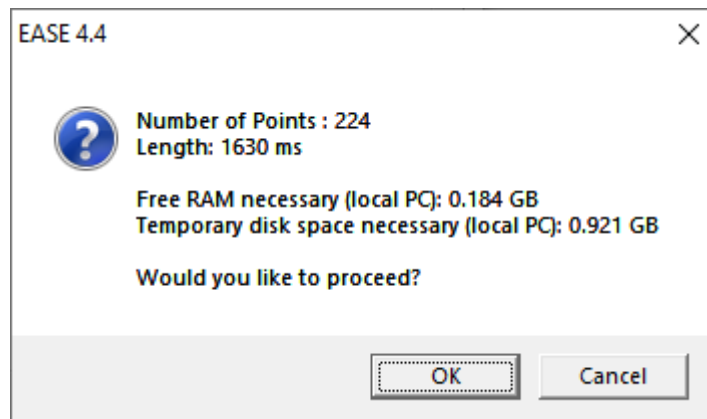
Recombination Window

For a typical calculation you can select all loudspeakers and listener seats and areas or faces with corresponding receiving points to perform the calculations in a single run-through.

After completing the calculations, EASE offers a recombination window to allow saving of different map files. This window shows all loudspeakers available for post processing. Now you can add or remove loudspeakers to create a mapping file for one combination of loudspeakers at a time with all included calculation points (listener seats, area points, face points). By this means you can generate maps for all needed combinations of loudspeakers without having to re-run the whole ray-tracing process.

Use the **Lspk Group**, **Deselect All** and **Select All** buttons or activate the individual checkboxes to select the loudspeakers for each recombination run.

Terminate the recombination with **Done** and the Evaluation window will open to display the resulting mapping files.
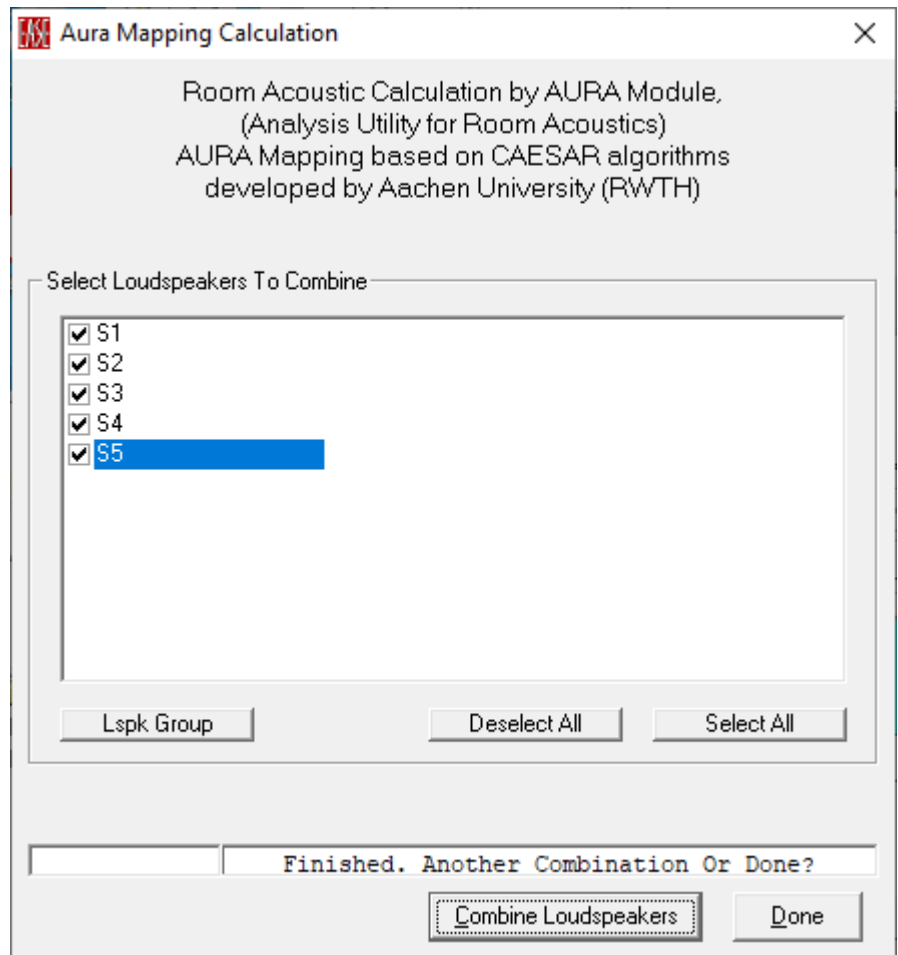
IR Simulation

Enables the setup of parameters for infrared mapping calculations. These calculations are limited to the direct field only and consider the following aspects:

- **Radiator** emission power and directional characteristics

- **IR Emitter** placement and aiming

- **IR Emitter** settings for percentage of working diodes and cable length

- Propagation delays in air and in cable

- Active channels and resulting power distribution

- **Infrared Receiver** sensitivity

- Shadowing of receive areas due to objects or walls in the room

- Noise level if defined

Note: This function is only available if the EASE InfraRed module is licensed.

Room Mapping:
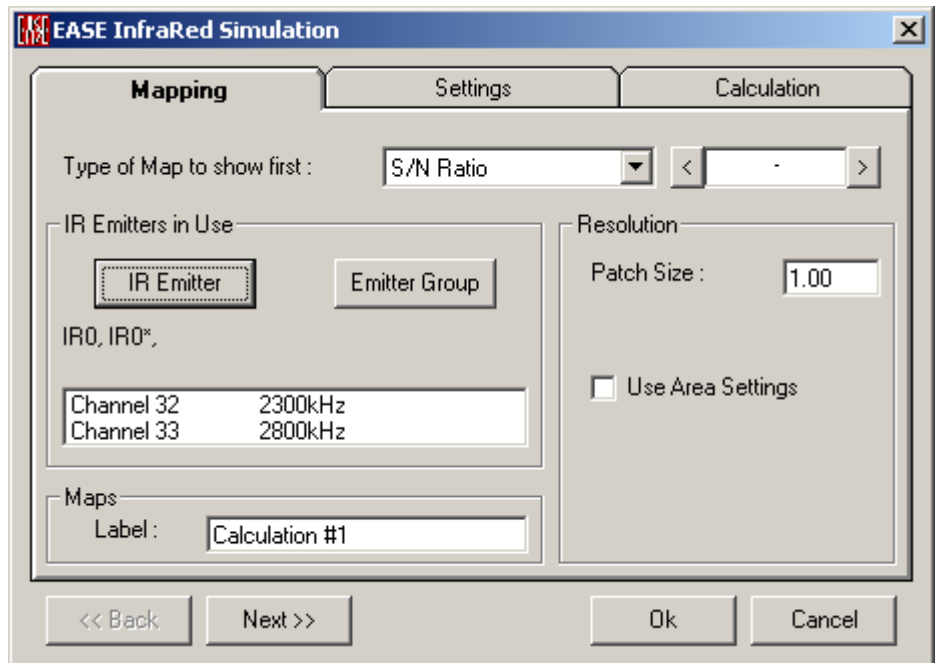
Area Mapping:
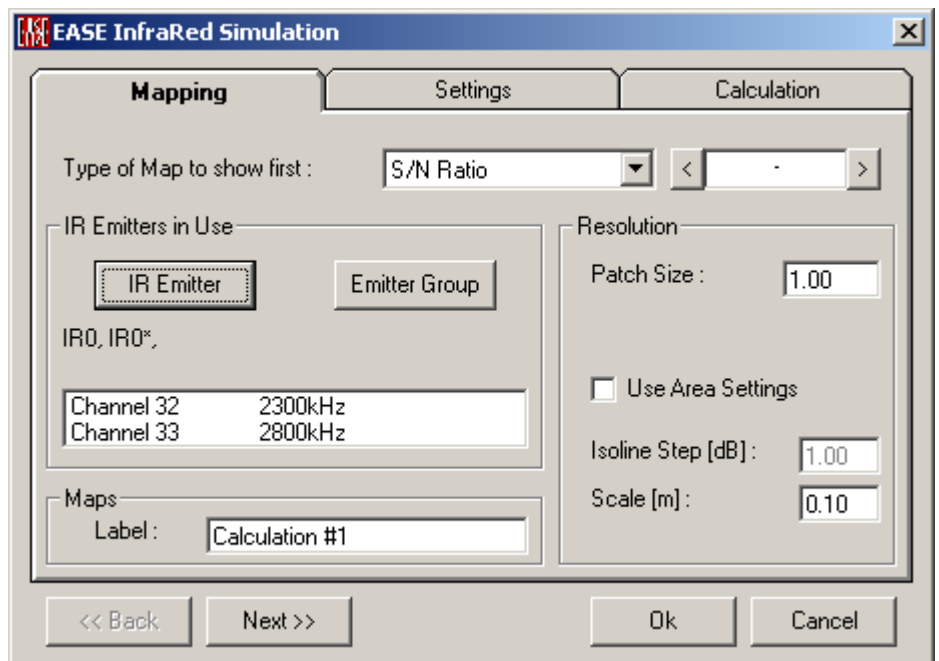
<<Back

Moves to the previous tab.

Next>>

Moves to the next tab.

OK

Accept all parameters and begin the calculation.

Cancel

Cancel the calculation.

Mapping Tab

Sets the **IR Emitters In Use** and the **Resolution** of the calculation.

Type of Map to show first

Depending on the number of active infrared channels this allows selecting the channel for which the infrared S/N mapping will be displayed first.

IR Emitters In Use

Select the **IR Emitters** that are considered active for subsequent infrared calculations.
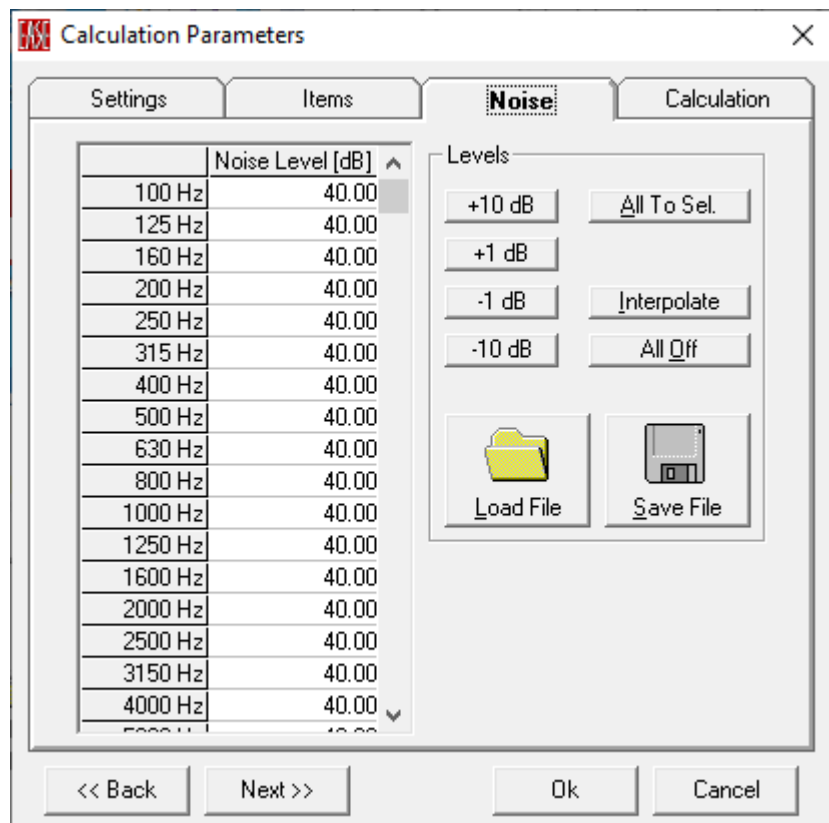
IR Emitter

Left click for a list of **IR Emitters**, with **IR Emitters In Use** highlighted. Left click to select a **IR Emitter**, <CTRL> Left click to select additional **IR Emitters**.

Emitter Group

Left click for a list of **IR Emitter Groups**, with **IR Emitter Groups In Use** highlighted. Left click to select an **IR Emitter Group**, <CTRL> Left click to select additional **IR Emitter Groups**.

[Channel List]

Shows the infrared transmission channels that are active due to the current selection of active **IR Emitters**.

Maps

Label

This window allows entering a user-defined label for this mapping calculation.

Resolution

This is the maximum distance (in feet or meters) between adjacent sample points used to compute the mapping on **Faces** and **Audience Areas**. There is an interaction between **Resolution** and calculation speed. If the **Resolution** value is doubled, calculation time drops by a factor of four because only one-fourth as many points or areas must be calculated.

Note: Any **Resolution** setting that causes an **Audience Area** to be divided into fewer than four segments per side can result in that area not being computed. This can happen with very large resolution numbers and/or with relatively small **Audience Areas**.

Patch Size

This sets the resolution in distance (feet or meters as set in EASE Main Options) or recalculated Pixel values, depending on the settings below or on **Use Area Settings**. The smallest patch size that EASE can compute is 1 cm (0.03 ft.).

Use Area Settings

This changes the definition and use of resolution settings.

If **Use Area Settings** is checked:

1. The Resolution set in the Patch Size box is in this case only valid for faces

2. Isoline and patch calculations on areas will use the Scanning P3>P2 and Scanning P2>P1 values set in the Properties window for each Audience Area.

If **Use Area Settings** is <u>not</u> checked the resolution set in the **Patch Size** box (in feet or meters) will be used for both **Patch** and **Isoline** calculations and here for faces as well as areas.

Isoline Step (dB) Window (Area Mapping Only)

This sets the amplitude resolution for displays using **Isolines** (lines of equal SPL). Default is 1dB steps.

Scale (Area Mapping Only)

The right scroll bar in the **Area Mapping** window can be used to rotate the display to show a 3D display of plotted results. **Scale** sets the vertical displacement corresponding to an **Isoline Step**.

Settings Tab

Selects the **Audience Areas, Faces,** and **Listener Seats** where calculations will be made.

Room Mapping:

Area Mapping:

Mapping

Calculations can be performed for selected **Audience Areas**, **Listener Seats**, and **Faces**.

On Areas

If checked, calculations will be performed for, and mapped onto, **Audience Areas** and **Area Groups in Use**.

On Seats

If checked, calculations will be performed for **Listener Seats** and **Seat Groups in Use**.

On Faces (Eyes Only)

If checked, calculations will be performed for, and mapped onto, **Faces in Use**.

Faces in Use (Eyes Only)

If **Mapping On Faces** is checked, calculations will be Mapped to **Faces in Use**.

Face

Left click for a list of **Faces**, with **Faces In Use** highlighted. Left click to select a **Face**, <CTRL> Left click to select additional **Faces**.

Audience Areas in Use

If **Mapping On Audience Areas** is checked, calculations will be mapped to **Audience Areas in Use**.

Aud. Area

Left click for a list of **Audience Areas**, with **Audience Areas In Use** highlighted. Left click to select an **Audience Area**, <CTRL> Left click to select additional **Audience Areas**.

Area Group

Left click for a list of **Audience Area Groups**, with **Audience Area Groups In Use** highlighted. Left click to select an **Audience Area Group**, <CTRL> Left click to select additional **Audience Area Groups**.

Listener Seats in Use

If **Mapping On Listener Seats** is checked, calculations will be Mapped to **Listener Seats in Use**.

List. Seat

Left click for a list of **Listener Seats**, with **Listener Seats In Use** highlighted. Left click to select a **Listener Seat**, <CTRL> Left click to select additional **Listener Seats**.

Seat Group

Left click for a list of **Listener Seat Groups**, with **Listener Seat Groups In Use** highlighted. Left click to select a **Listener Seat Group**, <CTRL> Left click to select additional **Listener Seat Groups**.

Style (Area Mapping Only)

Defines the default view setting for the mapping displayed first after the calculation is finished.

Patches

The map will be displayed as a set of quadrangles.

Isolines

The map will be displayed as a contour plot.

Colored

Colors will be used to indicate the level for each piece of the mapped area.

Labeled

If the map is displayed as an **Isolines** plot labels are attached to the isolines according to the respective level.

Calculation Tab

This tab establishes various rules and conditions for calculations.
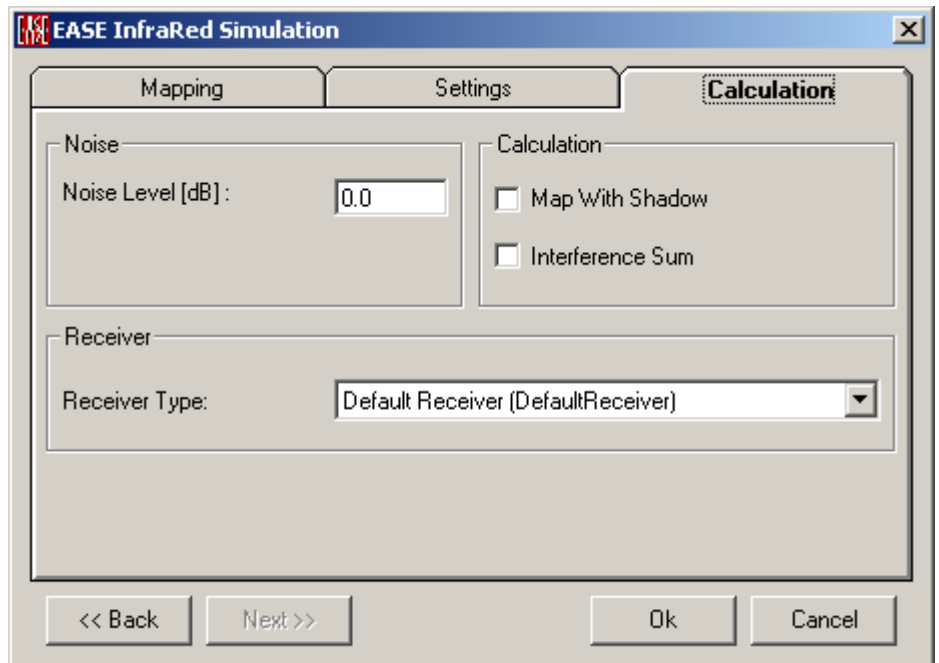
Noise

Noise Level [dB]

Enter the measured or predicted noise level for the Room. It will be used for the S/N calculation.

Calculation

Map With Shadow

If checked, the mapping calculation accounts for shadowing effects due to geometrical objects located on the direct propagation path between the **IR Emitter** and the receiver location.

Interference Sum

If checked, the mapping calculation accounts for level summation and reduction effects that are caused by different propagation times in cable and air.

Receiver

Receiver Type

Allows selecting different infrared receiver types from the installed database. The sensitivity of the selected receiver type will be used for all mapping points assuming that all listeners are using the same type of receiver.

Note: In order for receiver types to be available for selection here corresponding *.ire data files have to be located in the …\EASE40Data\IRDevices40\ReceiverTypes\ folder. By default the **Default Receiver** is available which incorporates the standard receiver sensitivity that was used for all infrared calculations in EASE 4.0 to 4.3.

Calculate Aura Response

This configures and initiates the **Aura** calculation of a reflectogram at a single point, using one or more selected sound sources (e.g. **Loudspeakers)** as excitation for the room. AURA computes an **EASE Response (.RSP) File** for analysis in **Probe**, and a **Binaural Impulse Response** or a B-format set of files for **Auralization**. Note: This **Binaural Impulse Response (BIR) File,** is calculated without the need to separately compute an **Impact File** or **Response File** (in **Rays**) and then convolve it with a **Head Related Transfer Function**. This calculation combines those steps and computes the **Binary Impulse Response File** directly.

Response Tab
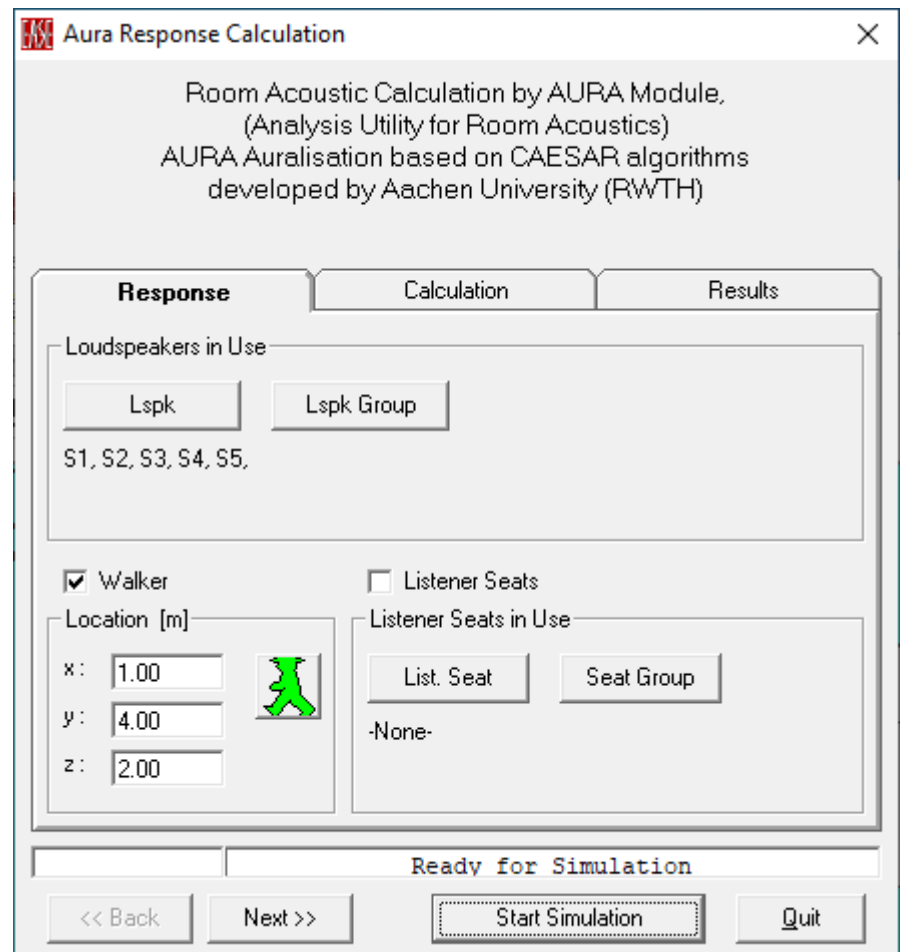
This tab is used to select sources and receivers used for reflectogram calculations.

Loudspeakers In Use

Loudspeakers In Use are the System Input for EASE calculations.

Lspk

Left click for a list of **Loudspeakers**, with **Loudspeakers In Use** highlighted. Left click to select a **Loudspeaker**, <CTRL> Left click to select additional **Loudspeakers**.

Lspk Group

Left click for a list of **Loudspeaker Groups**, with **Loudspeaker Groups In Use** highlighted. Left click to select a **Loudspeaker Group**, <CTRL> Left click to select additional **Loudspeaker Groups**.

Walker

A check here selects the walker position for calculation.

By clicking on the green walker symbol you adjust the location coordinates to the current walker position.

Listener Seats

A check here selects seat positions for calculation.

By clicking on **List. Seat** or **Seat Group** you can activate individual receiver locations or sets of them.

Calculation Tab
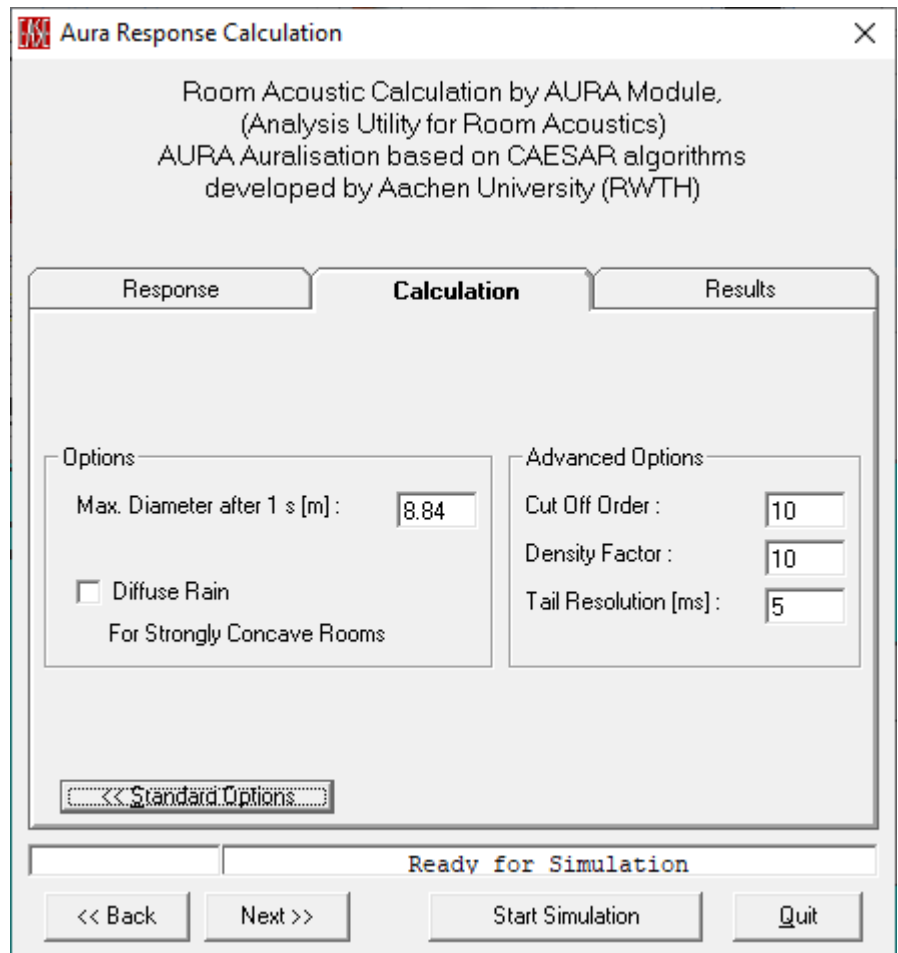
This tabs allows adjusting various parameters that affect the speed and the accuracy of the acoustic simulation as well as the resolution of the results.

Parameters for Standard Options

Sets typical conditions for the calculation.

Particles Window

Recommends or sets the number of particles (or in other terms rays) to be analyzed for each sound source (e.g. **Loudspeaker**). The recommended numbers are derived by EASE automatically based on the room volume and a desired particle detection rate at the receiver. Usually the very low and low resolution settings are sufficient to obtain an overview, but the intermediate or high resolution settings should be used for final calculations.

Length (ms) Window

Recommends or sets the **Length** of the echogram to be calculated. The recommended lengths are derived by EASE automatically based on the reverberation time of the statistical Eyring model. For most cases the recommended standard setting should be sufficient unless one expects a significantly atypical decay behavior, like for example in coupled rooms.

Default Value [%] for Surfaces without Scattering Data

This setting determines the broadband default value for the scattering coefficient that is used for all Wall Materials that have no scattering properties defined.

With AURA 4.0 a new default was introduced, the so-called S-curve. For this selection the scattering coefficient is 10% for frequencies below 1 kHz and 40% above 1 kHz. The crossover centered at 1 kHz has a width of two octaves. Based on recent research this generic curve seems to best represent typical room geometries, because surfaces are usually more strongly structured looking at high frequencies (short wavelengths) than at low frequencies (long wavelengths).

Other available default settings include 10%, 20%, 40% and 80% broadband scattering. For rooms where very smooth surfaces are dominant a coefficient of 10% may be used. If the surfaces of a room are very rough or strongly structured, a coefficient of 40% or higher should be used.

However, when using dedicated acoustic materials and diffusers one should rather refer to measurement data. You may also utilize the scattering calculation function included in the EASE Material Base software or the more flexible Reflex software available from AFMG.

Number of Calculation Threads

Recommends or sets the number of simultaneous ray-tracing processes used by AURA. AURA supports multiple processors and multi-threading. For the shortest calculation time, select the number of threads that is equivalent to the number of processors in your PC. Select a lower number if the computer should stay responsive during the calculation or if you wish to work with other software applications in the meantime. The maximum allowed value is 100 threads even if you have more available in the computer.

Parameters for Advanced Options

Sets the advanced conditions for the calculation.

Options

Max. Diameter after 1s [m]

This is the diameter of the imaginary sphere where impact rays will be collected for the **AURA Impulse Response**. The image model method used for the early part of the impulse response can also be considered as a cone-tracing approach. In this sense, the diameter defines the size of the cone after 1s of particle travel time.

Diffuse Rain

The use of diffuse rain assumes the presence of scattering coefficients for the wall materials. Without diffuse rain, at every impact point on a wall surface either a specular reflection or a scattered reflection is created. The latter only happens if a random number between 0 and 1 is
greater than the scattering coefficient. Then a single scattered ray is originated. In the case where diffuse rain is switched on, a different algorithm is used: at the impact point the scattered energy is not distributed randomly via a single ray but scattered to all existing listener seats uniformly. So it acts like a diffuse shower or rain. The more seats or area points are included in the AURA calculation, the more time the calculation takes. So you can obtain very realistic impulse responses with a high tail density. Use the histogram option to verify that a sufficient density has been achieved.

Note: Because the diffuse rain creates a particle shower at every reflection point it is much slower when compared to the classical method. However, better results can be achieved more quickly, because the particle density (see histogram) is increased significantly. It is recommended to use only 1/10th of the number of particles normally used for the method without diffuse rain

Advanced Options

Cut Off Order Window

This sets the highest ordered reflection that will be computed in the image model part of the response calculation. Use a small number (5-7) for basic reflection patterns, a larger number for Auralization.

Density Factor Window

This sets the pulse density of the echograms employed for storing the scattering and late specular part of the response calculation. See Appendix A, Resolution for further explanations.

Tail Resolution [ms]

This sets the time resolution of the echograms employed for storing the scattering and late specular part of the response calculation. See Appendix A, Resolution for further explanations.

Results Tab
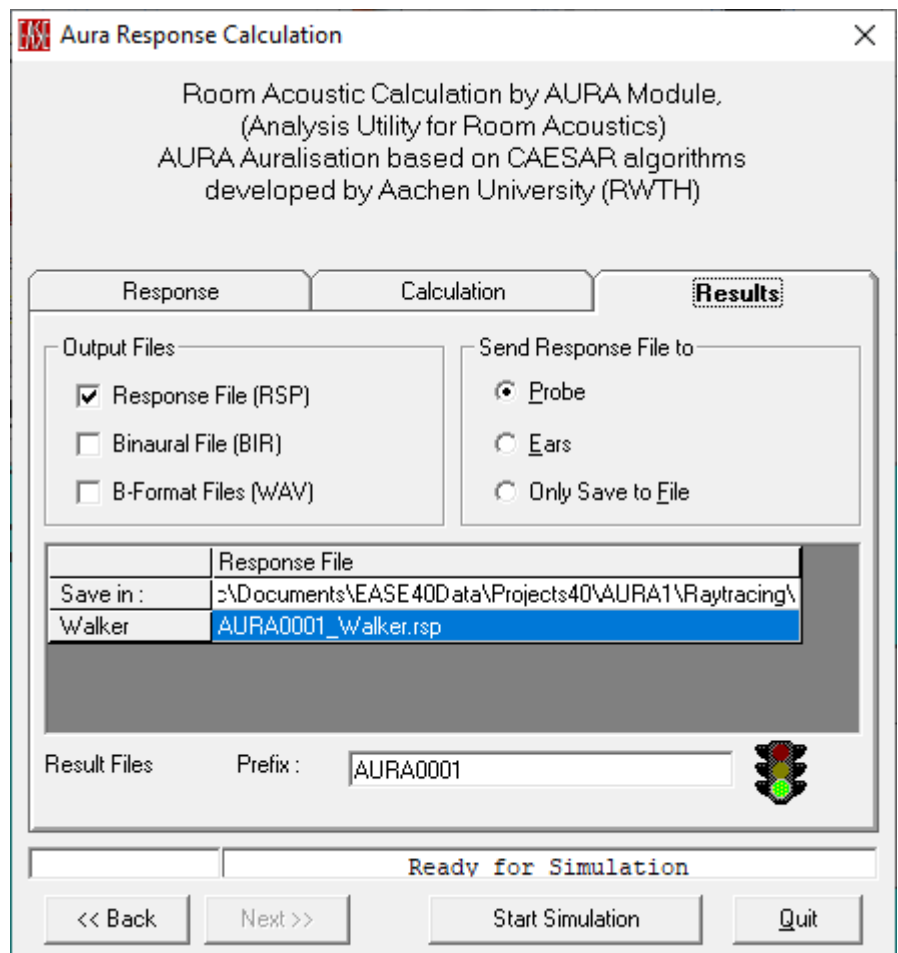
Defines output files and folders where the results of the **Aura Response** calculation will be stored. For each receiver position (Walker and Seat) that was selected on the **Response** tab a separate output file is created based on the format selections made here.

Output Files

Response File (RSP)

If checked, a response file (*.rsp) is created that can be used for further analysis in EASE Probe. The output file names can be defined in the table below.

Notice that response files require the largest amount of RAM during the calculation. At the same time, the memory size for each response file is limited to 100 MB. If response files are not needed this setting should be switched off.

Binaural File (BIR)

If checked, a binaural BIR file is created that can be used for auralisation. The output file names can be defined in the table below.

B-Format Files (WAV)

If checked, a set of output files in 2nd order B-format is created. The output file names can be defined in the table below.

Send Response File To

If a response file (*.rsp) is calculated this sends the resulting file to the Probe, to EARS, or just saves it.

Probe

After completing the calculation this opens the Probe with the resulting response file**.**

Ears

After completing the calculation this opens the EARS module with the resulting response file for further post processing**.**

Only Save To File

This saves the calculation results to a response file (*.rsp).

[Table]

Output file names and paths for saving the files can be edited by clicking on a file name in the table.

Depending on your selection of **Output Files** the table will show separate columns for the RSP, BIR and WAV formats respectively.

Notice that you can change the file name for each location and format individually. However, the output folder has to be the same for all files of the same format, i.e. for one column. The currently selected output folder is shown in the top row labeled **Save in**.

The traffic light will automatically change to red if any of the files already exist. Click on the icon to obtain detailed information.

Prefix

Under Prefix a default prefix name will be offered to use for the output files. This prefix name can be edited and set for general use.

<<Back

Moves to the previous **Settings Tab**.

Next>>

Moves to the next **Settings Tab**.

Start Simulation

Accepts parameter settings and starts the calculation.

Quit

This aborts the calculation and closes the window.

Memory Warning Window

At the beginning of an **AURA** Calculation, **EASE** determines how much temporary memory is required to complete it. Make sure you have enough RAM and hard disk space available.

Notice that with AURA 4.0, the software can utilize more than 1 GB of RAM when run on 64-bit operating systems. All of the RAM available can be used up to the limit of what is physically installed. However, the calculation of response files is still limited to a maximum of 100 MB each.
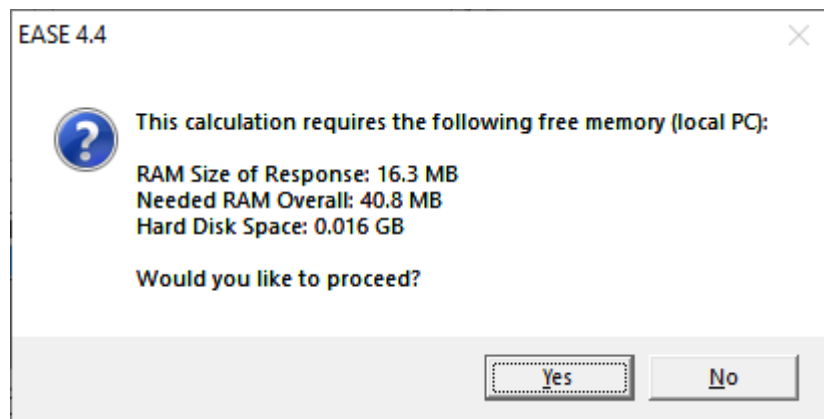
Local Ray Tracing Window

This sets parameters for computing a response file at the current viewpoint and starts the calculation. While commonly displayed as a simple monophonic Reflectogram the computed data includes magnitude, phase, and direction of arrival for all **Rays (in Probe) 3D Hedgehog**. It can also be convolved with a **Head Related Transfer Function** to produce a **Binaural Impulse Response**.
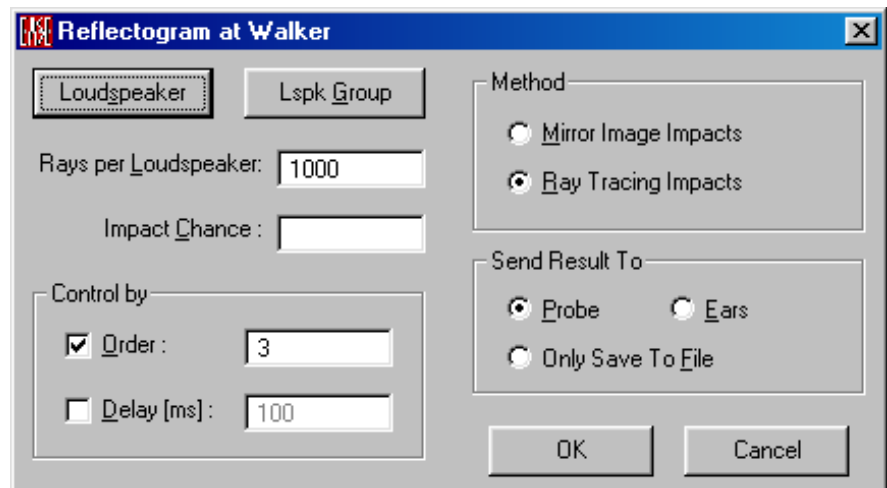
Loudspeaker

Left click displays a list of **Loudspeakers** that have been defined for the project. **Loudspeakers** that are **On** will be highlighted. Left click to toggle these and other **Loudspeakers ON** or **OFF** as desired.

Loudspeaker Group

Left click displays a list of **Loudspeaker Groups** that have been defined for the project. **Loudspeaker Groups** that are **On** will be highlighted. Left click to toggle these and other **Loudspeaker Groups ON** or **OFF** as desired.

Rays per Loudspeaker Window

Enter the number of rays to be used for each **Loudspeaker** in the calculation. (less than 1,000 for basic reflection patterns, 100,000 or more for Auralization.

Impact Chance Window

This is a probability computation by EASE based on calculation parameters entered by the User.

Method

Sets the computation method for the **Reflectogram**.

Mirror Image Impacts

If checked, the **Mirror Image** method will be used to compute the **Reflectogram**. This method takes a lot longer to compute, particularly for larger rooms, but it is the more precise.

Ray Tracing Impacts

If checked, **Ray Tracing** will be used to compute the **Reflectogram**. This method is much faster, but is less precise than **Mirror Image**.

Control By

Sets the limits on the length of the computation.

Order Window

If Order is checked, this sets the highest ordered reflection that will be computed. Use a small number (5-7) for basic reflection patterns, a larger number for **Auralization**.

Delay (ms)

If checked, maximum time allowed for reflections after direct sound in ms can be set.

Send Results To

Sets the use of the **3D Reflectogram**.

Probe

If checked, the completed **3D Reflectogram** will be displayed by the **Probe** for analysis.

Ears

If checked, the completed **3D Reflectogram** will be sent to the **Auralization** module.

Only Save to File

If checked, the completed Reflectogram will be saved to a **Filename** in a folder chosen by the User.

OK

This accepts the calculation parameters and opens a **Save File** window so a folder and filename for the **Response File (.RSP)** can be entered.

Cancel

Abort the calculation and close this window.

Compute Local Decay Time Window

This sets parameters for a **Local Decay Time Calculation** and initiates a Calculation. To compute **Local Decay Time**, EASE sends out rays from selected or scanned **Audience Area** positions or selected **Listener Seats** and observes the dB loss going through the air and after being reflected from **Faces**. Each ray is computed for 60 dB of loss and averaged with all other rays. **Local Decay Time** is useful in studying rooms where reverberation may vary with position, for example, with seating under a balcony.

Room Mapping:
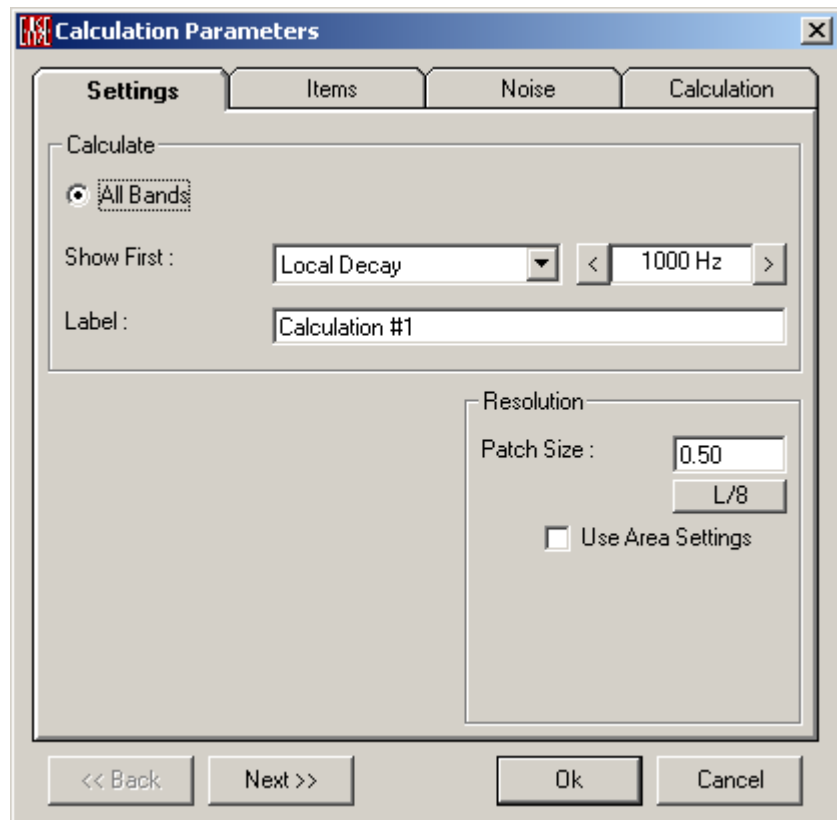
Area Mapping:
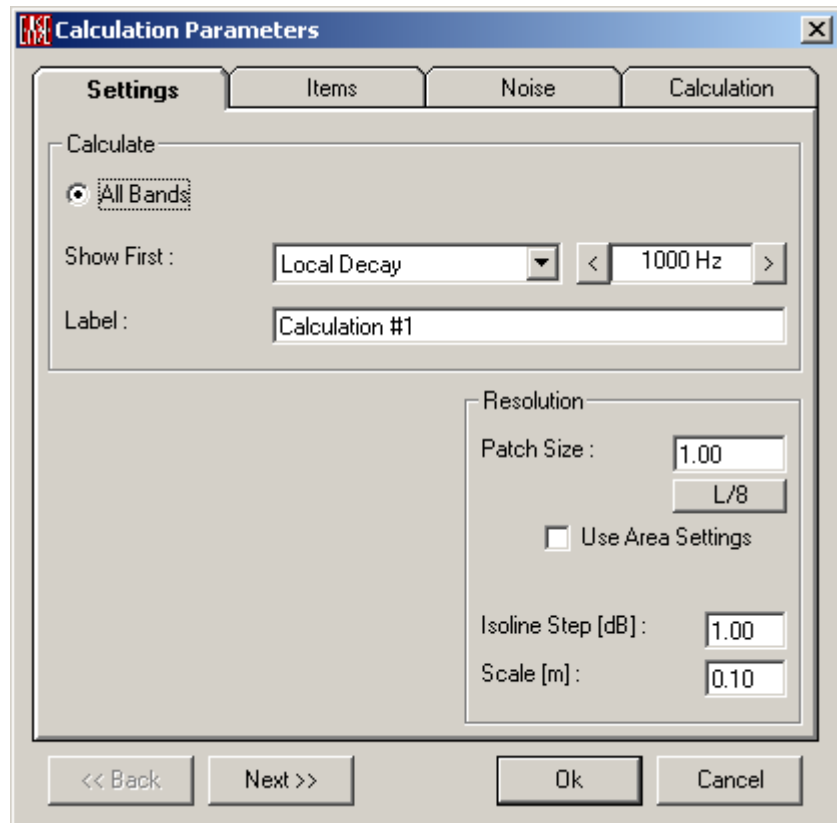
<<Back

Moves to the previous tab.

Next>>

Moves to the next tab.

OK

Accept all parameters and begin the calculation

Cancel

Cancel the calculation.

Settings Tab

Sets basic calculation parameters.

Calculate

Show First

Local Decay

Only **Local Decay Time** can be calculated.

Frequency Selection Window

Local Decay Time is calculated for all frequencies and displayed as a function of the frequency. The set **Frequency** will be the first displayed.

Label

This window allows entering a user-defined label for this calculation of mappings.

Resolution

This is the maximum distance (in feet or meters) between adjacent sample points used to compute the mapping on **Faces** and **Audience Areas**. There is an interaction between **Resolution** and calculation speed. If the **Resolution** value is doubled, calculation time drops by a factor of four because only one-fourth as many points or areas must be calculated.

Note: Any **Resolution** setting that causes an **Audience Area** to be divided into fewer than four segments per side can result in that area not being computed. This can happen with very large resolution numbers and/or with relatively small **Audience Areas**.

Patch Size

This sets the resolution in distance (feet or meters as set in **EASE Main Options**) or Pixels, depending on the setting of **Use Area Settings**. The smallest patch size that EASE can compute is 1 cm (0.03 ft.).

L/8

This computes 1/8 wavelength for the selected frequency and sets the **Resolution** to that distance. 1/8 wavelength resolution is needed to fully show interference at a given frequency.

Use Area Settings

This changes the definition and use of resolution settings.

If **Use Area Settings** is checked:

1. The Resolution set in the Patch Size box is in this case only valid for faces

2. Isoline and patch calculations on areas will use the Scanning P3>P2 and Scanning P2>P1 values set in the Properties window for each Audience Area.

If **Use Area Settings** is <u>not</u> checked the resolution set in the **Patch Size** box (in feet or meters) will be used for both **Patch** and **Isoline** calculations and here for faces as well as areas.

Isoline Step (dB) Window (Area Mapping Only)

This sets the amplitude resolution for displays using **Isolines** (lines of equal SPL). Default is 1 dB steps.

Scale (Area Mapping Only)

The right scroll bar in the **Area Mapping** window can be used to rotate the display to show a 3D display of plotted results. **Scale** sets the vertical displacement corresponding to an **Isoline Step**.

Items Tab

Selects the **Audience Areas, Faces,** and **Listener Seats** where calculations will be made.

Room Mapping:

Area Mapping:

Mapping

Calculations can be performed for selected **Audience Areas**, **Listener Seats**, and **Faces**.

On Areas

If checked, calculations will be performed for, and mapped onto, **Audience Areas** and **Area Groups in Use**.

On Seats

If checked, calculations will be performed for **Listener Seats** and **Seat Groups in Use**.

On Faces (Eyes Only)

If checked, calculations will be performed for, and mapped onto, **Faces in Use**.

Faces in Use (Eyes Only)

If **Mapping On Faces** is checked, calculations will be Mapped to **Faces in Use**.

Face

Left click for a list of **Faces**, with **Faces In Use** highlighted. Left click to select a **Face**, <CTRL> Left click to select additional **Faces**.

Audience Areas in Use

If **Mapping On Audience Areas** is checked, calculations will be mapped to **Audience Areas in Use**.

Aud. Area

Left click for a list of **Audience Areas**, with **Audience Areas In Use** highlighted. Left click to select an **Audience Area**, <CTRL> Left click to select additional **Audience Areas**.

Area Group

Left click for a list of **Audience Area Groups**, with **Audience Area Groups In Use** highlighted. Left click to select an **Audience Area Group**, <CTRL> Left click to select additional **Audience Area Groups**.

Listener Seats in Use

If **Mapping On Listener Seats** is checked, calculations will be Mapped to **Listener Seats in Use**.

List. Seat

Left click for a list of **Listener Seats**, with **Listener Seats In Use** highlighted. Left click to select a **Listener Seat**, <CTRL> Left click to select additional **Listener Seats**.

Seat Group

Left click for a list of **Listener Seat Groups**, with **Listener Seat Groups In Use** highlighted. Left click to select a **Listener Seat Group**, <CTRL> Left click to select additional **Listener Seat Groups**.

Noise Tab

This allows entry of measured or predicted noise levels for the Room for use in intelligibility calculations.

Chart

The unweighted noise levels are shown here in a tabular form. They can be entered as a function of frequency.

Levels

+10 dB, +1 dB, -1 dB, -10 dB

By means of these buttons you increase or decrease the noise level for all frequencies at the same time.

All to Sel.

This will set the noise level at all frequencies to the selected level of a single frequency band.

Interpolate

This allows interpolating for example octave band values to 1/3rd octave band ones.

All Off

This command will switch off the noise for all frequencies and for all types of calculation.

Load File

Opens a file dialog window to load a file with user defined noise curves (*.exn).

Save File

Opens a file dialog window to save a file with user defined noise curves (*.exn).

Calculation Tab

Sets parameters for the ray tracing calculation.
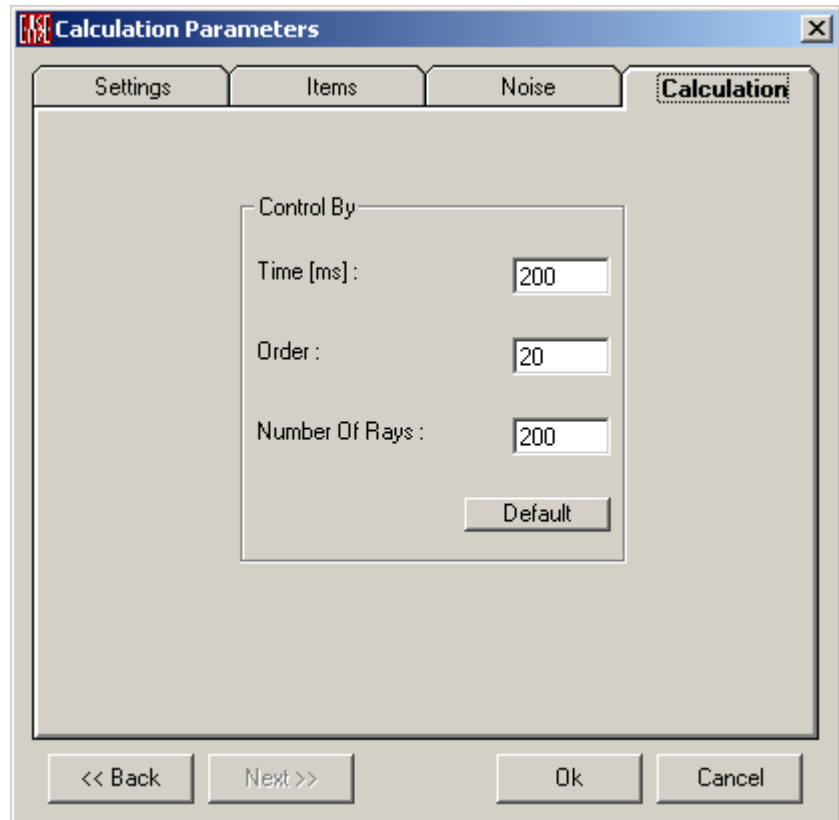
Control By

Time [ms]

Sets the cut-off time for the ray tracing. This defines the maximum travel time for a ray to be considered. For local decay time computations it only has to be long enough to capture sufficient detail, that is, absorption information, about the surrounding room. The default is 200 ms.

Order Window

Sets the highest **Order** reflection to compute. For local decay time computations the cut-off order has to be high enough to capture sufficient detail, that is, absorption information, about the surrounding room. The default is 20.

Number of Rays Window

Sets the **Number of Rays** to be used in the calculation. For local decay time calculations this number can be fairly low, since unlike for typical ray-tracing where a random ray must hit a receiver to generate one bit of information, here every ray and every reflection are used to determine the local decay time. The default is 200.

Default

Resets **Time**, **Order** and **Number of Rays** to their default. Default settings are 200 ms, 6th order and 200 rays.

Mapping Evaluation Window

The Mapping Evaluation Window is used to show the results of all mapping calculations and to control the mapping directly.

General Items

 Minimize / Maximize
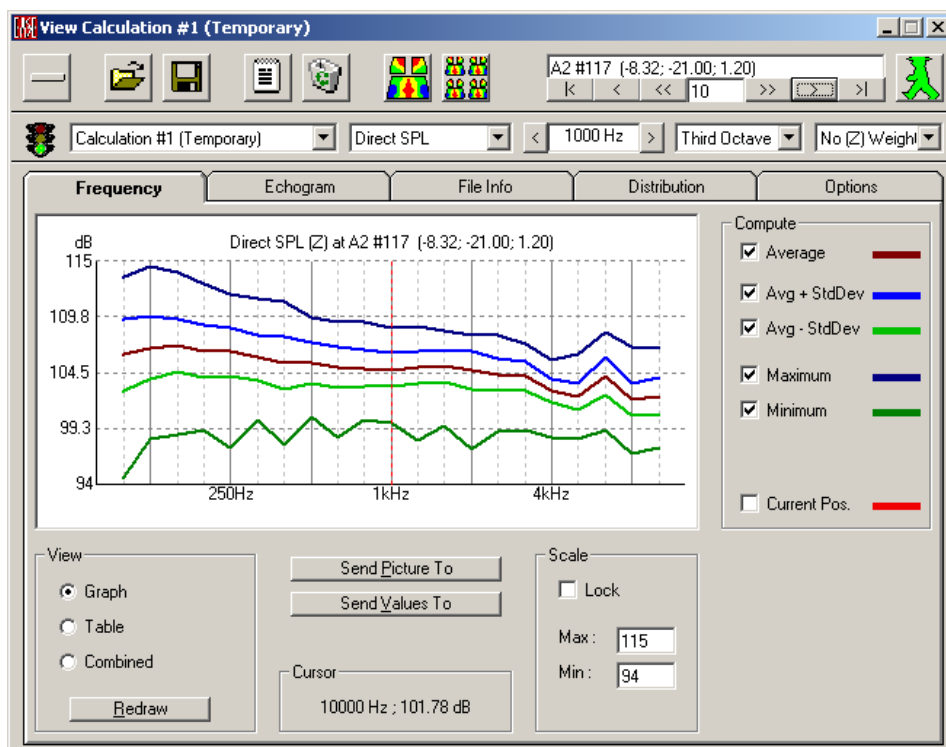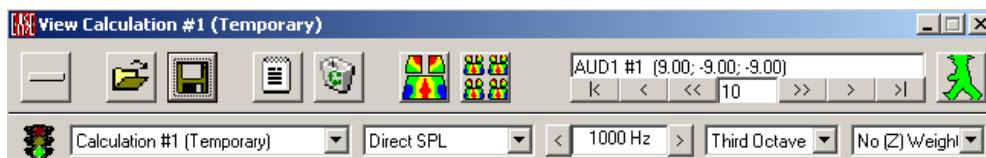
Shows only the upper part of the Evaluation Window to control the mapping selection

 Load

Loads an EASE Mapping file (*.emp) for mapping and other post processing.

 Save

Saves an EASE Mapping file (*.emp) for mapping and other post processing.

 Save Textfile

Saves a textfile (*.txt) in ASCII format which holds all the results of the calculation for the selected cursor position.

 Close

Closes the Mapping Evaluation Window.

 Rerender

Renders the Calculation Results to Audience Areas or Listener Seats under Room Mapping as well under Area Mapping.

 Rerender All

Renders all activated Calculation Results to Audience Areas or Listener Seats under Room Mapping as well as under Area Mapping. Optionally it transfers these results to EASEPaD, see also Select Mapping Window.
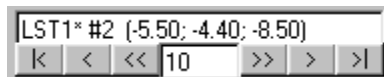
 Position

Shows the actual Mapping Area or Listener Position and the running number of all selected mapping points. Cursor arrows allow to jump from position to position in steps bigger than 1 (default: 10).

If you are interested to switch to a certain location in the room, activate the **Pick** mouse mode in the main window and press the **Walker** icon to the Mapping Evaluation Window. In this mode you can pick any 3D location in the main window and the mapping point that is closest to this location will be selected automatically for the **Position**.

 Walker

If checked, this indicates the actual Cursor Position on Mapping Areas or Listener Seats by means of the **Walker** symbol

When the **Pick** mouse mode is active, changing the **Walker** location in the main window will automatically choose the closest available mapping point for the **Position**.

Green light indicates an exact match between the current project and the project of the select mapping file. Yellow light indicates a minor deviation. Red light indicates that there were geometrical changes in the room drawing or in the loudspeaker system.

 Choose Calculation

Before Mapping calculation starts you can choose the corresponding label for the mapping file, Calculation #1 is the first default label name.

Direct SPL ▼ **Choose Mapping Parameter**

Selects the type(s) of calculations to be displayed first.

Direct SPL

This map shows the direct sound pressure level in dBSPL of the sound sources (e.g. **Loudspeakers)** that are **On**. See Appendix A, Direct SPL

Total SPL

This map shows the sum of the **Direct** and **Reverberant** sound pressure level in dBSPL of the sound sources (e.g. **Loudspeakers)** that are **On**. See Appendix A, Direct SPL

Lspk Overlap (not in AURA module)

This map shows the number of **Loudspeakers** of comparable intensity at a given location.

The value 1 indicates areas without any overlap between **Loudspeakers**. If the value exceeds 1.5 (maximum is the number of all Loudspeakers at full overlap) comb filtering or other undesirable interference behaviors should be expected.

Critical Distance (not in AURA module)

This map shows the ratio of direct to reverberant sound in terms of distance. **Critical Distance** is a distance from the source where the direct sound equals the reverberant sound. This is displayed in the map as 1. A value of 2 is twice critical distance etc.

D/R Ratio (not in AURA module)

This map shows the ratio of direct to reverberant sound in decibels.

The relationship between **D/R Ratio** and **Critical Distance r_C** is:

D/R Ratio = 20 log r_C dB – 20 log r dB

(where **r** is the distance from the source to the point of investigation)

EDT (Early Decay Time) (only in AURA module)

This map shows the **Early Decay Time**. EDT is the time required for the first 10dB of decay of sound energy multiplied by 6 to extrapolate to a 60-dB decay.

T-10 (only in AURA module)

This map shows the reverberation time T-10. T-10 is the time required after excluding the first 5dB for the sound energy to decay further 10dB, multiplied by 6 to extrapolate to a 60-dB decay.

T-20 (only in AURA module)

This map shows the reverberation time T-20. T-20 is the time required after excluding the first 5dB for the sound energy to decay further 20dB, multiplied by 3 to extrapolate to a 60-dB decay.

.

T-30 (only in AURA module)

This map shows the reverberation time T-30. T-30 is the time required after excluding the first 5dB for the sound energy to decay further 30dB, multiplied by 2 to extrapolate to a 60-dB decay.

Arrival Time

This map shows the sum of the electrical delay and the acoustic travel time for the first front arrivals in milliseconds. The displayed times include any electrical **Alignment** or **Delay Times** set for those sound sources (e.g. **Loudspeakers)** used in the calculation. This map can be used to set delay times between clusters.

ITD Gap (not in AURA module)

This map shows the arrival time difference between the first two direct sound arrivals at each point.

Definition D50 (only in AURA module)

This map shows the Definition function D in %. See Appendix A, Definition Measures .

Clarity Measures

This map shows the ratio of energy, in decibels, before and after a certain split time. The scaling of all C-Plots is in dB.

See Appendix A, Clarity Measures

C7 (not in AURA module)

This map shows the ratio of energy before and after 7 milliseconds in decibels. This map is used to predict the strength of direct sound of sources.

Definition Measure C50

This map shows the Definition Measure function C50 in dB, which is the ratio between the energy in the first 50ms and the energy after 50ms. This map is used to predict speech intelligibility. See Appendix A, Definition Measures

Clarity C80

This map shows the ratio of energy before and after 80 milliseconds in decibels. This map is used to predict the articulation of different modes of music. See Appendix A, Clarity Measures.

C-Split (not in AURA module)

This map shows the ratio, in decibels, of energy before and after a user specified split time in milliseconds.

Pressure Levels (not in AURA module)

This map shows the sum of the sound pressure levels in dBSPL of the Loudspeakers within a limited arrival time. See Appendix A, Pressure Levels

L7

This is the sum of the direct and reverberant sound energy in dBSPL within the first 7 ms.

L50

This is the sum of the direct and reverberant sound energy in dBSPL within the first 50 ms.

L80

This is the sum of the direct and reverberant sound energy in dBSPL within the first 80 ms.

L-Split

This is the sum of the direct and reverberant sound energy in dBSPL, within the user specified split time in ms.

Center Time t$_s$ (only in AURA module)

This map shows the Center Time which is defined as the ratio between the summed-up products of the energy components of the arriving reflections and their corresponding delays to the total energy component. See Appendix A, Center time Measure

LF (only in AURA module)

This map shows the Lateral Fraction in percentage. LF is a measure of the perception of the spatial extension of sources. See Appendix A, Lateral Fraction Measures

LFC (only in AURA module)

This map shows the Lateral Fraction Coefficient in percentage. LFC is a measure of the perception of the spatial extension of sources. See Appendix A, Lateral Fraction Measures

Sound Strength G (only in AURA module)

This map shows the Sound Strength Measure G in dB. G is ratio between the energy in a room at given location to the energy at 10m from the same source in free field. See Appendix A, G

Speech Transmission Index STI

This map shows the calculated Modulation Transfer Indices MTI and the derived Speech Transmission Indices for different weighting factors. The calculation is based on IEC 60268-16. See Appendix A, STI

Articulation Loss

This map shows the **Articulation Loss of Consonants**. This calculation is based upon the STI calculations and converted to ALCons using the Farrel Becker's equations. See Appendix A, STI

Articulation Index (not in AURA module)

This map shows the **Articulation Index**. See: ANSI S3.5-1997 "Methods for Calculation of Speech Intelligibility Index"

Privacy Index (not in AURA module)

This map shows the **Privacy Index** in percent. See Appendix A, Privacy Index

Echo Speech (only in AURA module)

This map shows a calculation that applies a weighting function (proposed by Dietsch and Kraak) to the echogram to predict how seriously late energy will degrade speech intelligibility. Computed values greater than 1 are likely to be problematic, and values greater than 0.9 are marginal. See Appendix A, Echo Criteria.

Echo Music (only in AURA module)

This map shows a calculation that applies a weighting function (proposed by Dietsch and Kraak) to the echogram to predict how seriously late energy will degrade the quality of music. Computed values greater than 2 are likely to be problematic, and values greater than 1.5 are marginal. See Appendix A, Echo Criteria.

 Choose Frequency

Selects frequency for mapping display
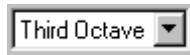
 Choose Bandwidth

Third Octave

One Octave

Three Octaves

Broad Band

To (selectable frequencies)

By selecting a frequency under Choose Frequency as a lower band limit you can here select the upper band limit for display.

Note: If you have selected Interference/Sinus in the Calculation Tab under Standard or Standard with Reflections Mapping then these sinusoidal results will be mapped accordingly when the Third Octave option in the Evaluation Window is used.
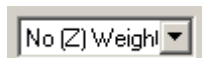
 Weighting

No (Z) Weighting

This setting displays SPL-based maps, like Direct SPL or Total SPL, with no (Zero) weighting applied.

A-Weighted

This setting displays SPL-based maps, like Direct SPL or Total SPL, with A-weighting applied.

Frequency Display Tab
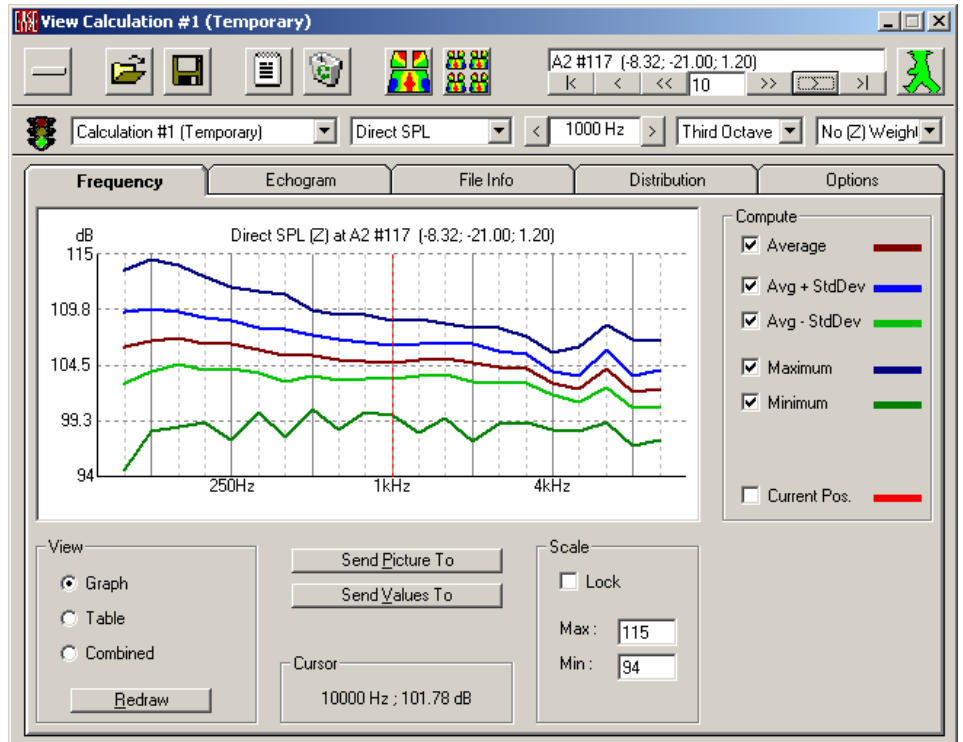
Display Window

Computes and displays the frequency response of the selected acoustic parameter for conditions you can select under Compute.

Compute

Average

Shows the average frequency response for all calculation points.

Avg + StdDev

Shows the average frequency response increased by the standard deviation for all calculation points.

Avg - StdDev

Shows the average frequency response reduced by the standard deviation for all calculation points.

Maximum

Shows the maximum frequency response for all calculation points.

Minimum

Shows the minimum frequency response for all calculation points.

Current Pos.

Shows the actual frequency response at the running calculation point.

View

Graph

Shows the frequency responses as graphs.

Table

Shows the frequency responses in tables.

Combined

Shows the frequency responses as graphs as well in tables.

Redraw

Redraws graphs or tables after changing a display parameter.

Send Picture to

This allows the current active picture to be sent to the Clipboard, a File, or EASE Page Designer.

Clipboard

This copies the picture to the clipboard for use in other applications.

File

This saves the picture to a file. The files can be saved in many formats, including:

> Windows Bitmap……………………………*.BMP
>
> JPEG…………………………………………*.JPG
>
> CompuServe GIF……………………………*.GIF
>
> Portable Network Graphics…………………*.PNG
>
> Tagged File Format…………………………*.TIF
>
> LuRa Tech Wavelet…………………………*.LWF
>
> Zsoft Paintbrush…………………………...*.PCX
>
> Windows Icon……………………………….*.ICO
>
> Enhanced Windows Metafile……………….*.EMF
>
> Truevision Targa……………………………*.TGA.

EASE Page Designer

This opens the current active picture in the **EASE Page Designer** module, allowing modifications to, and annotations of the picture before printing.

Send Value to

This allows the current active picture values to be sent to the Clipboard.

Clipboard

This copies the values to the clipboard for use in other applications.

MS Excel

For further post processing the mapping values are exported to MS Excel directly.

Cursor

Shows the actual cursor position by moving the mouse cursor over the display area.

Scale

Allows adapting the amplitude values of the graph to selected numbers.

Lock

Locks the amplitude display for selected values.

Min

Sets the minimum of the amplitude values.

Max

Sets the maximum of the amplitude values.

Echogram Tab
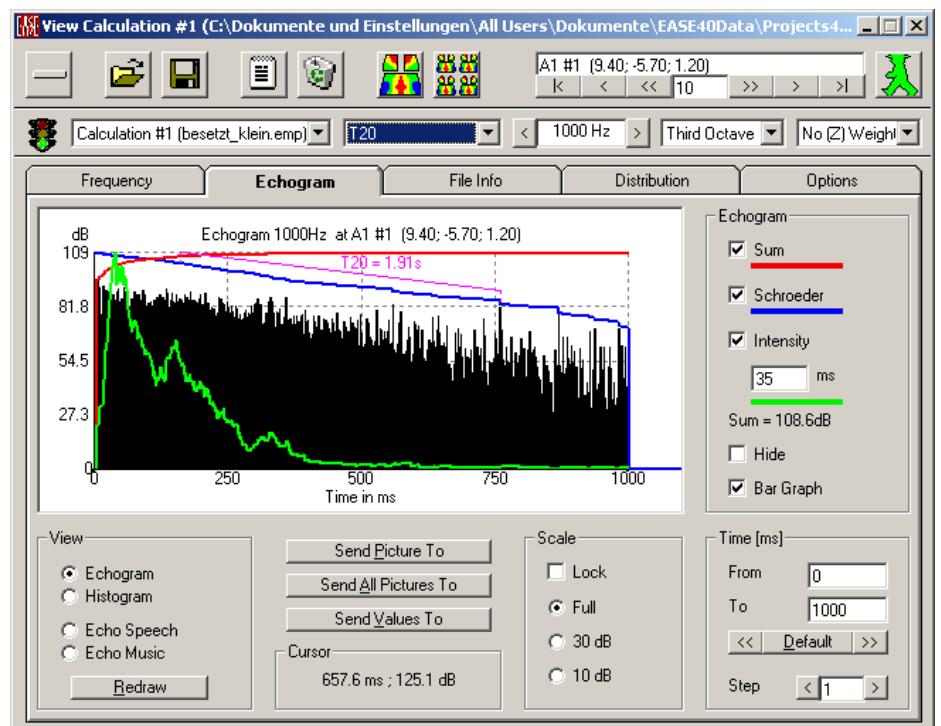
Display Window

Shows the echogram (1ms energy contributions vs. time) in squared energy view (black color) and optional in additional other views.

Echogram

Allows selecting additional views of the echogram

Sum (in red)

Allows showing the summation energy vs. time

Schroeder (in blue)

Shows the Schroeder plot and if a reverberation time parameter is selected additionally the regression line with the actual RT or EDT value

Intensity (in green)

Shows an ear weighted response to make visible irregularities inside the echogram

Time Constant Window

Chooses the time constant for weighting the envelope of the echogram

Hide

Hides the squared energy view of the echogram

Bar Graph

Changes the bar graph view of the squared energy echogram to a line graph view.

View

Allows changing the echogram display.

Echogram

Normal echogram vs. time.

Histogram

Here the impacts per bin are shown. In case of energy loss calculations an even distribution for the tail part should be expected. Impacts less than 10 must be avoided.

In case of particle loss a corresponding impact density within the first 200ms should be reached.

Echo Speech

This option shows a calculation that applies a weighting function (proposed by Dietsch and Kraak) to the echogram to predict how seriously late energy will degrade speech intelligibility. Computed values greater than 1 are likely to be problematic, and values greater than 0.9 are marginal. See Appendix A, Echo Criteria.

Echo Music

This option shows a calculation that applies a weighting function (proposed by Dietsch and Kraak) to the echogram to predict how seriously late energy will degrade the quality of music. Computed values greater than 2 are likely to be problematic, and values greater than 1.5 are marginal. See Appendix A, Echo Criteria.

Redraw

Redraws graphs or tables after changing a display parameter.

Send Picture to

This allows the current active picture to be sent to the Clipboard, a File, or EASE Page Designer.

Clipboard

This copies the picture to the clipboard for use in other applications

File

This saves the picture to a file. The files can be saved in many formats, including:

Windows Bitmap……………………………*.BMP

JPEG…………………………………………*.JPG

CompuServe GIF……………………………*.GIF

Portable Network Graphics………………….*.PNG

Tagged File Format…………………………*.TIF

LuRa Tech Wavelet…………………………*.LWF

Zsoft Paintbrush……………………………..*.PCX

Windows Icon……………………………….*.ICO

Enhanced Windows Metafile……………….*.EMF

Truevision Targa……………………………*.TGA.

EASE Page Designer

This opens the current active picture in the **EASE Page Designer** module, allowing modifications to, and annotations of the picture before printing.

Send All Pictures to

EASE Page Designer

This transfers all 21 active 1/3 octave band pictures to the **EASE Page Designer** module, allowing modifications to, and annotations of, the pictures before printing.

Cursor

Shows the actual cursor position by moving the mouse cursor over the display area.

Scale

Allows adapting the amplitude values of the graph to selected numbers.

Lock

Locks the amplitude display for selected values

Full

Shows the full amplitude range of the display

30 dB

Shows only the upper 30dB of the full amplitude range of the display

10 dB

Shows only the upper 10dB of the full amplitude range of the display

Time [ms]

Allows the selection of the time window of the echogram for display

From

Selects the lower time limit of the echogram for display

To

Selects the upper time limit of the echogram for display

<< / >>

Allows the selection of intermediate values

Default

Sets the default values, selected before the calculation is started.

Step

< 1 or 5 or 10 or 50 or "new value by hand" >

Sets the bin width within the echogram to sort energy in bigger bin boxes. This can help to overcome display distortions especially by calculations with Particle Loss. Default width is 1msec.

File Info Tab
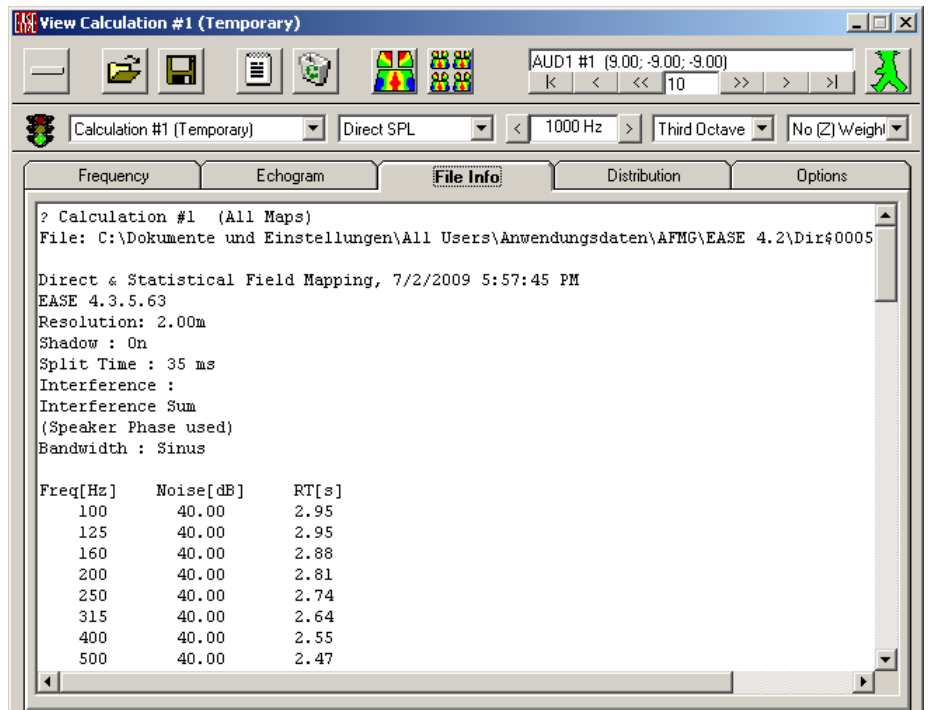
This window holds all parameters used for the mapping calculations

Distribution Tab

This window shows the selected measure distribution vs. used listener seats or areas in %. So e.g. in the case of direct sound level, the window shows the estimate of the quality of the sound distribution within the whole audience area. A uniform distribution is certainly achieved if 90% of the listeners have levels within 6dB.
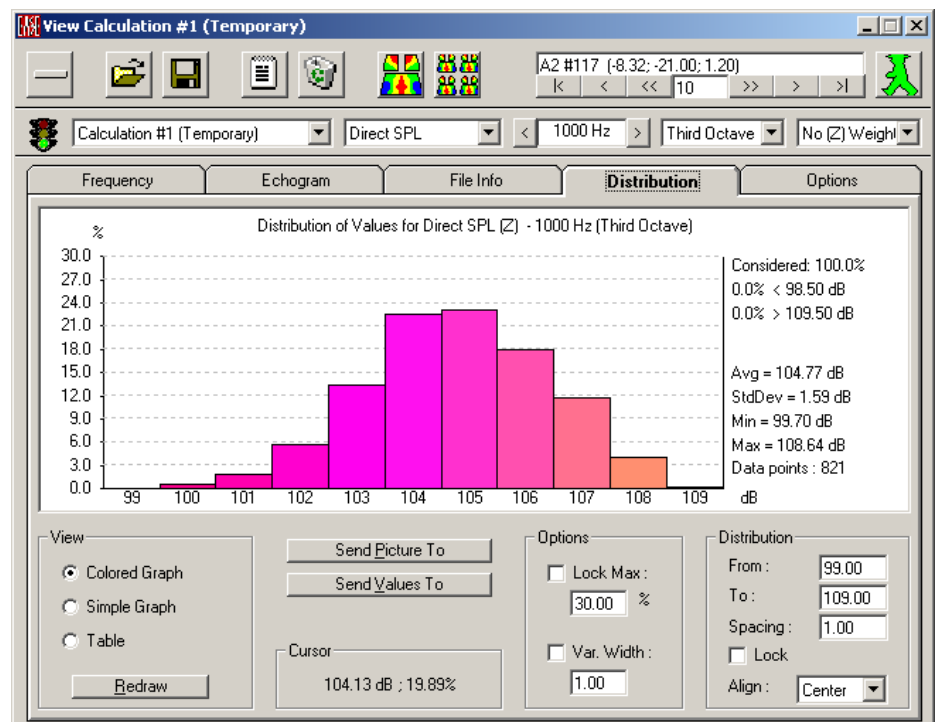
View

Allows changing the distribution display.

Colored Graph

Displays the graph in colors defined by the actual legend, which is useful for good association with the rendered map.

Simple graph

Displays the graph without colors, which is useful for the creation of documents in black and white.

Table

Displays the calculated data in a tabular format.

Redraw

Redraws graphs or tables after changing a display parameter.

Cursor

Shows the actual cursor position when moving the mouse cursor over the display area.

Options

Allows adapting the display parameters.

Lock Max

Fixes the current maximum of the display window at a user defined percentage value.

Variation Width

Sets the size of the integration interval. If this value is chosen differently from the Spacing, data points may not be included or they be used twice due to overlapping intervals.

Distribution

Allows adapting the range and the spacing of the data used for the distribution statistics.

From

Selects the lower limit used for the distribution calculation.

To

Selects the upper limit used for the distribution calculation.

Spacing

Selects the spacing between integration intervals used for the distribution calculation.

Lock

Locks the spacing and lower and upper limits for better comparison. Switch off for automatic scaling.

Align

Sets how the spacing is used based on the upper and lower limit.

Send Picture to

This allows the current active picture to be sent to the Clipboard, a File, or EASE Page Designer.

Clipboard

This copies the picture to the clipboard for use in other applications

File

This saves the picture to a file. The files can be saved in many formats, including:

> Windows Bitmap……………………………*.BMP
>
> JPEG…………………………………………*.JPG
>
> CompuServe GIF…………………………….*.GIF
>
> Portable Network Graphics………………….*.PNG
>
> Tagged File Format………………………...*.TIF
>
> LuRa Tech Wavelet………………………….*.LWF
>
> Zsoft Paintbrush……………………………..*.PCX
>
> Windows Icon……………………………….*.ICO
>
> Enhanced Windows Metafile……………….*.EMF
>
> Truevision Targa…………………………….*.TGA.

EASE Page Designer

This opens the current active picture in the **EASE Page Designer** module, allowing modifications to, and annotations of the picture before printing.

Send Values to

This allows the current active picture values to be sent to the Clipboard.

Clipboard

This copies the values to the clipboard for use in other applications.

Options Tab
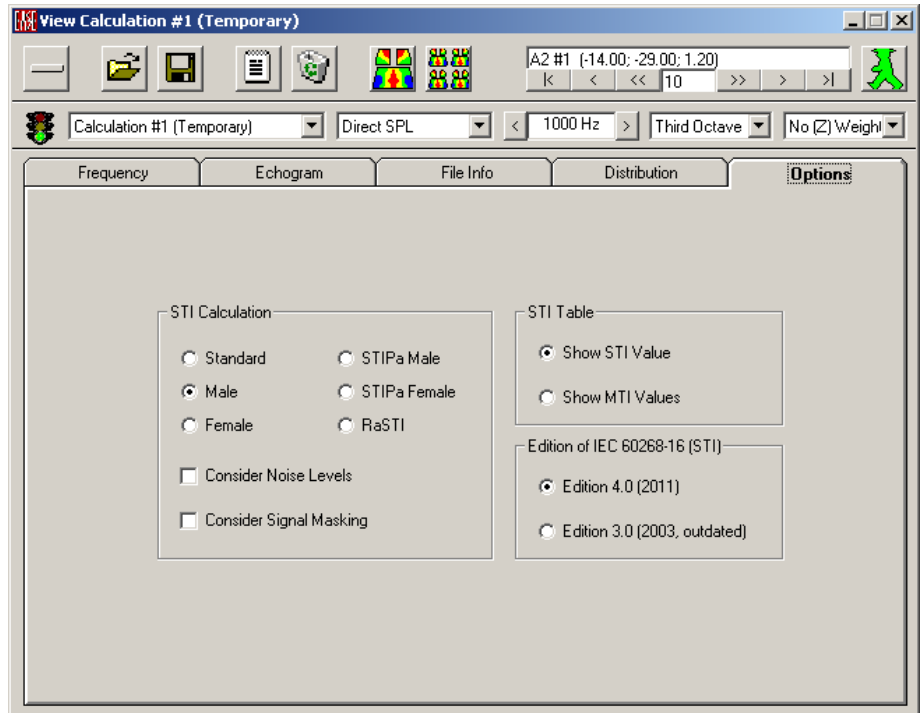
STI Calculation

By checking the radio button you can choose:

Standard

Uses Standard weighting factors for the STI calculation, see Appendix A, STI.

Male

Uses male weighting factors for the STI calculation, see Appendix A, STI.

Female

Uses female weighting factors for the STI calculation, see Appendix A, STI.

STIPa Male

Uses male weighting factors for the STIPa calculation, see Appendix A, STI.

STIPa Female

Uses female weighting factors for the STIPa calculation, see Appendix A, STI.

RaSTI

Uses standard weighting factors for the RaSTI calculation, see Appendix A, STI.

Consider Noise Levels

Enables S/N correction for calculation of STI and derived measures according to IEC 60268-16, see Appendix A, STI.

Consider Signal Masking

Enables signal masking and hearing threshold corrections for calculation of STI and derived measures according to IEC 60268-16, see Appendix A, STI.

STI Table

By checking the radio button you can choose:

Show STI Value

Displays a single STI values for all frequencies under STI/Tables.

Show MTI Value

Displays 7 octave MTI values for all 21 1/3 octave frequencies under STI/Tables.

Edition of IEC 60268-16 (STI)

In EASE the only difference between the implementations of Edition 3.0 vs. 4.0 is the revised function for signal masking.

Edition 4.0 (2011)

Enables calculation of STI and derived measures according to IEC 60268-16:2011, see Appendix A, STI.

Edition 3.0 (2003, outdated)

Enables calculation of STI and derived measures according to IEC 60268-16:2003, see Appendix A, STI.

Select Mapping Window
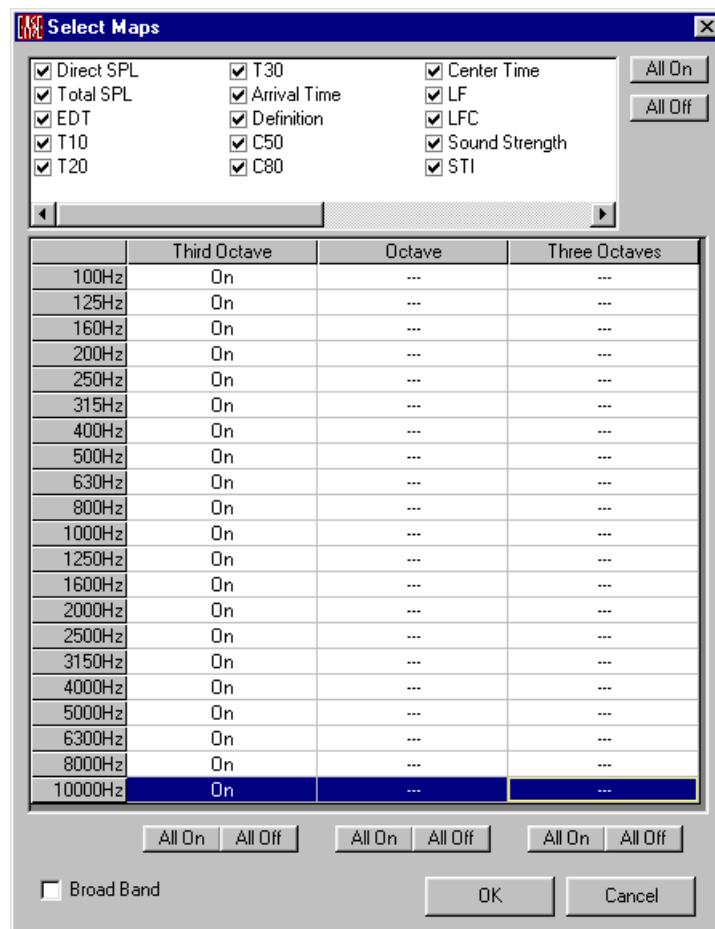
With this Window you are able to select the acoustic measures and the corresponding frequency resolutions for mapping presentations in EASEPaD.

Please watch the Timer Step to set the time interval during screen demonstrations.

Chapter VI : Ease Vision/ Light Source Base/ Texture Base

EASE Vision

Architectural Rendering is a new feature in EASE 4.0 that allows you to enhance the visual presentation of a project. While **EASE Vision** is the basic module, you will need the **Light Source Base** and the **Texture Base** in order to create a specific light and texture library. **Textures** and **Lamps** are entered into the model in the **Room Editor.**

Light Source Base Window

This window allows creating a **Light Source** and changing the properties of an existing one. The properties that you can determine include **Label, Firm, Color** and **Type**. The default setting for a **Light Source** is a sphere with a white light.
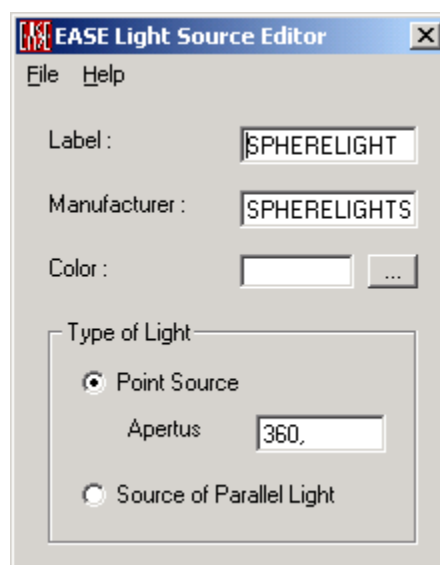
File Menu

New Light Source

This allows the creation of a new **Light Source**.

Open Light Source

This allows the opening of an already existing **Light Source**.

Save Light Source

This saves the current **Light Source** file immediately to the existing .BLB file.

Save Light Source As

This saves the current **Light Source** to a different file name. The **Light Source** is saved as follows:

> EASE Light Source……………………………*.BLB

Exit

This exits the **Light Source Base Window**.

Help Menu

About

This displays information about your EASE program.

Light Source Tab

Label

This allows you to assign a specific name to a **Light Source**.

Manufacturer

This allows you to enter a name if you consider using a **Light Source** from a certain company.

Color

This allows the selection of a color for a specific **Light Source**.

To use this command:

4. Left click on **Color.**

5. This opens the **Color** window to allow setting of the **Light Source** color.

6. Left click on **OK.**

Type of Light

Type of Light allows you to distinguish between a **Point Source** and a **Source of Parallel Light** (sun light). Note that you can adjust the **Apertus** if you go for the first option.

Texture Editor Window

This window allows creating new **Textures** and changing existing ones. The default setting is a white wall with 100% diffusion, all other layers set to 0. Things that you can determine are **Color, Name** and properties such as

---

Transparency, **Reflection** and **Diffusion**. In addition to that, it is possible to **import *.BMP** or ***.TGA files**, a method that can help to enhance the illusion of a photo-realistic rendering in a fast, easy and convincing manner.
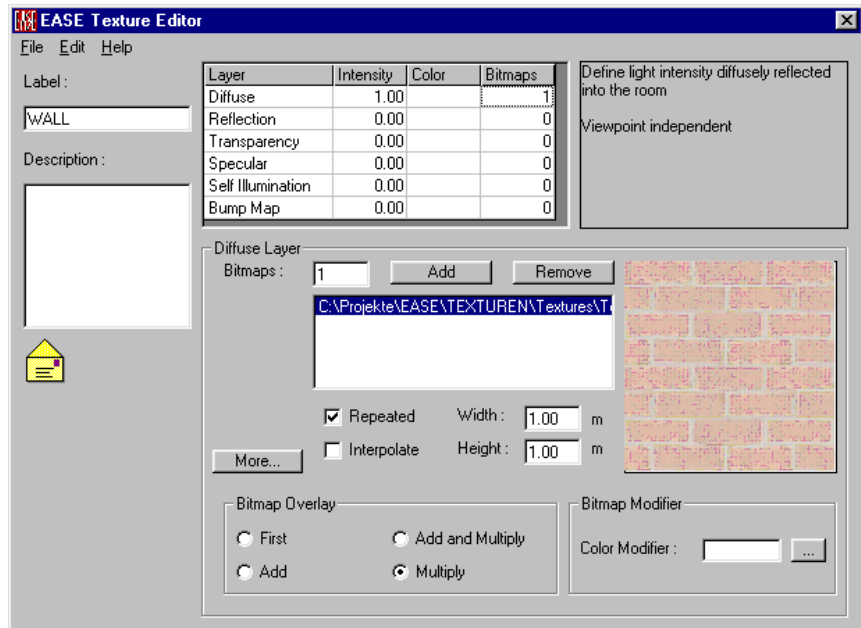
File Menu

New

This allows creating a new **Texture**.

Open

This allows opening an already existing **Texture**.

Save

This saves the current texture file immediately to the existing .TEX file.

Save As

This saves the **Texture** to a file. The **Texture** is saved as follows:

      EASE Texture……………………………*.TEX

Exit

This exits the **EASE Texture Base Window** .

General Description Tab

Label

This allows assigning a specific name to a **Texture**

Description

This allows writing a more elaborate description of the **Texture**.

Edit Menu

Edit Menu allows you to define and organize the properties of a **Texture** on different layers. On the **Edit Texture Window** itself, you can find an overview of those six layers showing the **Name** (e.g. Diffuse)**, Intensity** (value between 0 and 1)**, Color** and the path of all imported **Bitmaps**. Besides **Angular Dependency**, which deals with general determinations about how the light is reflected, you can work with the following layers:

Diffuse Layer

Diffuse Layer defines the light intensity diffusely reflected into the room. Note that this is viewpoint independent.

Note: The sum intensity of **Diffuse**, **Reflection** and **Transparence Layer** should be equal to 1.

Reflection Layer

Reflection Layer defines the amount of light reflected into the room. Note that reflection is viewpoint dependent. 100% reflection is typical for surfaces such as mirrors.

Note: The sum intensity of **Diffuse**, **Reflection** and **Transparence Layer** should be equal to 1.

Transparence Layer

Transparence Layer defines the amount of light that is transmitted through the material. Properties concerning transparency are independent in terms of the viewpoint. 100% transparency – a value of one – is typical for surfaces such as windows.

Note: The sum intensity of **Diffuse**, **Reflection** and **Transparence Layer** should be equal to 1.

Specular Layer

Specular Layer defines the light intensity reflected into the room in a specular way. Note that this property is dependent on the point of view. The higher the value for the specular layer, the shinier the surface.

Self Illumination

Self Illumination defines the amount of light emitted into the room. Self illumination is independent of the point of view. The higher the value for self illumination, the more fluorescent the material.

Bump Map

Bump Map defines the surface height modification for reflection of light. This is typical for substructures like in rough tapestry. Note that the bitmap serves as an isobars layer with the red components used as height.

Angular Dependency
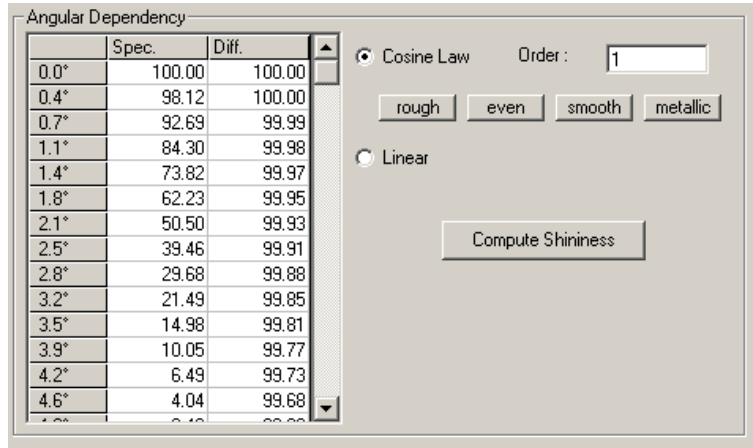
Defines the amount of **specular** and **diffuse reflection** depending on each specific angle. Generally spoken, the higher the angle of the incident light, the higher the amount of specular and diffuse reflection. The **Shininess** can be either computed in a **linear** way or according to the **cosine law**. Using the **cosine law** allows you to also take surface properties in terms of roughness/smoothness into account. If known you can also enter these values manually into the table.

Bitmaps

Bitmaps

Shows the number of imported bitmaps on the specific layer. Note that bitmaps are imported onto the active layer only (the name of the active layer can be seen right above the word **Bitmaps**)!

Add

Allows to import ***.BMP** or ***.TGA** files onto the chosen layer. Note that if you use a bitmap file, it needs to be a 24 Bits per pixel one.

Remove

Allows you to remove the selected bitmap file.

Repeated

Repeats the **Texture** according to the scale of the bitmap and the size of the **Face**, e.g. like tiles on the floor. If not checked the **Texture** will not be repeated, e.g. like a picture on the wall.

Interpolate

This allows you to interpolate between the adjacent pixels of a bitmap. This is especially useful if the bitmap used has a low resolution and it is not desired to let the viewer recognize individual pixels. In other words **Interpolate** smoothes the transition from one pixel to the next.

Width

This allows you to define the width of the imported bitmap in terms of the actual dimension of the image. If you for example had an image of a window that is supposed to be 1m wide, you would have to enter 1. In other words, you can scale the bitmap by inserting an actual value for the width of the imported image.

Height

This allows to define the height of the imported bitmap in terms of the actual dimensions of image. If you for example had an image of a window that is supposed to be 1.5 m high, you would have to enter 1.5. In other words, you can scale the bitmap by inserting an actual value for the height of the imported image.

More

Toggles between normal and extended options

Bitmap Overlay

This defines how different bitmaps of the same layer are combined. The options that are available are as follows:

First

Uses the colors of the first bitmap for overlay. Other bitmaps will be ignored.

Add

Adds the different color steps linearly. That means for every pixel the program will sum up all color values given by the individual bitmaps and create an overall bitmap. This is useful when a wall has characteristic structures of different size.

Add and Multiply

Add and multiplies the different color steps. That means for every pixel the program will sum up and multiply all color values given by the individual bitmaps and create an overall bitmap. This is useful when a wall has characteristic structures of different size and intensity.

Multiply

Multiplies the different color steps. That means for every pixel the program will multiply all color values given by the individual bitmaps and create an overall bitmap. This is useful when a wall has characteristic structures of different intensity.

Bitmap Modifier

This allows you to modify the color of a bitmap.

To use this command:

1. Left click on **Color Modifier** window or **Color Modifier** button**.**

2. This opens the **Color** window to allow setting of the Bitmap Color.

3. Left click on **OK.**

Help Menu

About

This displays information about your EASE program.

Vision Main Window

Key Conventions

F1	Help
F7	Options View Tab
F9	Options General Tab
F10	Options Panels Tab
F11	Zoom In w/o the scroll bars with no limit
F12	Zoom Out w/o the scroll bars with no limit
x	Changes to x-View and changes the selected editing plane to the y-z plane
y	Changes to y-View and changes the selected editing plane to the x-z plane
z	Changes to z-View and changes the selected editing plane to the x-y plane
3	3D-View
Home	Full View
p	Activates the Pick Function Mouse mode
d	Activates the Drag Function Mouse mode
n	Activates the Spin Function
t	Activates Turn Mouse Mode
Left Arrow	Moves the horizontal rotation scrollbar to the left
Right Arrow	Moves the horizontal rotation scrollbar to the right
Up Arrow	Moves the vertical rotation scrollbar upwards
Down Arrow	Moves the vertical rotation scrollbar downwards
PgUp	Moves the Zoom scrollbar up to Zoom-In
PgDn	Moves the Zoom scrollbar down to Zoom-Out

Ctrl+

Changes Pick and Turn Mouse Mode to Drag Mouse Mode

Shift+

Changes Pick and Drag Mouse Mode to Turn

Mouse Conventions

Mouse Modes

Pick	Allows opening the Walker Window for the picked position
Center	This allows picking of a spot and centering that spot on the screen.
Drag	This allows moving the model around on the background. Click on the part of the screen you want to move and hold the LMB and move the mouse to where you want the point to be
Turn	This allows rotating the viewpoint of the model around on the background. Click on the part of the screen you want to rotate and hold the RMB and move the mouse to where you want the point to be. With holding down the LMB you can Zoom In and Out.
Zoom In	This allows a graphic zoom in function. Click on the part of the screen you want the zoom window to start and hold the LMB while dragging the window around the area to be zoomed to. When the LMB is released the zoom will activate.
Zoom Out	This allows a graphic zoom out function. Click on the part of the screen that you want the box to start and hold the LMB while dragging the frame to cover the area of the screen that you want the present picture to cover. When the LMB is released the zoom will activate

Mouse Mode Turn

LMB on picture	This allows rotating the viewpoint of the model around on the background
RMB on picture	This allows zooming in and out

Mouse Wheel

Mouse wheel spinning allows zooming in and out.

File Menu

Acquire Project Data

This forces an information update. A yellow edge in the window indicates that it is necessary to update EASE Vision by using **Acquire Project Data**. A red one indicates that you first need to **check** the **data** in the **Room Editor** before **acquiring** the **project data** in EASE Vision.

Load GL Texture Map

This loads an existing GL Texture Map; so you can visualize complex texture mappings without recalculation.

Save GL Texture Map

This saves a GL Texture Map as an ***.ETX** file.

Send Picture To

This allows the current active picture to be sent to the Clipboard, a File, or EASE Page Designer.

Clipboard

This copies the picture to the clipboard for use in other applications

File

This saves the picture to a file. The files can be saved in many formats, including:

> Windows Bitmap……………………………*.BMP
>
> JPEG…………………………………………*.JPG
>
> CompuServe GIF……………………………*.GIF
>
> Portable Network Graphics………………….*.PNG
>
> Tagged File Format…………………………*.TIF
>
> LuRa Tech Wavelet…………………………*.LWF
>
> Zsoft Paintbrush…………………………...*.PCX
>
> Windows Icon……………………………….*.ICO
>
> Enhanced Windows Metafile………………*.EMF
>
> Truevision Targa……………………………*.TGA.

EASE Page Designer

This opens the current active picture in the EASE Page Designer module, allowing modifications to, and annotations of, the picture before printing.

Print

This prints the open window, pixel for pixel, without the window frame, e.g. without the command buttons and scroll bars.

Options

This opens the Options Window to allow the setting of parameters for use in that part of the program.

Modify Toolbar

This allows the changing of any entry in the row(s) selected. This menu gives access to file management functions and program settings.

Exit

This closes EASE Vision.

Item Menu

Select or modify **Items** to be displayed or to be used in computation.

Edges

A check here makes **Edges** visible. A change causes an immediate redraw.

Loudspeakers

A check here makes **Loudspeakers** visible. A change causes an immediate redraw.

Audience Areas

A check here makes **Audience Areas** visible. A change causes an immediate redraw.

Listener Seats

A check here makes **Listener Seats** visible. A change causes an immediate redraw.

Lamps

A check here makes **Lamps** visible. A change causes an immediate redraw.

IR Emitters

A check here makes **IR Emitters** visible. A change causes an immediate redraw.

Select Active

Selects **Items** (**Loudspeakers**, **Audience Areas**, **Listener Seats**, **Lamps**, **IR Emitters**) to be active.

Display Active Only

Selects **Items** (**Loudspeakers**, **Audience Areas**, **Listener Seats**, **Lamps**, **IR Emitters**) to be displayed only when selected as active.

View Menu

3D Perspective

This brings up a perspective view of the object. This command has four preset angles, e.g. (60 deg X –30 deg).

Side View

This displays the object in the YZ-Domain. This is otherwise known as the X-View.

End View

This displays the object in the XZ-Domain. This is otherwise known as the Y-View.

Plan View

This displays the object in the XY-Domain. This is otherwise known as the Z-View.

Redraw

This forces a drawing update.

Full

This forces the drawing to fit the window to a fixed tolerance and causes immediate redraw.

Zoom In

The scope angle decreases as the zoom increases. This function can also be accessed using PgUp or F11.

Zoom Out

The scope angle increases as the zoom decreases. This function can also be accessed using PgDn or F12.

Perspective View

Brings up a perspective view looking from a **Loudspeaker**, a **Listener Seat**, a **Lamp** or an **IR Emitter**. Using this command opens a list of available items to choose from.

External View

Brings up an aerial view of the three-dimensional model. This command is very helpful in case one happens to get lost while navigating through the model.

Walker

Device that helps to navigate through the three-dimensional model. Note that the **Walker Window** automatically pops up if a a random spot is **picked** in the window.

Calculation Menu

This menu allows choosing the method for rendering the model. Depending on the chosen calculation method – **Raytracing, Scanline, Open GL Texture Map, (Pure) Open GL Simple Map** - you will find slightly different Calculation Setup Window**s**. Besides the **Open GL Simple Map**, which uses the standard OpenGL routine without textures, each calculation window gives you the choice concerning different **Features (Shadow, Volume Effects, Anti Aliasing, Reflections),** different **Color Clipping Modes** (**RGB Simple, HSV Simple, HSV Saturation, HSV Smoothed**), the **Background Color** and **Lamps / Lamp Groups**.

Raytracing

Rendering method that allows you to create photo-realistic images. The software actually models the light rays as they bounce around in the three-dimensional model, so it does not surprise that this process might take some time. The time it takes depends on the speed of your computer, the size of the model, the size of the window and the chosen detail in terms of **Anti-Aliasing**. Note that the result is a single image, so do not forget to **save** it right away, you won't be able to move around in the virtual space or to recover the rendering after moving on to something else!

Technically spoken the program will run a ray tracing process for every pixel of the screen.

Note: For a complex environment **Raytracing** is the recommended method. If the model does not have reflective surfaces the **Scanline** command will probably be faster.

Scanline

Rendering method that creates very similar results to **Raytracing.** However, you might want to use this method when you have a model with a large amount of **big Faces**, for the **Scanline** rendering generally tends to take a little less time. The **Scanline** method has proved to be faster if the number of **Faces** in the actual viewing window is small and the options **Shadow** and **Reflections** are off.

Technically spoken the program will run an intersection test for every pixel row of the screen.

Note: This command is useful for a quick view of how the room would look like. For a complex environment the calculation time will be the same as for **Raytracing** and might even exceed it.

OpenGL Texture Map

Unlike **Raytracing** and **Scanline**, this is a rendering method that after calculating the model – a process that also might take some time - allows you to move around in the three-dimensional virtual space. However, the result of each individual image is with standard settings not nearly as good as with **Scanline** or **Raytracing** (also see the visual examples a little later in this chapter). Only with high texture resolutions and of course long calculation times can you get similar results.

Note: Naturally this kind of map cannot support viewpoint dependent features, such as reflections or shiny surfaces. On the other hand it allows you to move through the room without recalculation, taking into account shadows, diffuse textures, fluorescent and transparent surfaces as well as bump map textures.

In most cases you will compute an **OpenGL Texture Map** with low resolution first to see if all textures applied work as desired. After that you will calculate and save a high resolution bitmap using the **Raytracing** or **Scanline** method, taking into account Reflections. For presentation purpose it is useful to calculate and save a high resolution **OpenGL Texture Map**.

OpenGL Simple Map

Standard rendering method that you automatically use once you open **EASE Vision**. **OpenGL Simple Map** allows you to move around in space, but does not add qualities such as **Shadows, Reflections** and variations in color and shade.

Raytracing/Scanline (with **Shadow** and **Reflections**)

OpenGL Texture Map (Low resolution)

OpenGL Texture Map (High resolution)
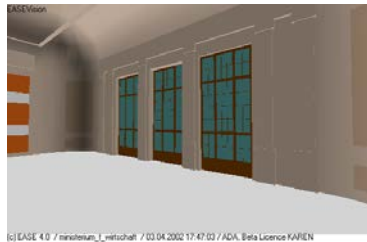
OpenGL Simple Map

Utilities Menu

This menu holds tools useful in manipulation, labeling and saving of window displays.

Spin

This command is an equivalent to the **Turn** and **Full** commands given one after another at high speed. The turning resolution and speed of redraw is set in **Options**. The speed is controlled by the computer capabilities. If the speed is set too high the computer will redraw at its maximum rate, whatever that is. If a spot is picked on the model then spinning will happen around the **Pick**ed spot.

Insert Parameters

This inserts information into the picture for printing and presentations. This information can consist of things like:

- Name of the project
- Viewpoint (only for perspective view), vertical and horizontal view angles.

Mouse Menu

This menu switches the mouse between six operating modes, and allows zooming the graphics display.

Pick

Sets the mouse to **Pick** mode, allowing the selection of **Audience Areas, Edges, Loudspeakers, Lamps, IR Emitters,** and **Listener Seats**. The picked position can be used as a viewpoint in a perspective view function.

Center

In this mode, the display will be panned to place the point selected with LMB at center of the display.

Drag

This allows moving the model around on the background. Click on the part of the screen you want to move and hold the LMB and move the mouse to where you want the point to be.

Turn

This allows rotating the viewpoint of the model around on the background. Click on the part of the screen you want to rotate and hold the LMB and move the mouse to where you want the point to be. With holding down the RMB you can Zoom In and Out..

Zoom In

This allows a graphic zoom in function. Click on the part of the screen you want the zoom window to start and hold the LMB while dragging the window around the area to be zoomed to. When the LMB is released the zoom will activate.

Zoom Out

This allows a graphic zoom out function. Click on the part of the screen that you want the box to start and hold the LMB while dragging the frame to cover the area of the screen that you want the present picture to cover. When the LMB is released the zoom will activate

Share Menu

This function allows multiple open windows to share parameters and to act upon that information immediately. For example, a Mapping window could share parameters with Loudspeaker Aiming and the Speaker Model's Balloon. In general, most parameters that can be placed on the Status Bar can be Shared (even though their display on the Status Bar may be switched off in Options).

Horizontal Angle

This toggles the horizontal angle on or off as a common viewing parameter.

Vertical Angle

This toggles the vertical angle on or off as a common viewing parameter.

Window Menu

This menu sets the position of the current window.

Screen Quarter

This allows placement of the active window into any of 5 positions.

Center

This places the open window in the center of the screen.

Upper Left

This places the open window in the upper left corner of the screen.

Upper Right

This places the open window in the upper right corner of the screen.

Lower Left

This places the open window in the lower left corner of the screen.

Lower Right

This places the open window in the lower right corner of the screen.

Cascade Window

This makes all open windows appear in a stacked format.

Help Menu

This menu allows access to all forms of help.

Help Topics

This offers a list of commonly asked help subjects. We have made a concerted effort to develop the Help files and the manual together. If you need an answer as to what a particular command does go to the help files. You will likely find your answer there.

About

This displays information about your EASE program.

About Open GL

Information about OpenGL

Memory Used

This submenu displays the computer memory actually used.

Calculation Setup Window

Common Properties in all calculation Windows

Features

Allows you to decide whether you want to take the following four parameters into account or not:

Shadow

This calculates shadows and conveys a feeling of depth in the rendered image.

Anti Aliasing

This smoothes out the jagged edges between solid colors and suppresses the display of single pixels due to the pixel resolution of a bitmap.

Reflections

This calculates reflections dependent on the textures use (such as mirrors) It contributes to a more photo-realistic impression by giving information about surface qualities such as shininess etc., not available in **Open GL Texture Map** and (Pure) **Open GL Simple Map** mode.

Color Clipping

Gives you the choice between four different modes of **color clipping**: **RGB** (Red - Green - Blue) **Simple**, **HSV** (Hue – Saturation – Value) **Simple**, **HSV Saturation**, **HSV Smoothed**.

Note: This option is of importance when the light intensity is very high. It defines how the color value of a specific pixel is computed when it approaches the white color due to the high light intensity. In architectural rendering several methods are in use depending on the environment and colors used.

In the following pictures one can easily see how the brown frame of the left window is treated. Depending on the **Color Clipping** chosen the brown color will tend towards white on different color paths

RGB Simple

HSV Simple

HSV Saturation

HSV Smoothed

Lamps Used

Allows you to choose **Lamps** and **Lamp Groups** that you want to be active when running the calculation. Note that if you don't pick any, the default lamp as set up under **Options** will be used.

Background Color

This command is used to change the background color ofthe screen.

To use this command:

1. Left click on **Color.**

2. This opens the **Color** window to allow setting of the Background color.

3. Left click on **OK.**

OK

Applies changes and closes window.

Cancel

Discards changes and closes window.

Raytracing and Scanline Setup Window
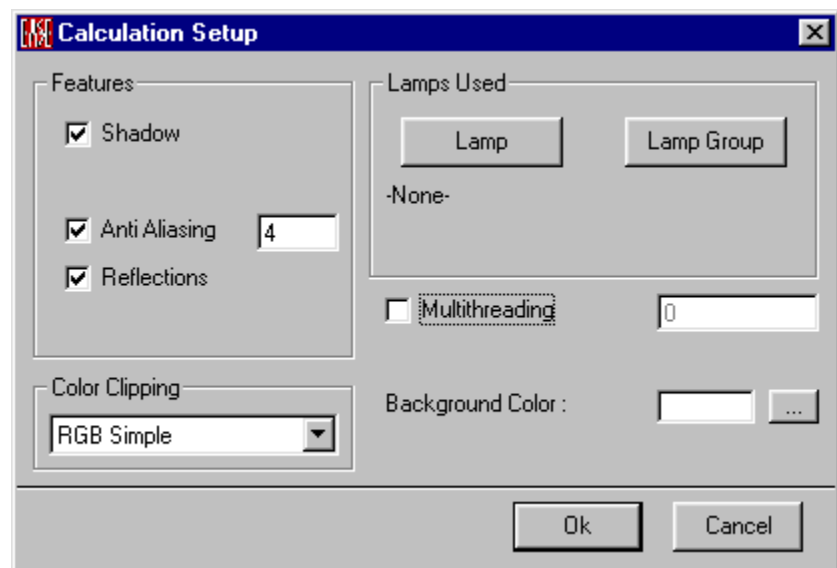
Multithreading

Using **multithreading** enables you to speed up the calculation by taking advantage of multiple processors. Note that this option is only available in the **Raytracing** and not in the **Scanline** mode.

OpenGL Texture Map Setup Window
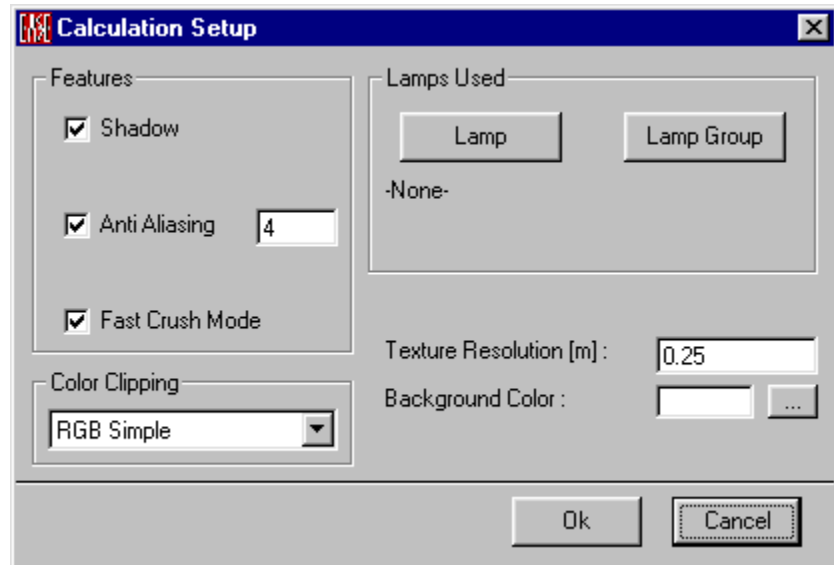
Fast Crush Mode

A check mark here enables you to speed up the calculation. This command shifts a part of the overall calculation time from preparation to calculation. If selected the preparation for the calculation will be simplified. As a result the geometrical optimization of the object for the calculation is not very good.

For simple models this option is useful, since the calculation time is not very high in any case and the preparation time is significantly reduced.

For complex models it is recommend to switch off **Fast Crush Mode** to allow the program to optimize the internal geometrical bodies for the calculation. This will significantly reduce the calculation time, while the preparation time being small compared to the calculation time will be increased.

Texture Resolution

Sets the size of the resolution to calculate the texture map. The smaller the resolution the longer is the calculation time.

Note: With a low resolution **Textures** using bitmaps may not be recognizable. The Texture resolution has to be as high as the bitmap resolution, if a detailed view is desired.

Options Window

This allows setting of parameters for this window.

Apply

Applies the current Settings and leaves the **Options** window open.

OK

Applies the current Settings and closes the **Options** Window.

Cancel

Closes the Options window without saving or **Applying** changes.

General Tab
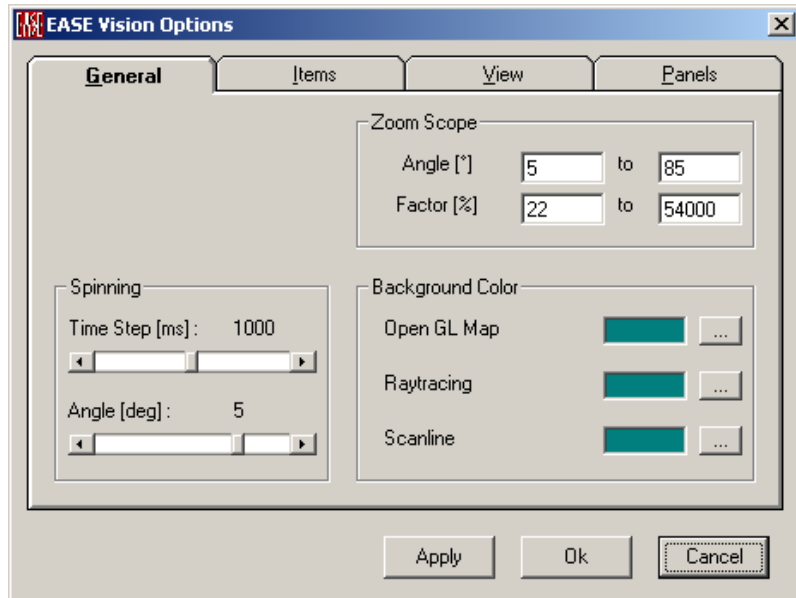
Zoom Scope

This area allows setting the limits of the **Zoom** function.

Factor Limit Windows (%)

Sets the limits of the **Zoom** function in the **Vision** window.

Spinning

This area allows setting of the parameters for the **Spin** function.

Time Step Slider (ms)

This sets the time interval between steps when **Spinning**.

Angle Slider (deg)

This sets the increment in degrees of turning from one step to another when **Spinning**.

Background Color

This sets the **Background Color** for each rendering mode.

To use this command:

1. Left click on **Color** window or **Color** selection button**.**

2. This opens the **Color** window to allow setting of the **Background Color**.

3. Left click on **OK.**

Items Tab
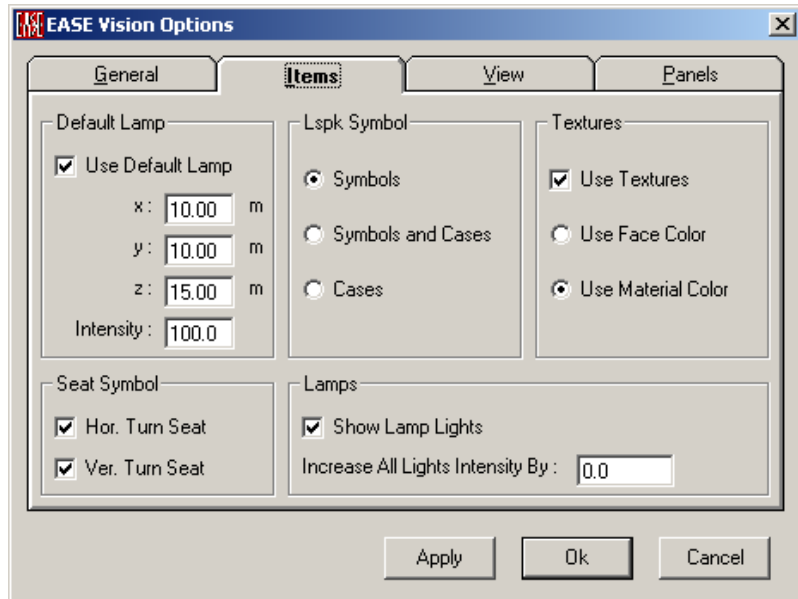
Default Lamp

Defines whether the **Default Lamp** is used or not. The **Default Lamp** is a spherical light source with white light.

Use Default Lamp

Checking this box activates the **Default Lamp**. Note that you can set the position of the Lamp as well by defining the x, y, z coordinates.

Intensity

Sets the **Intensity** of the Default Lamp.

Loudspeaker Symbol

Defines how **Loudspeakers** are displayed in the **Edit Room** window.

Symbols

This radio button will make a **Loudspeaker** symbol visible in the model, but not the **Case** or **Wireframe**. The size of the symbol can be adjusted in the **Edit | Room Data | Settings** Tab.

Symbols and Cases

This radio button will make the **Loudspeaker** symbol and the appropriate **Speaker Case** or **Wireframe** visible in the model.

Cases

This radio button will make only the **Speaker Case** or **Wireframe** visible in the model.

Textures

Defines whether **Textures** are used in the Calculation or not.

Use Textures

Checking this box activates the use of assigned **Textures**.

Use Face Color

This radio button activates the use of assigned **Face** colors. Once you have checked the texture box, all **Faces** will show the properties of the assigned **Texture** after using **Raytracing, Scanline** or **Open GL Texture Map**, not the **Face** color.

Use Material Color

This radio button activates the use assigned **Material Colors**. Once you have checked the **Face** box, all **Faces** will show the properties of the assigned texture after using **Raytracing, Scanline** or **Open GL Texture Map**, not the **Material Color**.

Seat Symbol

Defines the orientation display of **Seats**.

Horizontal Turn Seat

This command allows to switch off the horizontal angle of **Listener Seats** for display purposes only.

Vertical Turn Seat

This command allows to switch off the vertical angle of **Listener Seats** for display purposes only.

Lamps

Defines the display properties of **Lamps**.

Show Lamp Lights

This radio button will bring up a light spot showing the location of each active **Lamp**.

Increase All Light Intensity

Changing this value enables you to adjust the Light Intensity. Note that in this part of the program you can only change the intensity of ALL **Lamps**.

View Tab
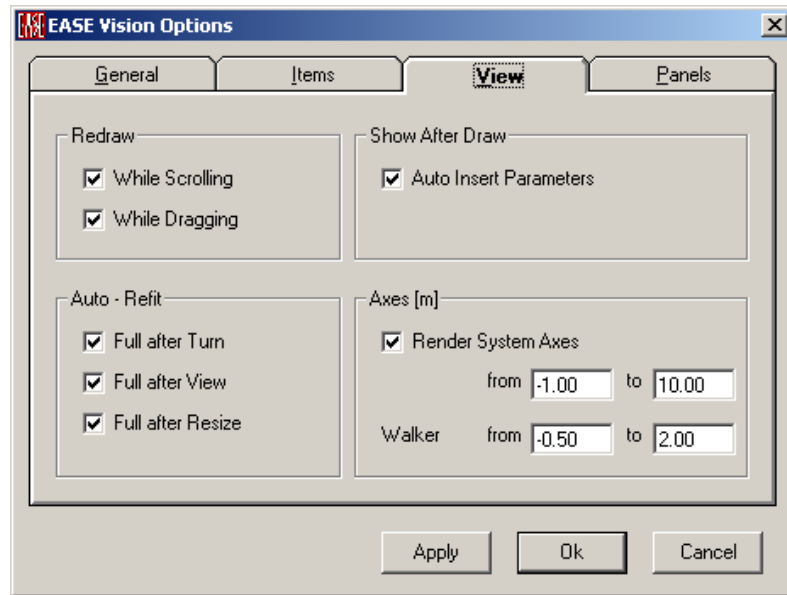
Redraw

This area sets the rules used for redraw of the model.

While Scrolling

If checked, the screen will be redrawn continuously during a scrolling operation.

While Dragging

If checked, the screen will be redrawn continuously during a dragging operation.

Show after Draw

This area allows display of additional information items on the model drawing.

Auto Insert Box Labels

This allows display of the View Label, such as "3D Perspective", in the lower right corner

Auto Refit

This area sets the rules for when the **Vision** display should be automatically resized.

Full after Turn

This redraws to Full Size after a Turn operation.

Full after View

This redraws to Full Size after changing the View.

Full after Resize

This redraws to Full Size after a resizing of the window.

Axes (m or ft)

This area allows the configuration of the Room Axes display.

Render System Axes

If checked, this allows the display of the x, y, and z-axes in the **Vision** window.

Walker from/to

These windows allow entry of the length of the axes using the units set by the **Options** Menu in **EASE Main**.

Panels Tab

This tab allows selection of the parameters displayed on the status bar at the bottom of the window.
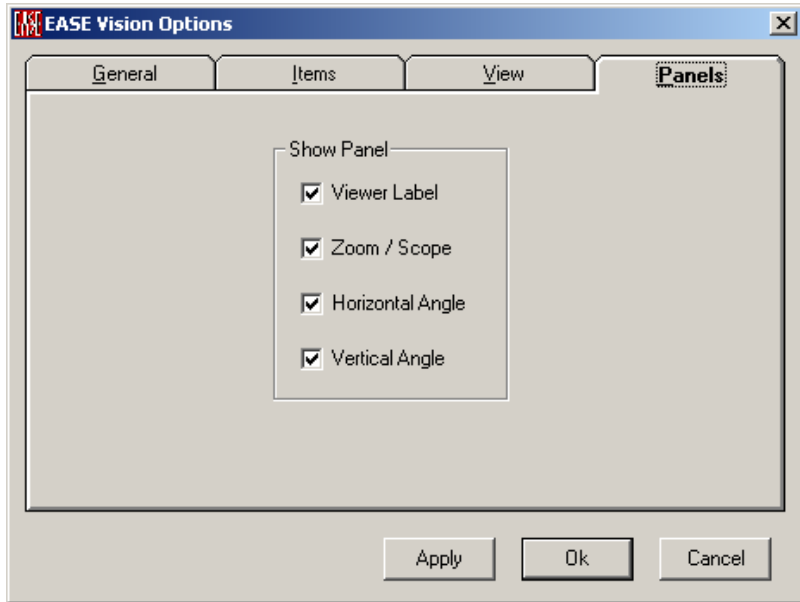
Show Panel

Viewer Label

This shows the name/number of the **Picked View**.

Zoom / Scope

This shows the current **zoom** factor.

Horizontal Angle

This shows the current **Horizontal Viewing Angle**.

Vertical Angle

This shows the current **Vertical Viewing Angle.**

Chapter VII : Ease Probe

EASE Probe

Probe is a tool for detailed analysis of **Response Files** created by EASE **Rays** and EASE **Aura** to study room acoustic and sound system performance. [Note: The **Probe** is <u>not</u> included with **EASE Jr.**] From a **Response (.RSP) File**, **Probe** can compute and display the **Impulse Response, the Energy Time Curve, Waterfall** response**, Frequency Response,** Direction and Relative Strength (**3D Hedgehog),** and the **Modulation Transfer Function**. The **Probe** can also display **Direct, Reverberant**, and **Total SPL**, as well as **Clarity** and **Intelligibility** functions.

The EASE **Rays** module is an analysis tool. The **Responses** computed by **Rays** can be thought of as the output of an ideal (but imaginary) omnidirectional microphone at a single point at the center of a listener's head, with the ability to determine time and direction of each sound arrival (**Ray**), both direct and reflected, as well as the magnitude and phase response versus frequency for each **Ray**. **Rays** computes and saves directional data, so the directional orientation of the **Listener Seat** where **Rays** is used is important, and can be set to any desired direction for purposes of analysis. The **calculated Response** computed by **Rays** can be saved as a **Response (.RSP) File.**

A **Head Related Transfer Function (HRTF)** describes the directional response of the human head. By convolving an **HRTF** with a **Response File**, the **Response** is transformed into two responses that are a function of frequency and direction of arrival to produce a **Binaural Impulse Response (.BIR) File. The EARS** module can perform this convolution. The **.BIR File** includes the directional response of the human ear/head at the computed receiver location, and both the Left and Right responses are contained within a single **.BIR File**. The reference direction for the **HRTF** (the direction the human listener is facing) will be the same as the reference direction when the **Response (.RSP) File** was computed.

This **Binaural Impulse Response** can be convolved with an audio signal and the resulting audio signal played back through loudspeakers or headphones to simulate what the **Loudspeaker(s)** will sound like in the **Room** at the **Probe** location. This process, called **Auralization,** takes place in the **Auralization** module (**EARS**).

EASE Rays can compute **Response Files** for any desired length of time, but computation time increases with the length of response. The response of a room will be dominated by room-specific reflections for the early part of the response but will become increasingly statistical at later times. The time where this transition occurs is called the **Diffuse Time** (computed and displayed on **Graphs | Inspect Details**).

The study of reflections in a room generally requires a relatively short response (i.e., less than the **Diffuse Time**), but **Auralization** requires a much more complete Response (i.e., including statistical reverberation). To reduce

computation time for **Response Files** used for **Auralization**, EASE has the ability to build a complete response by combining a computed response for the time period where room-specific reflections dominate (i.e., before the **Diffuse Time**) with a statistical response for the period after the **Diffuse Time**. This statistically computed response is called a **Reverberant Tail**.

EASE Probe provides two methods for computing a **Reverberant Tail**. **Add Random Tail** computes a purely statistical Tail based on the computed **Reverberation Time** as displayed in **Edit Room | Room Data**. The **Add Random Tail** computation for this purely statistical Tail can be user modified in amplitude, density, and modulation to more closely match the computed response at the point of transition.

Add Predicted Impacts Tail takes a much more sophisticated approach, using complex algorithms to analyze the **Response File** and use it as the basis for computing a statistically random **Tail**. This computed Tail will be added to the previously computed response, filling in the later parts of the computed **Response** and extending it to the desired length.

For Response Files produced with EASE AURA we do not need to add a tail. EASE AURA provides you with the full response, including the first part and the following tail.

Probe Window

The **Probe** calculates, displays and allows analysis of response data in the time as well as in the frequency domain for any single point within an Audience Area including any seat and other probe positions somewhere inside the model. .

Key Conventions

F1	Help
F7	View/Change Grid/Y-Axis
F8	Full View
F9	Options
F10	Status Bar settings
F11	Zoom In
F12	Zoom Out
x	x-View
y	y-View
z	z-View
3	3D-View
Home	Full View
PgUp	Zoom In
PgDn	Zoom Out
+	Increase Current Order
-	Decrease Current Order
Del	Deactivate Picked Pulse
Ins	Activate Picked Pulse
Down	Frequency -1/3 Octave (not 3D Graphs)
Up	Frequency +1/3 Octave (not 3D Graphs)
Left	Pick Previous Pulse (not 3D Graphs)
Left	Move EFC Cursor (Freq. Response only)

Right	Pick Next Pulse (not 3D Graphs)
Right	Move EFC Cursor (Freq. Response only)
Bksp	No Current Pulse, No Current Order, No EFC Cursor
Esc	No Current Pulse, No Current Order, No EFC Cursor
Alt-Bksp	Spin/Stop

Ctrl+

O	Open Response File
A	Save Response File As
X	View/Change Grid/X-Axis
Y	View/Change Grid/Y-Axis
+	Increase Current Order
-	Decrease Current Order
Left Arrow	Move viewpoint to the left (10%)
Right Arrow	Move viewpoint to the right (10%)
Up Arrow	Move viewpoint upwards (10%)
Down Arrow	Move viewpoint downwards (10%)
PgUp	Move the selected frequency +1
PgDn	Move the selected frequency –1
Tab	Pick Next Pulse
Tab	Move EFC Cursor (Freq. Response only)
BackTab	Pick Previous Pulse
BackTab	Move EFC Cursor (Freq. Response only)

Shift+

F11	Pick Next Pulse
F11	Move EFC Cursor (Freq. Response only)
F12	Pick Previous Pulse
F12	Move EFC Cursor (Freq. Response only)

Mouse Conventions

A Double click on the title of the chart opens the Options Window, selecting the correct page automatically.

A Double click on the bottom chart legend opens the Options Window, selecting the **Legend** page allowing modification of the abscissa (x-axis). (See **Edit-Change Grids**)

A Double click on the right chart legend opens the Options Window, selecting the **Legend** page allowing modification of the ordinate (y-axis). (See **Edit-Change Grids**)

A Double click on the center of the chart invokes an immediate redraw.

Statusbar Conventions

Freq	This is the **Frequency** selected for the current display
Pulse	This is the selected **Pulse Number** in the reflectogram.
Lspk	This is the selected pulses originating

	Loudspeaker
Time	This is the selected pulses arrival **Time** after the first direct sound pulse
Level	This is the selected pulses level in dB
Order	This is the selected pulses reflection **Order** (0= Direct, 1= 1st reflection)
Hor	This is the selected pulse's **Horizontal** arrival direction compared to the head orientation
Ver	This is the selected pulse's **Vertical** arrival direction compared to the head orientation

File Menu

This menu gives access to file management functions and program settings.

Open Response File (standalone mode only)

This opens a **Response File (*.RSP)** saved by EASE 3.0, 4.x for post processing in **Probe**.

Shortcut: Ctrl+O

To use this command:

1. Left click on **Open Response File** to open an **Open File** window.

2. Browse to the folder for the **Response** file, select the file, and Left click **Open.**

Open Impact File (standalone mode only)

This opens an **Impact File (*.MPC)**, saved by EASE 4.x, 3.0 and EASE 2.1, for post processing) in **Probe**, and for saving as a **Response File** (.RSP).. To use this command:

1. Left click on **Open Impact File** to open an **Open File** window.

2. Browse to the folder for the **Impact** file, select the file, and Left click **Open.**

Import POST File (standalone mode only)

This opens of a post file (*.*R) as an ASCII table of Pulse SPL's vs. Delays. To use this command:

1. Left click on **Import POST File** to open an **Open File** window.

2. Browse to the folder for the **POST** file, select the file, and Left click **Open.**

Open EARS 1.0 File (standalone mode only)

This opens a post-processed Ears 1.0 file (*.#*). This includes head angle, edit tail and angular and level information about reflections. To use this command:

1. Left click on **Open EARS 1.0 File** to open an **Open File** window.

2. Browse to the folder for the **EARS 1.0 File**, select the file, and Left click **Open.**

Save As

This saves data post-processed by **Probe** in multiple formats for later use.

Response File

This saves the current **reflectogram** as a user named **Response File** (*.RSP).

Shortcut: Ctrl+A

To use the command:

1. Left click **Save As Response File As** to open a **Save File** window.

2. Choose a folder for the **Response** file, enter a file name, and Left click on **Save.**

Post File

This saves the current reflectogram as a user named ASCII table of Pulse SPL's vs. Delays (The files are exported as a *.*r). To use the command:

1. Left click on **Save As POST File** to open a **Save File** window.

2. Choose a folder for the **POST** file, enter a file name, and Left click on **Save.** This will open a window **asking "View Postfile now?"**

3. Left click on **OK** will open a separate text viewer/editor window with copy and paste capability.

BIR File

This saves the current reflectogram as a user named **Binaural Impulse Response File** (*.BIR) by convolving the response file with the omnidirectional ("**Unity Sphere**"), trivial HRTF

Shortcut: Ctrl+A

To use the command:

1. Left click on **Save As BIR File As** to open a **Save File** window.

2. Choose a folder for the **Binaural Impulse Response** (**BIR)** file, enter a file name, and Left click on **Save.**

WAV File

This saves the current reflectogram as a user named (*.WAV) file by convolving the response file with the omnidirectional ("**Unity Sphere**"), trivial HRTF.

Shortcut: Ctrl+A

To use the command:

1. Left click on **Save As WAV File** to open a **Save File** window.

2. Choose a folder for the **WAV** file, enter a file name, and Left click on **Save.**

MTF Table

This computes the **Modulation Transfer Function (MTF)** and **Speech Transmission Index (STI)** for the current reflectogram and saves the result as an ASCII text table of values in a user named text file. (*.**MTF**).

Shortcut: Ctrl+A

To use the command:

1. Left click on **Save As MTF Table** to open a **Save File** window.

2. Choose a folder for the **MTF** file, enter a file name, and Left click on **Save.**

3. The MTF file will be opened in a simple text viewer window that can copy text to the Windows clipboard.

This file also stores information about related measures like Alcons, STIPa and RaSTI. See also parameters set on the **MTF/STI Tab** and on the **Noise Tab** in the **Options** window.

View File

This opens POST and MTF Table data files in a simple text viewer.

Post File

This opens a **Post** file in a text viewer that allows simple copy and paste editing. To use this command:

1. Left click on **View Post File** to open the **Open File** window.

2. Browse to the folder for the **Post** file, select the file, and Left click **Open** to open the simple text editor.

MTF Table

This opens a selected MTF file in a simple text viewer window and allows selection of lines of text for windows manipulation such as copy and paste. To use this command:

1. Left click on **View MTF File** to open the **Open File** window.

2. Browse to the folder for the **MTF Table** file, select the file, and Left click **Open** to open the simple text editor.

Send Picture To

This allows the current active picture to be sent to the Clipboard, a File, or **EASE Page Designer**.

Clipboard

This copies the current picture to the **Windows Clipboard**.

File

This saves the current picture to a file. Supported formats are:

Windows Bitmap……………………………*.BMP

JPEG……………………………………….*.JPG

CompuServe GIF……………………………*.GIF

Portable Network Graphics……………….*.PNG

Tagged File Format…………………………*.TIF

LuRa Tech Wavelet…………………………*.LWF

Zsoft Paintbrush……………………………..*.PCX

Windows Icon……………………………….*.ICO

Enhanced Windows Metafile………………*.EMF

Truevision Targa……………………………*.TGA.

EASE Page Designer

This opens the current picture in **EASE Page Designer,** allowing text annotations, multiple picture layouts, and editing of the page layout format before printing, or for use in printed reports and presentations.

Print

This prints the open window without the window frame, e.g. without the command buttons and scroll bars.

Options

This opens the Options Window to set parameters for **EASE Probe**.

Shortcut: F9

Modify Toolbar

This opens a window to modify the **Toolbar**. Buttons and commands maybe added or subtracted as needed.

Exit

This exits **Probe**.

Edit Menu

Functions on this menu can modify the current **Response File**.

Modify Reverb.Times

This opens the Rev.Time Tab to the **Rev. Time Tab** to view and set the **Reverberation Times**.

Add Random Tail

This opens the Reverberant **Tail** Parameters **Window** to view and set parameters for the **Random** reverberation **Tail**. Herewith can be set parameters to generate random pulses intended for use as a reverberation tail based on the settings. A reverberant tail will make **Auralizations** more realistic. The reflection order of the tail is n+1, if the nth order was selected during raytracing calculation.

Add Predicted Impacts

This computes a **Tail** using complex algorithms to analyze the **Response File** and using the analysis as a basis for computing a statistically random **Tail**. This computed Tail will be added to the previously computed response, filling in the later parts of the computed **Response** and extending it to the desired length. See the Impact Prediction Window. The reflection order of the tail is n+1, if the nth order was selected during raytracing calculation.

Cut Random Tail

This removes any **Tail** added to the original response. This works with a **Tail** added in the current session and one stored in a file. Note: There is no **Undo**, other than recalling a saved file containing the **Tail**.

Turn Dummy Head

This opens the **HRTF Tab** of the **Probe** HRTF Tab to set **Dummy Head** horizontal and vertical rotation. This setting is only relevant for the relative pulse directions, as shown under **Pulse directionality**, but not for impulse response computation because of the omnidirectional HRTF used there.

Gain and Sampling Rate

This opens the **HRTF Tab** of the **Probe** HRTF Tab to set **Gain** and **Sampling Rate** for files created by Probe.

Activate

This allows the **Probe** to enable the Selection of some Items of the reflectogram for use in later calculations. Select an item, then Left click **Activate the corresponding item.**

Current Pulse

Activates a current reflection pulse.

Loudspeaker

Activates a current loudspeaker or source with all corresponding reflections.

Reflection Order

Activates all reflections of a current reflection order.

All Pulses

Activates all reflections of the reflectogram.

Deactivate Pulse

This allows the **Probe** to disable the Selection of some Items of the reflectogram for use in later calculations. Select an item, then Left click **Deactivate the corresponding item**. The deactivated items will be shown grayed out in the reflectogram, but the pulses marked as deactivated will neither be saved with a file, nor used in any calculation like IR, ALcons etc.

Current Pulse

Deactivates a current reflection pulse.

Loudspeaker

Deactivates a current loudspeaker or source with all corresponding reflections.

Reflection Order

Deactivates all reflections of a current reflection order.

All Pulses

Deactivates all reflections of the reflectogram.

View Menu

This menu accesses to viewing tools.

Previous   Ctrl + Z

This shows a previous probe graph.

Next

This shows a next probe graph.

3D Perspective

This command has four preset angles, e.g. (60 deg X –30 deg). This displays the object isometrically.

Side View (x)

This displays the object in the YZ-Domain. This is otherwise known as the X-View.

End View (y)

This displays the object in the XZ-Domain. This is otherwise known as the Y-View.

Plan View (z)

This displays the object in the XY-Domain. This is otherwise known as the Z-View.

Redraw

This forces a drawing update.

Full View

This forces the drawing to fit the window to a fixed tolerance and causes immediate redraw.

Zoom In

This increases the zoom percentage. This can also be accessed using PgUp or F11.

Zoom Out

This decreases the zoom percentage. This can also be accessed using PgDn or F12.

Frequency Band

Left click to select the 1/3 octave band (100 Hz to 10 KHz) for presentation.

Reflection Order

This opens a submenu allowing highlighting of individual reflections by **Reflection Order.** Options are

Select

This highlights the **Selected** Order reflections and the **Order** is shown in the **Statusbar** at the bottom of the screen. **Order** is the number of reflection from the direct sound; e.g. direct equals 0, first reflection equals 1 and so on. All pulses of the selected order are highlighted.

Next + (Hotkey is + (on the number pad))

This highlights the rays of the next higher **Order** than those currently highlighted, and their **Order** is shown in the statusbar at the bottom of the

screen. **Order** is the number of bounces from the direct sound, e.g. direct sound is order 0, first reflection is order 1.

Previous - (Hotkey is - (on the number pad))

This highlights the rays of the next lower **Order** than those currently highlighted, and their **Order** is shown in the statusbar at the bottom of the screen. **Order** is the number of bounces from the direct sound, e.g. direct sound is **Order** 0, first reflection is **Order** 1.

All Off

This disables highlighting of reflections by **Order**.

Change Grid

This opens a submenu allowing choice of axes for editing.

X-Axis Ctrl + X

This opens the **Legend** page of the Legend Tab, for modification of the abscissa (**X-Axis**).

Y-Axis Ctrl + Y

This opens the **Legend** page of the Legend Tab, for modification of the ordinate (**Y-Axis**).

Inspect Details

This window displays useful metrics about the response file based on current **Probe** data, see the Inspect Details Window.

Response Info Text

The parameters used to calculate the response file are shown ; see Response Info Text Window.

Graphs Menu

This menu accesses graphical presentation of **Probe** calculations, including **Time, Energy** and **Frequency**.

Time Response:

This accesses **Time Response** graphs.

Reflectogram

This shows the reflectogram at the selected **Probe** position as a SPL (dB) vs. Time (ms) graph. This is used for investigation of early and/or late room reflections.

Short Time Period

This shows the reflectogram at the selected **Probe** position as a SPL (dB) vs. Time (μs) graph. This is used for alignment of drivers inside of a cluster.

Water Fall

This shows a 3-dimensional reflectogram at the selected **Probe** position as SPL (dB) vs. Time (ms) vs. Frequency graphic presentation. E.g. this allows an overview of the frequency and level loss over the selected period of time.

By means of the Cursor buttons you are able to turn the 3D polar graph.

Phase Angles

This shows a polar graph of **Amplitude** vs. running time **Phase Angle** of the selected reflectogram at the **Probe** position.

Impulse Response

This shows the **Impulse Response** at the selected **Probe** position as a Pressure vs. Time (ms) graph. It is equivalent to looking at an oscilloscope trace at the output of an omnidirectional microphone at the **Probe** position.

Energy Time Curve

This shows the computed ETC at the **Probe** position as a SPL (dB) vs. Time (ms) graph. (this is equivalent to a squared impulse response).

Frequency Response

This accesses **Frequency Response** graphs.

Single Pulse

This shows the frequency response of the selected reflection or direct sound.

Pulse Sum

This shows the frequency response of all reflections including the direct sound.

Pulse Directionality

This accesses graphs showing **Directionality** of sound arrivals at the **Probe** location.

Horizontal

This polar graph shows the Amplitudes vs. **Horizontal** Arrival **Angles**.

Vertical

This polar graph shows the Amplitudes vs. **Vertical** Arrival Angles.

3D HedgeHog

This 3D polar graph shows the **Amplitudes** vs. **Horizontal** and **Vertical** Arrival Angles.

By means of the Cursor buttons you are able to turn the 3D polar graph.

Reverberation

This accesses the **Reverberation** graphs.

Reverberation Time

This shows **Reverberation Time** vs. frequency, computed using Sabine, Norris-Eyring, or Schroeder equations or provided RTs as selected in the **Rev. Time Tab** in the Rev.Time Tab.

Tolerance Range

This adds to the graph commonly used **guidelines** and **Tolerances** for the range of values that are acceptable according to several common acoustic criteria (various musical forms, cinema, and speech). Criteria are set on the **Tolerance Tab** of the **Options** Window.

Pressure Levels

This shows a frequency response plot of all partial SPL including direct and total in decibels selected on the **Levels Tab** of the **Options** Window. See Appendix A, Pressure Levels.

Expectation Values

This accesses the graphs of intelligibility predictions.

Clarity Measures

This shows C7, C50 and C80 measures (if selected on the **Levels Tab** of the **Options** Window). See Appendix A, Clarity Measures.

MTF/STI

This shows the calculated MTF curves and the resulting **STI** value at the **Probe** position derived directly from the response files. Additional parameters according to IEC 60268-16 can be set on the **MTF/STI Tab** and the **Noise Tab** of the **Options** Window.

Note that this information can be saved to a file using the command **File | Save As | MTF Table**.

See Appendix A, **MTF/STI**.

Tools Menu

This menu accesses tools for **Auralization**.

Invoke Ears

This is a 2-function command. When **clicking**, a dialog box will ask "If you want the current Response Transferred to EARS, click the YES button. Save Response File"

A **Yes** answer will open a **Save File** dialog and then load the file directly into **EARS**. A **No** answer will do the same without a Save File dialog.

See further EASE EARS.

Auralize Reflectogram

This opens a window to begin the **Auralization** of **the current response** at the actual **Probe** position. First, the **Impulse Response** computed by EASE for a single point must be convolved with a **Head Related Transfer Function** (HRTF) to get the **Binaural Impulse Responses** (BIR) (that is, the response at each of the two ears, modified by the directional properties of the ear/head combination). The resulting BIR file can be convolved with a .WAV file and played back through a stereo pair of loudspeakers or headphones to hear a prediction of the total sound of the Loudspeakers used in the calculation of the

Response File. This makes it possible to hear effects such as delay, comb filtering, and precedence. Default settings for **Auralize the Response File** are set using **Keep To Auralize** in the **Utilities Menu** in **EASE Ears**.

Note: **EASE Aura** (an extra option in EYES or AREA Mapping) can compute a **Binaural Impulse Response (BIR) File** directly from **Room Mapping** and **Area Mapping**, and that BIR file can be opened and used by **EASE Ears.**

Invoke EASERA

These menu commands transfer the current response file directly to the measuring software EASERA.

Note: You must have EASERA installed to use this option.

Create WAV File

This command converts and saves the current response file to a WAV file and automatically opens the result file in EASERA. The corresponding conversion settings can be adjusted on the **HRTF Tab** of the **Options** Window.

Create BIR File

This command converts and saves the current response file to a BIR file and automatically opens the result file in EASERA. The corresponding conversion settings can be adjusted on the **HRTF Tab** of the **Options** Window.

Utilities Menu

This menu holds tools useful in manipulation of window displays.

Spin

This command is an equivalent to the **Turn** and **Full** commands given one after another at high speed. The turning resolution and speed of redraw is set in **Options**. The speed is controlled by the computer capabilities. If the speed is set too high the computer will redraw at its maximum rate, whatever that is.

Random Pulses (standalone mode only)

This generates a random Response File for training and practice.

Mouse Menu

This menu sets mouse functions.

Pick

This sets the mouse to the **Pick** (selection) mode. A Left click on an individual arriving Ray will select it and the Ray will be highlighted. Once picked the selected pulse can be enabled with **Activated (Edit|Activate),** and used for calculations and display or **Deactivated** (removed from calculations).

Location

This displays the coordinates of the selected spot in the level and time values permanently (Right Mouse click) or temporarily (Left Mouse click).

Center

This allows picking a spot on the graph and **Centering** that spot within the graph window.

Drag

This allows moving the graph around in the window. Click on the part of the screen you want to move and hold the LMB and move the mouse to where you want the point to be. A graph zooming takes place.

Zoom In (F11)

A check enables Zoom In mode. To **Zoom In**, left click on where one corner of the new zoom window should be and hold the LMB while dragging to the opposite corner of the new window. When the LMB is released the zoom will activate.

Zoom Out (F12)

A check enables **Zoom Out** mode. To **Zoom Out**, left click on the part of the screen where one corner of the new zoom window should be and hold the LMB while dragging to the point on the screen where the current window should fit into. When the LMB is released the zoom will activate.

Share Menu

This function allows different windows to share information and to act upon that information immediately.

Frequency

A checkmark here makes **Frequency** a common viewing parameter.

Horizontal Angle

A checkmark here allows synchronizing the horizontal view angle of the **Hedgehog** graph with the 3D main view of the **Room Editor** (or the **View Project** window opened from the Ray Tracing module).

This function can be useful to obtain a better impression of the directions of incident sound waves at the listener seat relative to the room geometry.

Vertical Angle

A checkmark here allows synchronizing the vertical view angle of the **Hedgehog** graph with the 3D main view of the **Room Editor** (or the **View Project** window opened from the Ray Tracing module).

This function can be useful to obtain a better impression of the directions of incident sound waves at the listener seat relative to the room geometry.

Selected Pulse

A checkmark here will keep the currently selected pulse synchronized between different instances of the **Probe** window.

This is useful for comparing different graphs of the same **Response** file. As one instance of the **Probe** can only show one graph at a time, multiple instances of the **Probe** window have to be open in order to look at different graphs at the same time, e.g. **Reflectogram** and **Hedgehog**. When sharing the selected pulse the same incident sound wave is automatically activated in all graphs.

Window Menu

This sets the position of the **Probe** window.

Screen Quarter

This allows placement of the active window into any of 5 positions.

Center

This places the open window in the center of the screen.

Upper Left

This places the open window in the upper left corner of the screen.

Upper Right

This places the open window in the upper right corner of the screen.

Lower Left

This places the open window in the lower left corner of the screen.

Lower Right

This places the open window in the lower right corner of the screen.

Cascade Windows

This makes all open windows appear in a stacked format.

Keep Picture

This saves a current window view to a BitMap File

Help Menu

This menu allows access to all forms of help.

Help Topics

This offers a list of commonly asked help subjects. We have made a concerted effort to develop the Help files and the manual together. If you need an answer as to what a particular command does go to the help files. You will likely find your answer there.

About

This displays information about your EASE program.

About OpenGL

Information about OpenGL

Memory Used

This tests and dynamically displays the computer memory actually used.

RMB Menu

Activate/Deactivate

Activates or Deactivates a current reflection pulse

Next order

This highlights the rays of the next higher **Order** than those currently highlighted, and their **Order** is shown in the statusbar at the bottom of the screen. **Order** is the number of bounces from the direct sound, e.g. direct sound is order 0, first reflection is order 1.

With Reflections

This checkmark includes all reflections in the current reflectogram for calculations, such as Schroeder, and displays, such as a reflectogram.

With Precedence

This checkmark allows 1kHz precedence curves to be displayed. The display height and crossing determine what loudspeaker will be used as the reference zero time for calculations involving direct-reverberant ratios or all intelligibility measures (finding of first wave front).These precedence curves are shown to make visible the first psychoacoustically recognized sound arrival and the corresponding reflectogram reference time.

Modify x-Axis

Opens the **Legend Tab** in the **Option Window** for modifying

Modify y-Axis

Opens the **Legend Tab** in the **Option Window** for modifying

All Grid Colors

This opens a **Color Palette** to change the grid colors

Text Color

This opens a **Color Palette** to change the text color including legends and picture frame

Background Color

This opens a **Color Palette** to select a **Background Color** for the **Probe** window.

Options

This opens the Options Window to view and set parameters for the **Probe** display.

Shortcut: F9

Options Window

OK

This **Applies** all settings and closes the **Options** window.

Cancel

This closes the **Options** window without **Applying** any changes that have not already been **Applied**.

Apply

This **Applies** all settings without closing the **Options** window.

General Tab

This Tab sets units of length, text fonts and display colors.
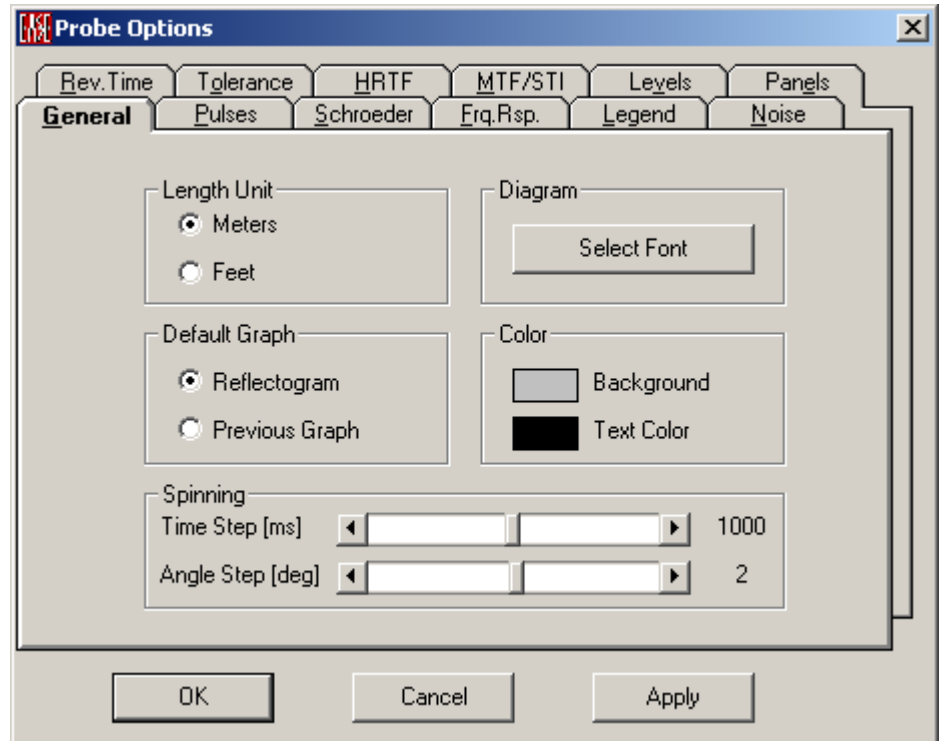
Length Unit

This chooses meters or feet for the **Probe** window and is immediately active (without **Apply**). This affects only the **Probe** – units set here do not affect other EASE windows!

Diagram

Select Font

This sets the font used for alphanumeric display in **Probe** graph and table windows. This setting affects **Probe** only – the font choice here does not extend to other EASE modules.

Default Graph

This sets a **Default Graph** for start presentation after Opening the Probe.

Reflectogram

This sets the reflectogram view as Default.

Previous Graph

This sets the last shown Graph as Default.

Color

This opens a **Color** palette for selection of background and text colors.

Background

This opens a **Color** palette to set the **Background Color** for **Probe** graph windows.

Text Color

This opens a **Color** palette to set the **Text Color** for **Probe** graph windows.

Spinning

Time Step

The **Time Step** determines how fast the picture will spin by settings the **Time Step.** Settings between 0 and 2000 ms are permitted. . The speed is also controlled by the computer capabilities. If the speed is set too high the computer will redraw at its maximum rate, whatever that is.

Angle Step

This sets how much the display is rotated between successive screen redraws when the display is set to **Spin**. Allowed are Angle Steps in degrees from –90° to +90°. This indicates how many degrees the object will turn before it is redrawn.

Pulses Tab

This Tab sets certain parameters for reflectogram calculations.
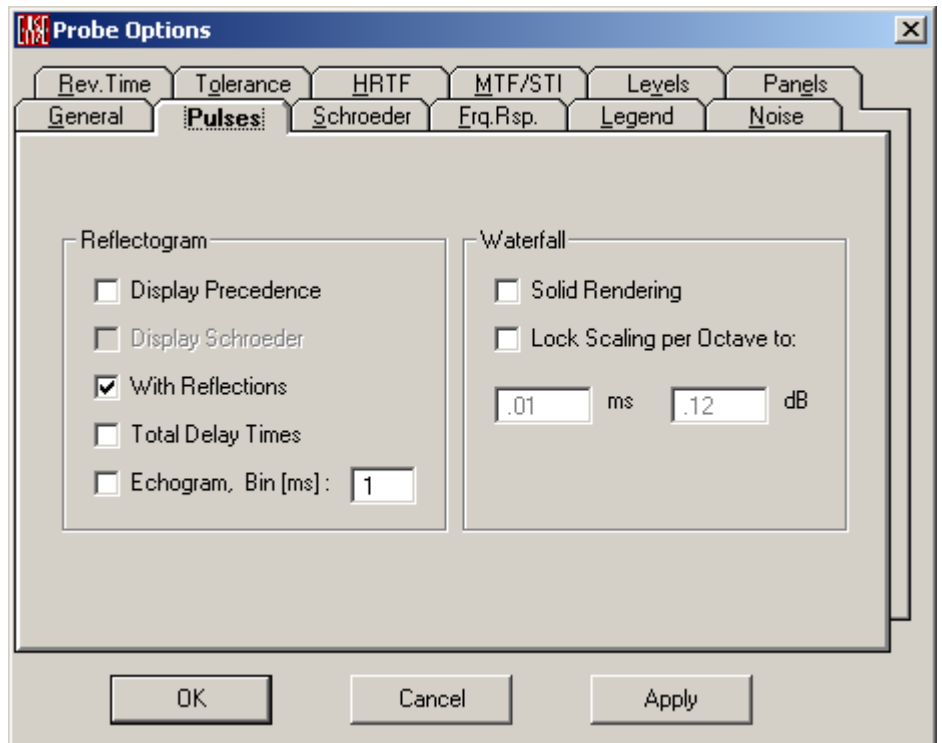
Reflectogram

Display Precedence

This checkmark allows 1kHz precedence curves to be displayed. The display
height and crossing determine what loudspeaker will be used as the reference
zero time for calculations involving direct-reverberant ratios or all intelligibility
measures (finding of first wave front).These precedence curves are shown to
make visible the first psychoacoustically recognized sound arrival and the
corresponding reflectogram reference time.

Display Schroeder

This checkmark, accessible only after **Compute**, allows a previous Schroeder
calculation to be displayed with Sabine, Eyring, Provided, or any combination of
the previous equations. This display will appear in Room RT graphs.

With Reflections

This checkmark includes all reflections in the current reflectogram for
calculations, such as Schroeder, and displays, such as a reflectogram.

Total Delay Times

This checkmark shows all reflections in the current reflectogram including the
runtime source to first listener.

Echogram (Bin = 1ms)

The displays the reflectogram as a SPL-per-millisecond echogram. All pulses
within the same "bin" of 1 millisecond length are summed up, thus showing
higher pulse densities in the form of increased levels.

This presentation can be compared with the echograms in the AURA mapping module.

Waterfall

Solid Rendering

This checkmark displays the **Waterfall** view in a **Rendered** form. No checkmark displays it as a wire frame. To calculate the rendered view can take a lot of time.

Lock Scaling per Octave to:

Window / ms:

Sets the length of the shown response

Window / dB:

Sets the amplitude of the shown response

Schroeder Tab

This sets parameters for **Schroeder Integration** calculations.
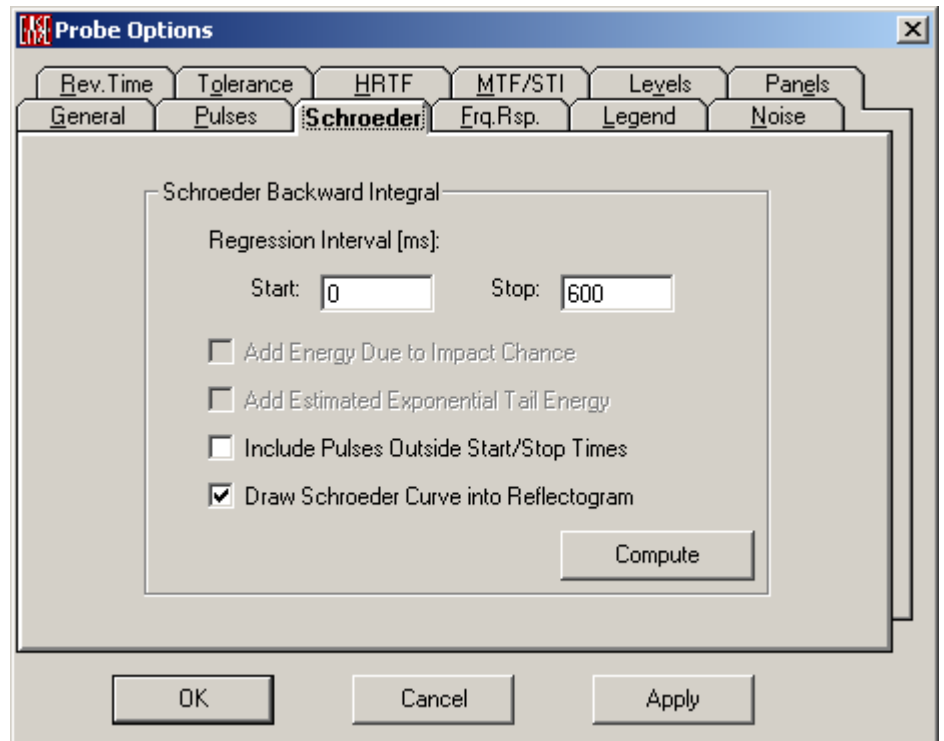
Schroeder Backward Integral

Start (ms)

This sets the time where the **Schroeder Integral Starts** - should be set where reverberant decay begins. The magenta regression line shows the interval used.

Stop (ms)

This sets the time where the **Schroeder Integral Stops** – this should be set to a time before pulses start thinning out. The magenta regression line shows the interval used.

Add Energy Due to Impact Chance

A checkmark here chooses an algorithm that compensates methodically caused thinning out effects due to missing impacts by raising accordingly the level of the present pulses. It can be selected only if the reflectogram is calculated in **Ray Tracing Impact Mode** with **Impact Control By The Time**. When **Impact Chance** is selected, EASE will compute the probability of **Impacts** based on settings entered for start/stop times and used ray numbers.

Add Estimated Exponential Tail Energy

Suppresses the iterated estimation of an exponential tail behind the reflectogram during Schroeder computation if not checked. This option unchecked usually causes lower RT values to be obtained due to the sudden ending of the response.

Include Pulses Outside Start/Stop Times

Off: EASE considers only the pulses inside the time range Start to Stop. for the displayed backward sum (yellow curve)

On: the backward sum (yellow curve) is done for all pulses of the reflectogram.

Independent of this checkbox setting, the time markers Start and Stop will always set the limits for the Schroeder regression calculation

Draw Schroeder Curve into Reflectogram

Draws the calculated Schroeder curve including regression line into the reflectogram

Compute

This computes a new **Schroeder Integral**.

Frequency Response Tab

This sets display parameters for **Frequency Response** graphs.
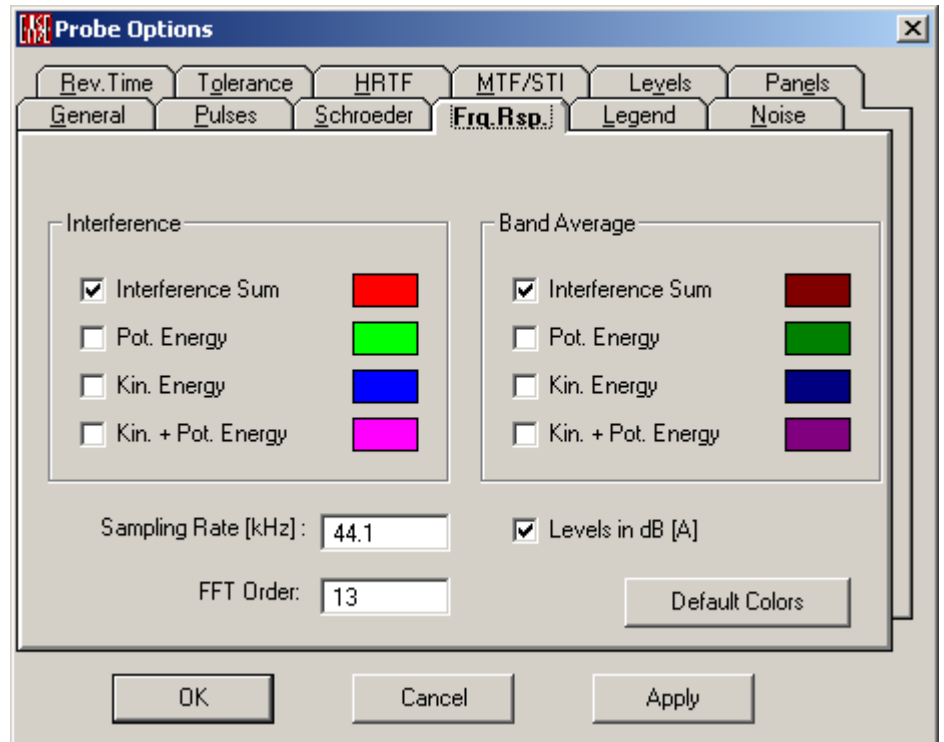
Interference

These selections dictate whether **Complex Addition** of wavefronts from multiple **Loudspeakers** are used to compute the sound pressure, and how that addition should take place. If no boxes are checked, simple **Power Summation** of the sound pressure will be used. See Appendix A for a discussion of how these computations are made.

Colors

Each calculation will be displayed using the indicated colors. To change the colors, Left click for a **Color Palette** and select the desired color.

Interference Sum

If checked, sound pressure will be calculated in a manner that shows **Interference** between **Loudspeakers**. This is the standard method of calculating the **Interference** between sources using running time phase and, if available, the internal speaker phase interference. See Appendix A for a discussion of how this computation is made.

Pot.Energy

If checked, only the pressure part of the energy will be used to compute sound energy in a manner that shows **Interference** between **Loudspeakers**. See Appendix A for a discussion of how this computation is made.

Kin.Energy

If checked, only the velocity part of the energy will be used to compute sound energy in a manner that shows **Interference** between **Loudspeakers**. See Appendix A for a discussion of how this computation is made.

Kin. + Pot. Energy

If checked, both the pressure and velocity components of the energy will be used to compute sound energy in a manner that shows **Interference** between **Loudspeakers**. This is the sum of the potential and kinetic energy. See Appendix A for a discussion of how this computation is made.

Nothing checked

Two times the pressure part will be used to compute sound energy in a manner that shows **Interference** between **Loudspeakers**. This is total energy assuming equality of both potential and kinetic energy, which is true for planar waves. It is a common simplification in acoustics, because only the pressure part is received by standard microphones. See Appendix A for a discussion of how this computation is made.

Band Average

These selections dictate whether **Complex Addition** of wavefronts from multiple **Loudspeakers** is used to compute the band average of the sound pressure, and how that addition should take place. If no boxes are checked, simple **Power Summation** for the band averages will be used. See Appendix A for a discussion of how these computations are made.

Colors

Each calculation will be displayed using the indicated colors. To change the colors, Left click for a **Color Palette** and select the desired color.

Interference Sum

If checked, **Band Averages** will be calculated in a manner that shows **Interference** between **Loudspeakers**. This is the standard method of calculating the **Interference** between sources using running time phase and if available the internal speaker phase interference. See Appendix A for a discussion how this computation is made.

Pot.Energy

If checked, only the pressure part of the energy will be used to compute **Band Averages** in a manner that shows **Interference** between **Loudspeakers**. See Appendix A for a discussion of how this computation is made.

Kin.Energy

If checked, only the velocity part of the energy will be used to compute **Band Averages**. in a manner that shows **Interference** between **Loudspeakers**. See Appendix A for a discussion of how this computation is made.

Kin. + Pot. Energy

If checked, both the pressure and velocity components of the energy will be used to compute **Band Averages**. in a manner that shows **Interference** between **Loudspeakers**. This is the sum of the potential and kinetic energy**.** See Appendix A for a discussion of how this computation is made.

Sampling Rate (kHz)

This sets the digital **Sample Rate**. Upper frequency limit determines the sample rate. The Shannon formula is $F_{digital} = >2*F_{analog}$. To reproduce 20 kHz the sample rate must be a minimum 40 kHz. The default value is 44100 Hz.

FFT Order

This window sets and displays the **Order** of the **FFT** to be used in the computation. **Orders** between 8 and 16 can be used. The default value is 13.

Levels in dB (A)

This checkmark makes the frequency response display **A weighted**. If not checked, no weighting will be used.

Default Colors

Left click restores **Frequency Response Display Colors** to their **Defaults**.

Legend Tab

The **Legends Tab** sets parameters for the naming, range, and calibration of the axes of **Probe** graphs.
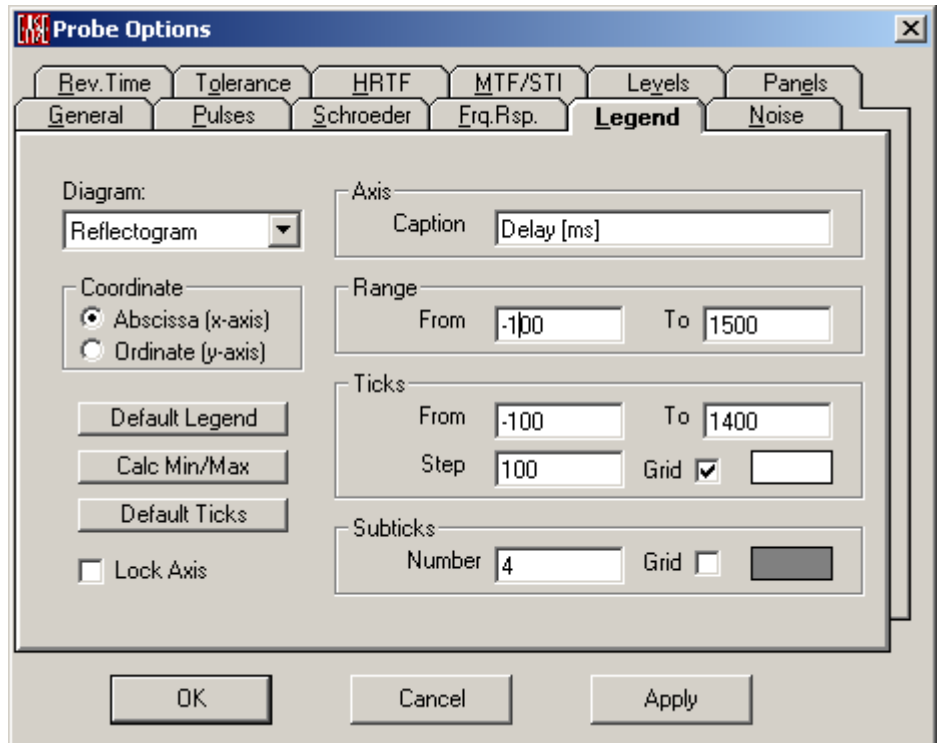
Diagram

This drop down box selects the graph whose settings are to be displayed or modified.

Reflectogram

This displays settings for the standard **Reflectogram.**

Short Time

This displays settings for the **Short Time** Reflectogram.

Reverb Time

This displays settings for the **Reverberation Time** graphs.

Single Pulse EFC

This displays settings for the frequency response graph of a **Single Pulse**.

Pulse Sum EFC

This displays settings for graphs of **Interference (frequency response, complex summation)** between multiple arrivals.

Tolerance

This displays settings for graphs of **Tolerance** guidelines.

Clarity Measures

This displays settings for graphs of **Clarity** measures.

Pressure Levels

This displays settings for graphs of **Pressure Level** graphs.

ALCons

This displays settings for graphs of **ALCons**.

RaSTI

This displays settings for graphs of **RASTI**.

MTI/STI

This displays settings for graphs of **MTI** and **STI**.

Impulse Response

This displays settings for graphs of **Pressure** vs. **Time**.

Energy Time Curve

This displays settings for graphs of **Level** vs. **Time**.

Coordinate

This selects the axis whose settings are to be displayed and set -- either abscissa (x, horizontal) or ordinate (y, vertical) axis

Abscissa (x-axis)

This selects the settings of the **Abscissa (X-Axis)** for display and editing.

Ordinate (y-axis)

This selects the settings of the **Ordinate (Y-Axis)** for display and editing.

Default Legend

Left click to replace current settings with standard EASE settings for this axis.

Calc Min/Max

Left click to compute current upper and lower limits from the data.

Default Ticks

Left click to replace current tick settings with default tick settings for this axis.

Lock Axis

If checked, suppresses auto range and auto ticks and keeps them "frozen".

Axis

For Entering Text for the y-axis

Caption Window

Text entered here will be used to label the selected axis.

Range

Values entered here define the limits of the display of this axis.

From

This number sets the algebraically lowest value to be displayed on this axis.

To

This number sets the algebraically highest value to be displayed on this axis.

Ticks

This section defines the major calibrations of the axis.

From

This number sets the algebraically lowest calibrated value on this axis.

To

This number sets the algebraically highest calibrated value on this axis.

Step

This number sets the increment between calibration points.

Grid

A check in this box will enable grid lines for this axis.

Grid Color

The color box displays the **Grid Line Color**. Left click the box for a Color palette to change the color.

Subticks

This section defines the minor calibrations of the axis.

Number

This sets the number of minor ticks between major ticks.

Grid

A check in this box will enable grid lines for this axis.

Grid Color

The color box displays the **Grid Line Color**. Left click the box for a Color palette to change the color.

Noise Tab

This allows entry of measured or predicted noise levels for the Room for use in intelligibility calculations.

Chart

The unweighted noise levels are shown here in a tabular form. They can be entered as a function of frequency.

Levels

+10 dB, +1 dB, -1 dB, -10 dB

By means of these buttons you increase or decrease the noise level for all frequencies at the same time.

All to Sel.

This will set the noise level at all frequencies to the selected level of a single frequency band.

Interpolate

This allows interpolating for example octave band values to 1/3rd octave band ones.

All Off

This command will switch off the noise for all frequencies and for all types of calculation.

Load File

Opens a file dialog window to load a file with user defined noise curves (*.exn).

Save File

Opens a file dialog window to save a file with user defined noise curves (*.exn).

Rev.Time Tab

This sets parameters for the calculation of **Reverberation** and the addition of a **Reverberant Tail**.
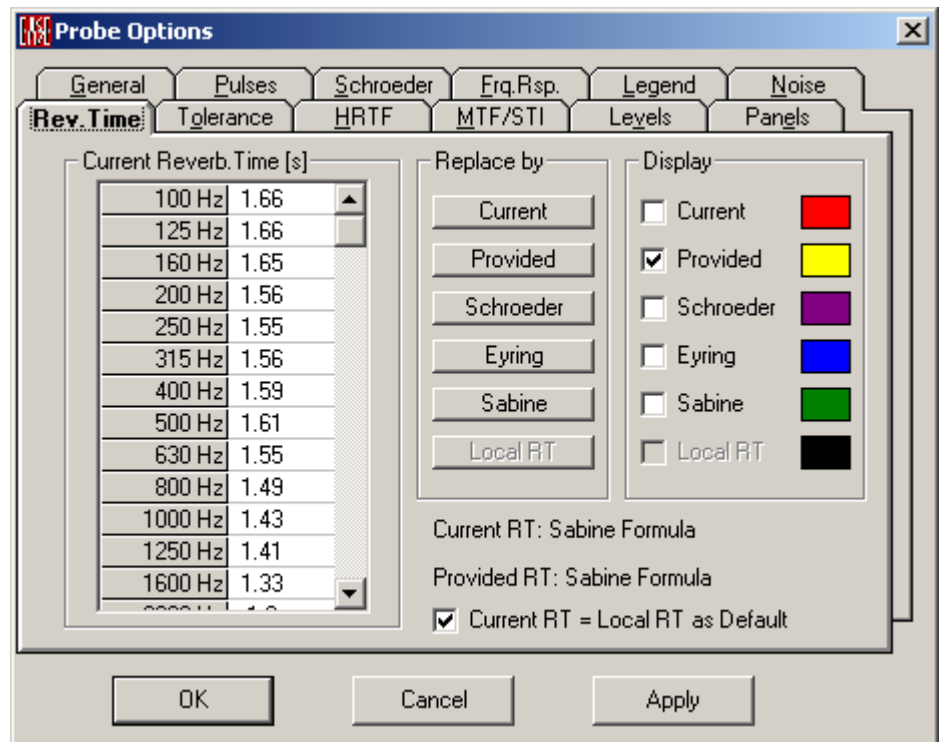
(…….) Reverb. Time [s]

This shows the **activated type of Reverb Times** (here: Current Reverb. Time) in one-third octave bands. Note: This window only affects calculations in Probe.

Schroeder or **Provided** RT60 values will not be used by **EASE Mapping** unless they are entered manually in **Edit Room | Room Data | Room RT** and **RT Locked** is checked.

Replace By

This area allows current **Reverb Times** to be replaced by other **Reverberation** data.

Current

Left click to displays the RT60 values currently valid and last applied in **Probe Options**.

Provided

Left click to replace the display of the current RT60 values with values that were imported along with the reflectogram. Note: This only affects calculations in **Probe**. **Schroeder** or **Provided** RT60 values will not be used by **EASE Mapping** unless they are entered manually in **Edit Room | Room Data | Room RT** and **RT Locked** is checked.

Schroeder

Left click to compute (if not yet done) and to replace the display of the current RT60 values with **Schroeder** RT60. Note: This only affects calculations in **Probe**. **Schroeder** or **Provided** RT60 values will not be used by **EASE Mapping** unless they are entered manually in **Edit Room | Room Data | Room RT** and **RT Locked** is checked. Second Note: the computed values are dependent on the settings for the computation of Schroeder at the Pulse Tab.

Eyring

Left click to replace the display of current RT60 values with the **Eyring** RT60 estimate for actual room properties. See also Appendix A, Reverberation Time. Note: This only affects calculations in **Probe**. **Eyring** RT60 values will not be used by **EASE Mapping** unless they are selected in **Edit Room | Room Data | Room RT.**

Sabine

Left click to replace the display of current RT60 values with the **Sabine** RT60 estimate for actual room properties. See also Appendix A, Reverberation Time. Note: This only affects calculations in **Probe**. **Sabine** RT60 values will not be used by **EASE Mapping** unless they are selected in **Edit Room | Room Data | Room RT.**

Local RT

Left click to replace the display of current RT60 values with the **Local RT** computed at the current **Probe** location. Note: This only affects calculations in **Probe**. **Local RT60** values will not be used by **EASE Mapping** unless they are entered manually in **Edit Room | Room Data | Room RT** and **RT Locked** is checked.

Display

This area selects one or more RT60 values for display in **Probe/Graph/Reverberation**. You may choose one or more at the same time to compare them. Colors help to distinguish the RTs.

Current

Left click to display the RT60 values **Probe** is currently using for calculations. To select and change the current RT60 is done by use of the Apply or OK button.

Provided

Left click to display the RT60 values imported with the reflectogram.

Schroeder

Left click to compute (if not yet done) and display **Schroeder** RT60 values for the current reflectogram.

Eyring

Left click to display the RT60 estimate for actual room properties based on use of the **Eyring** formula. See also Appendix A, Reverberation Time.

Sabine

Left click to display the RT60 estimate for actual room properties based on use of the **Sabine** formula. See also Appendix A, Reverberation Time.

Local RT

Left click to display the Local RT.

See also Appendix A, Reverberation Time.

Tolerance Tab

This Tab displays, sets, and computes parameters for the display of **Tolerance** and guideline criteria for **Reverberation Time**.
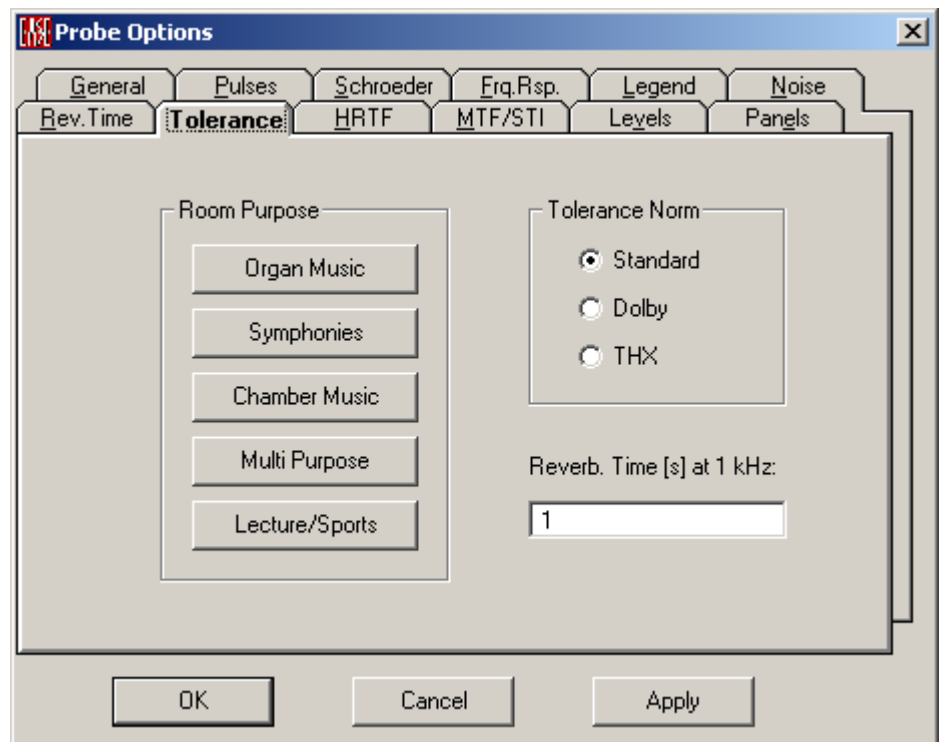
Room Purpose

Computes the recommended (desired) **Reverberation Time** for the current project depending on the intended use and the volume of the hall.

Note: this option is only active together with the Standard Tolerance Norm.

Organ Music

This button gives a RT desired for volumes of $10.000m^3$ ($353.000ft^3$) around 2.4 sec.

Symphonies

This button gives a RT desired for volumes of $10.000m^3$ ($353.000ft^3$) around 2.1 sec.

Chamber Music

This button gives a RT desired for volumes of $10.000m^3$ ($353.000ft^3$) around 1.8 sec.

Multi-Purpose

This button gives a RT desired for volumes of $10.000m^3$ ($353.000ft^3$) around 1.4 sec.

Lecture/Sports

This button gives a RT desired for volumes of $10.000m^3$ ($353.000ft^3$) around 1.3 sec.

Tolerance Norm

This toggles between the Standard tolerance setting set by the RT desired and the Dolby and THX cinema standards.

Standard

This selects display of **Room Purpose** guidelines.

Dolby

This selects display of **Dolby** room recommendations for cinemas.

THX

This selects display of **THX** recommendations for cinemas.

Reverb Time (s) at 1 kHz

This window shows the recommended **Reverb Time at 1 kHz** and allows entering one by hand.

HRTF Tab

This Tab sets parameters for **Impulse Response** and **Energy Time** Curve calculations as well as for **Pulse Directionality** for the dummy head.
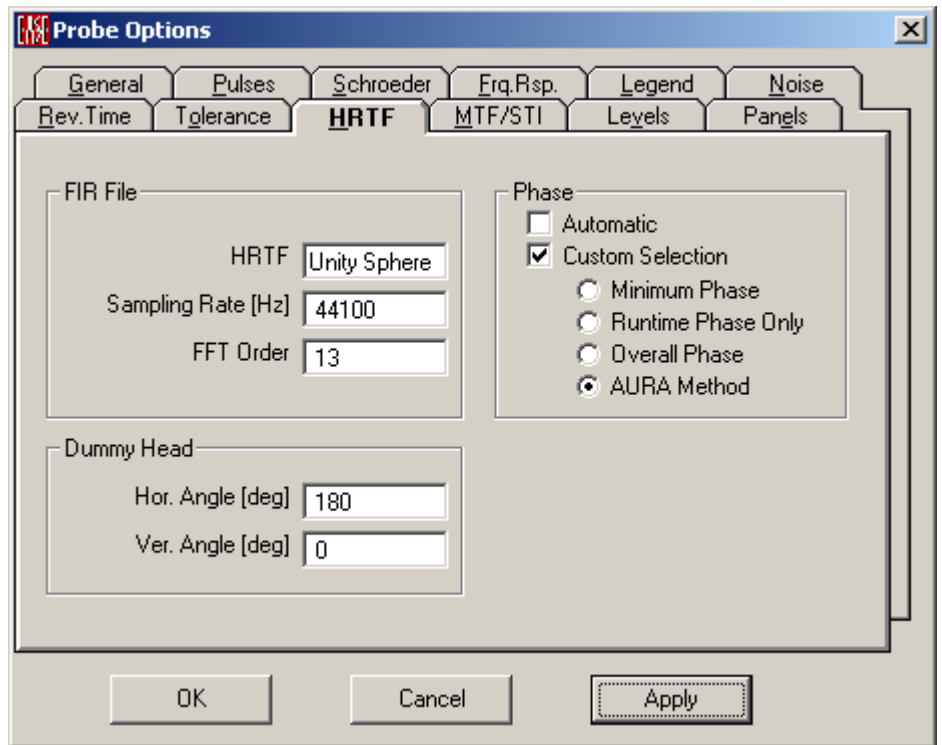
FIR File

This shows that Unity Sphere is the only (trivial) HRTF used in Probe and sets the calculation parameters for time sampling and FFT convolution.

HRTF

Names the HRTF file to be used in calculations.

Sampling Rate (Hz)

This sets the digital sample rate. Upper frequency limit determines the sample rate. The Shannon formula is $\mathbf{F_{digital} = >2*F_{analog}}$. To reproduce 20 kHz the sample rate must be a minimum 40 kHz. The default value is 44100 Hz.

FFT Order

This window sets and displays the **Order** of the **FFT** to be used in the computation. **Orders** between 8 and 16 are can be used. The default value is 13.

Dummy Head

This sets the horizontal and vertical orientation of the **Dummy Head** that is simulated by the **HRTF** (Head Related Transfer Functions) at the **Probe** location. This sets the directional viewpoint of all computed responses. Zero degrees horizontal is looking in the +Y direction. Zero degrees vertical is looking parallel to the Z domain and positive angles are upward.

Hor.Angle (deg)

This sets the orientation of the Dummy Head in the horizontal plane (azimuth). The reference direction looks toward positive Y.

Ver.Angle (deg)

This sets the orientation of the Dummy Head in the vertical plane. Positive angles are upward. .

Phase

This sets the phase response of the HRTF filters.

Automatic

This setting is the recommended setting for the generation of the phase response. If selected the software will automatically choose the most appropriate calculation parameters. In most cases this will be the same as the AURA method.

Custom Selection

Minimum Phase

This selects Minimum Phase response.

Runtime Phase only

This selects Linear Phase Response and uses runtime phase only.

Overall Phase

This selects True Phase Response, i.e. the runtime phase and the phase of the devices.

AURA Method

This setting selects a Linear Phase Response that is applied along with a cubic (spline) interpolation of the frequency response data.

MTF/STI Tab

Sets colors for the display of **MTF** (Modulation Transfer Function) and **STI** (Speech Transmission Index) calculations.
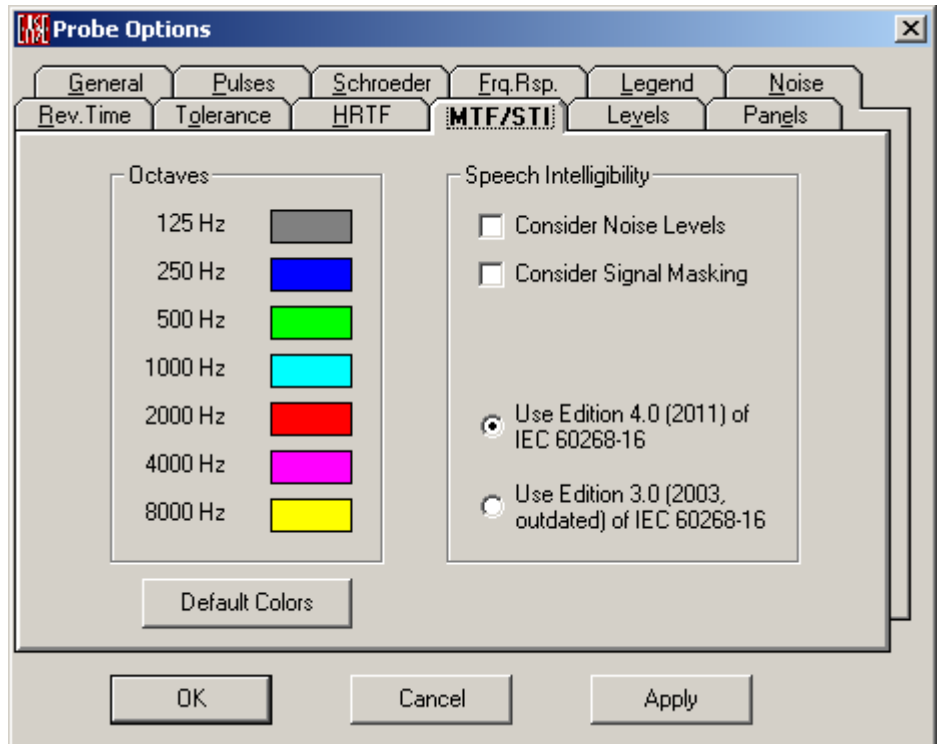
Octaves

This sets colors used to display MTF and STI data. To change a color, click on it to open the Color palette and select the desired color.

125-8K 1 Octave Bands

This sets colors used to display **MTF** and **STI** data. To change a color, click on it to open the Color palette and select the desired color.

Default Colors

Left click to reset Colors to standard EASE colors.

Speech Intelligibility

Allows enabling additional parameters for intelligibility calculations.

In EASE the only difference between the implementations of Edition 3.0 vs. 4.0 is the revised function for signal masking.

Consider Noise Levels

Enables S/N correction for calculation of STI and derived measures according to IEC 60268-16, see Appendix A, STI.

Consider Signal Masking

Enables signal masking and hearing threshold corrections for calculation of STI and derived measures according to IEC 60268-16, see Appendix A, STI.

Use Edition 4.0 (2011) of IEC 60268-16

Enables calculation of STI and derived measures according to IEC 60268-16:2011, see Appendix A, STI.

Use Edition 3.0 (2003, outdated) of IEC 60268-16

Enables calculation of STI and derived measures according to IEC 60268-16:2003, see Appendix A, STI.

Levels Tab

This Tab defines what Pressure Level and Clarity quantities will be displayed and what colors will be used for each.
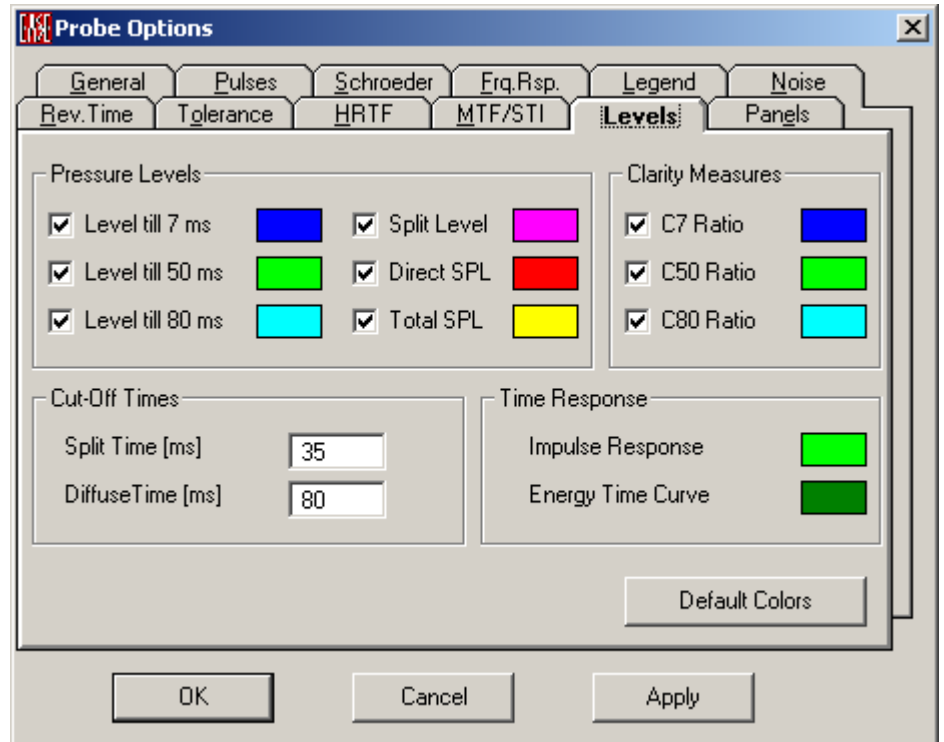
Pressure Levels

This section selects the pressure levels metrics for display on the **Pressure Level** graph and the display color for each.

Level till 7 ms.

A checkmark here displays **L7**, the sum of the direct and reverberant energy, in dB SPL, within the first 7 milliseconds of the first arrival.

Level till 50 ms.

A checkmark here displays **L50**, the sum of the direct and reverberant energy, in dB SPL, within the first 50 milliseconds of the first arrival.

Level till 80 ms.

A checkmark here displays **L80**, the sum of the direct and reverberant energy, in dB SPL, within the first 80 milliseconds of the first arrival.

Direct SPL

A checkmark here displays the direct sound energy, in dB SPL.

Split Level

A checkmark here displays **Lsplit**, the sum of the direct and reverberant energy, in dB SPL, between the period beginning with the first arrival and ending at 0 the selected split time.

Total SPL

A checkmark here displays **Total SPL**, the sum of the direct and reverberant energy in dB SPL.

Clarity Measures

This section selects the **Clarity Measures** for display on the **Clarity** graph and the display color for each.

C7

This is the ratio, in decibels, of energy before and after 7 milliseconds (relative to the time of first arrival). This calculation is used to predict the strength of direct sound sources for localization.

C50

This is the ratio, in decibels, of energy before and after 50 milliseconds (relative to the time of first arrival). This calculation is used to predict the articulation of human speech.

C80

This is the ratio, in decibels, of energy before and after 80 milliseconds (relative to the time of first arrival). This calculation is used to predict **Clarity** of different modes of music.

Colors

This selects colors for the presentation of IR and ETC response.

Cut-Off Times

Split Time (ms)

Sets the time relative to the first arrival that delineates **Direct** and **Reverberant Sound**.

Diffuse Time (ms)

This is the **Time**, relative to the first arrival, when the reverberant field becomes **Diffuse** in its reflections.

Time Response

Impulse Response

This shows the color used to display the **Impulse Response**. Left click on the color to open a **Color** palette to change the **Color**.

Energy Time Curve

This shows the color used to display the **ETC**. Left click on the color to open a **Color** palette to change the **Color**.

Default Colors

Left click will reset all colors on this Tab to standard EASE settings.

Panels Tab

This tab controls the display of parameters on the **Status Bar** at the bottom of the **Probe** window.
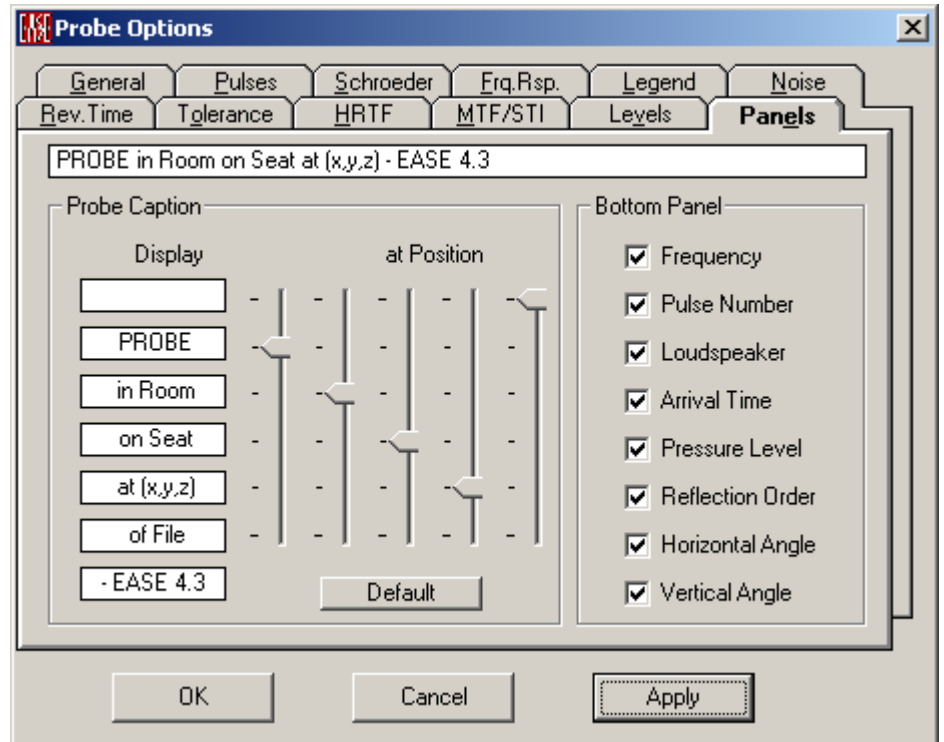
Probe Caption

This section allows customizing the relevant parameters displayed in the caption of the main window. Use the sliders to change the order of the items shown.

Default

Resets the sequence of items displayed in the window caption to the standard setting.

Time Response

Frequency

A checkmark here shows the current **Frequency** on the **Status Bar** in **Probe**.

Pulse Number

A checkmark here shows the current **Pulse Number** on the **Status Bar** in **Probe**.

Loudspeaker

A checkmark here shows the current sound source (e.g. **Loudspeaker**) on the **Status Bar** in **Probe**.

Arrival Time

A checkmark here shows the current **Arrival Time**, relative to the first arrival, on the **Status Bar** in **Probe**.

Pressure Level

A checkmark here shows the current **Pressure Level** on the **Status Bar** in **Probe**.

Reflection Level

A checkmark here shows the **Level** for the current **Reflection** on the **Status Bar** in **Probe**.

Horizontal Angle

A checkmark here shows the current **Horizontal Angle** on the **Status Bar** in **Probe**.

Vertical Angle

A checkmark here shows the current **Vertical Angle** on the **Status Bar** in **Probe**.

Reverberant Tail Window

Parameter

Parameters set on this screen are interactive. When some are entered, others will be computed and displayed. Left click to **Recompute** or **OK** to begin calculations.

Tail Start [ms]

This defines the time at which the user wants to add the tail.

Tail Length [s]

This defines the length of the added tail. It should be orientated to the RT60.

Pulse Density [1/s²]

This allows the user to influence the pulse density of the tail. Normally it increases with time. The entered value defines the increase of the pulse density per second. The default value is calculated from the ETC curve.

Maximum Density [1/s]

This value determines how soon the increase of pulse density will be stopped and stays constant after that. The default value is calculated from the ETC curve.

Amplitude Noise [dB]

This defines the size of the level variation of the random noise. The default value is calculated from the ETC curve.

Amplitude Gain [dB]

The value entered here moves the whole tail sound pressure level above or down, applied to all third octave bands simultaneously. The default value is calculated from the ETC curve.

Recompute

Left click on **Recompute** sets all these parameters to the default values calculated from the ETC curve.

Tail Onset SPL

These fields allow the input of the sound pressure level at the starting point for every third octave band of the tail. This allows the user to adjust the level of the tail for each third octave band.

Impact Prediction Window
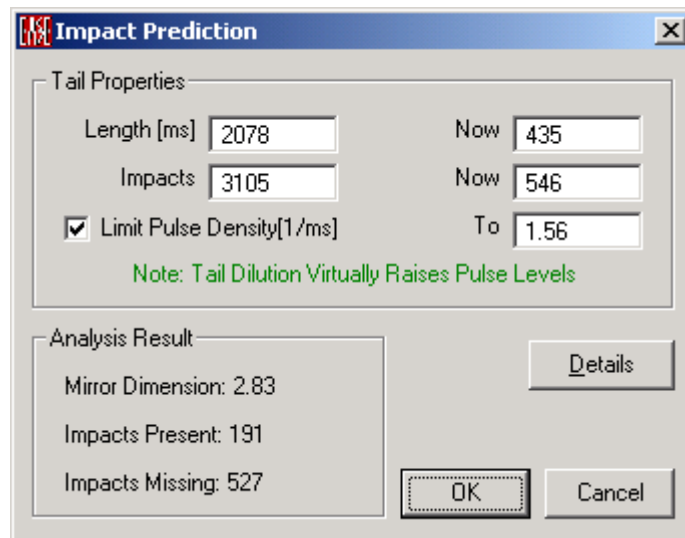
Tail Properties

Length

This is the duration of the tail wanted and until now.

Impacts

This is the number of reflections in the resulting **Tail**. The two parameters are interactive – if either is entered the other will be computed.

Limit Pulse Density

If this is checked, the maximum pulse density (pulse number per millisecond) is limited to the value entered into the box, or remains as determined by the prediction algorithm. The latter case can lead to unwanted very high density values which need much memory. Increasing the density beyond 2.8/ms is psychoacoustically no longer audible.

Analysis Result

This Window shows some Tail parameters.

The number N of theoretically expected impacts within delay t is assumed to grow exponentially as $N(t) = A*t^D$. The exponent D is shown as **Mirror Dimension**. For a shoebox-shaped hall without absorbing walls, D should approach 3, the physical dimension of the room, if t sufficiently exceeds the mean free path length of the hall. **Impacts Present** is the number of impacts contained in the currently analyzed reflectogram. **Impacts Missing** is the difference between N(t) and **Impacts Present**. More details are displayed by the **Details** button.

Inspect Details Window

This window displays the results of computation of useful metrics about the project based on current **Probe** data.
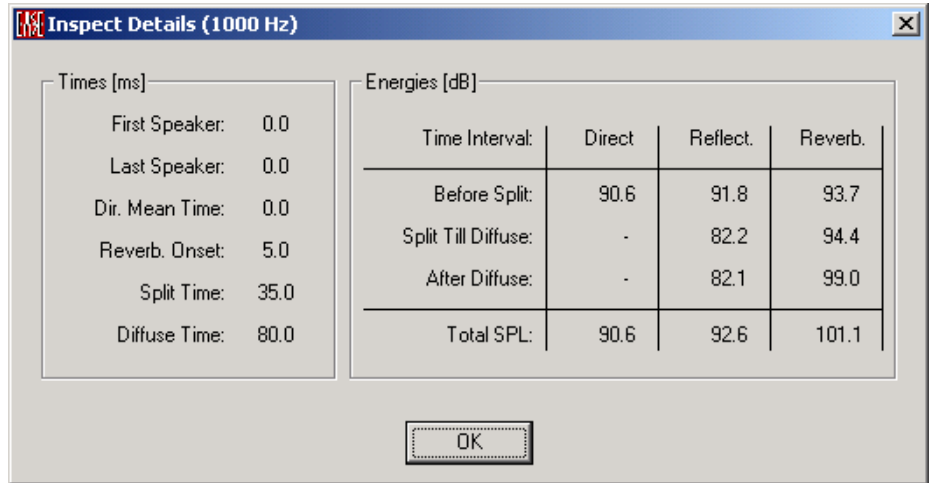
Times (ms)

First Speaker

This is the time of the first pulse with respect to a certain "reference time" **tRef.**
This time is determined as follows. To start with, **tRef** is set to the arrival of the
first pulse. Then, all subsequent pulses are checked to determine whether there is
one (later than **tRef**, but not later than 50 ms) above the precedence level curve
(Haas-Effect, s. Ahnert/Steffen, Fig. 3.37) of the reference pulse. If so, the new
pulse is taken as a reference pulse, and the check procedure is repeated until no
new reference pulse can be found.

Last Speaker

This shows the last direct arrival but it may be different than "Direct Off" if the
last speaker is shadowed or masked.

Direct Mean Time

This shows the time in the direct sound reflectogram when there is an equal
energy split point. This is known as the energy barycenter. The energy is
calculated by averaging the pulses and time together. The earlier the center time
occurs, the more all calculations are referred to the first speaker time.

Reverb. Onset

This shows the start of the reverberation period if there are no reflections
available to calculate after it (either 5ms after the last speaker signal or 25 ms
after Direct Mean Time or not later than 2ms * Square Root (room volume/m³),
it depends on what is earlier.)

Split Time

This shows the **Split Time** set in the **Levels Tab.** This time is used to separate
the energy that is considered "good" for intelligibility from the "bad".

Diffuse Time

This shows the time set under the **Levels Tab**. This indicates the point when the
reverberant field becomes diffuse in its reflections. **tDiff** is used to indicate the
end of simulated reflections and the start of diffusive sound field estimates. If
reflections are available, reverberation estimates are not used before **tDiff**. If no
reflections are available, reverberant sound is estimated to start at the "Reverb.

Onset" time. Note that the energy portion in the tail after **tDiff** still depends on the reverb onset time, even if only simulated reflections are considered before **tDiff.**

Energies (dB)

This area shows the different energies at the selected frequency.

Direct (before split)

This shows the summed energy of all the direct sounds that occur before the split time.

Reflect (before split)

This shows the summed energy of all the reflected sounds that occur before the split time. This does not include direct energy.

Reverb (before split)

This shows the summed energy of all the reverberant energy that occurs before the split time.

Direct (split till diffuse)

This shows the summed energy of all the direct sounds that occurs after the split time and before the diffuse time.

Reflect (Split till diffuse)

This shows the summed energy of all the reflected sounds that occurs after the split time and before the diffuse time.

Reverb (split till diffuse)

This shows the summed energy of all the reverberant energy that occurs after the split time and before the diffuse time.

Direct (after diffuse)

This shows the summed energy of all the direct sounds that occurs after the diffuse time.

Reflect (after diffuse)

This shows the summed energy of all the reflected sounds that occurs after the diffuse time.

Reverb (after diffuse)

This shows the summed energy of all the reverberant energy that occurs after the diffuse time.

Direct (total SPL)

This shows the summed energy of all the direct sounds.

Reflect (total SPL)
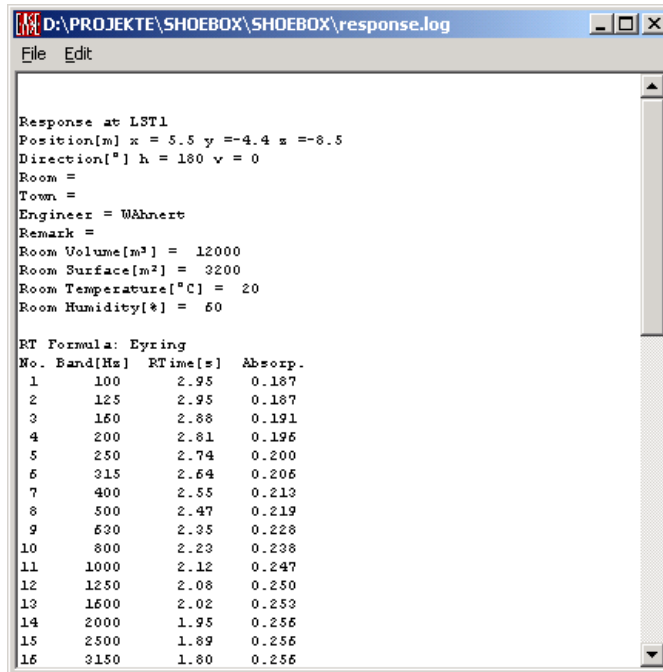
This shows the summed energy of all the reflected sounds.

Reverb (total SPL)

This shows the summed energy of all the reverberant energy.

Response Info Text Window

This window displays the parameter of computation used in the current **Probe** data file.

File Menu

Clear   *Ctrl+N*

Clears the file

Save   *Ctrl+S*

Saves the file

Save As

Saves file under another name

Print Selected Text

Allows the printing of marked parts of the text

Print File   *Ctrl+P*

Prints whole content of the file

Exit

Leaves the Window

Edit Menu

Copy Ctrl+C

Copies marked parts of the text into the clipboard

Select All   Ctrl+A

Marks the whole text

Notes

EASE 2.1 and earlier Reflectogram Files (POST, EARS, and IMPACT) provide only partial information about reverberant noise conditions. Only some contain data about room volume or mean absorption. Impact files contain 1m SPL values, but no directivities. Hence, PROBE must assume SPHERE speakers, thus overestimating e.g. reverberant energy.

What information is carried with different files?

File:	Post1.0	Post1.1	Post2.0	Post2.1	EARS	IMPACT	EASE 2.1
Refl. Order	-	-	-	-	-	x	-
Impact angles	-	x	x	x	x	x	x
Volume	-	-	-	x	x	x	x
Surface	-	-	-	x	x	x	x
Absorption	-	-	-	-	x	x	x
Lsp 1m SPL	-	-	-	-	-	x	x
Directivity	-	-	-	-	-	-	x
Reverb.Time	-	-	-	x	x	x	x
Ambient Noise	-	-	-	x	x	x	x

Chapter VIII : Ease Ears

EASE Ears

EARS is a collection of tools for **Auralization** -- that is the multi-step process of 1) computation of the response at a given point within a known room from excitation by a known sound source (done in ray module or in Area or Room mapping); followed by 2) convolution of that response with the **Head Related Transfer Function** of a human listener to produce the **Binaural Impulse Response** for that listener at that point in the room (done in EARS); then 3) convolution of the **Binaural Impulse Response** with an **Input Sound (WAV) File** having no reverberation to produce a resultant sound (.WAV) file that includes the room response (done in the Auralization part of EARS); and 4) the auditioning of a playback of the resultant .WAV file through a pair of loudspeakers or headphones.

EARS/Auralization can also convolve **Binaural Impulse Responses** measured in real rooms using devices like the **Kemar Dummy Head,** and can compute response files for use in **Auralizations** using the **Lake CP4** or **Huron DSP Board**.

EARS can perform the third step "in real time" or "off-line". "Off Line" convolution operates on files only, and produces a resultant file. Real Time convolution operates on an audio source and produces an audio output. The **EARS Convolver** works only Off-Line, while the Lake Convolver can work either Off Line or in Real Time.

Finally, **EARS** can perform multiple Off Line convolutions to a single location for multiple sources, multiple source locations, and each at its own level, then combine them to produce a resultant sound file which includes a prediction for all sources at their relative levels. Such combined convolutions can, for example, simulate the performance of a multi-channel sound system or an orchestra, the behavior of a sound system in the presence of noise, the effect of various room treatments on sound system performance or on noise sources, and so on.

Ears Main Window
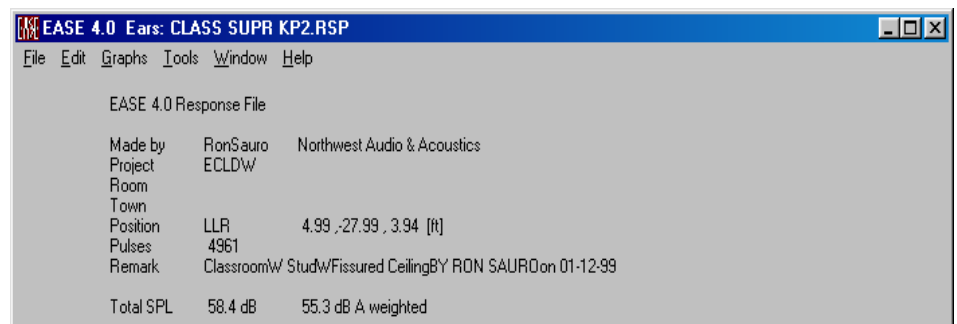
After loading a response file you enter the main menu of EARS and get some basic information about the file just loaded in.

File Menu

This menu accesses file management and Printing.

Open Response File(RSP)

This opens EASE 3.0, 4.x Response Files for listening and editing. To use this command:

1. Left click on **Open Response File (RSP)**. This opens an **Open File** window.

2. Browse to the folder for the **Response** file, select the file, and Left click **Open**.

Open Filter File (BIR)

This opens EASE 3.0, 4.x Filter Files for listening and editing of filter data. To use this command:

1. Left click on **Open Filter (BIR) File**. This opens an **Open File** window.

2. Browse to the folder for the **Filter File**, select the file, and Left click **Open.**

Send Picture To

This allows the current active picture to be sent to the Clipboard, a File, or **EASE Page Designer**.

Clipboard

This copies the current picture to the **Windows Clipboard.**

File

This saves the current **Picture** to a file. Supported formats are:

Windows Bitmap……………………………*.BMP

JPEG………………………………………*. JPG

CompuServe GIF……………………………*.GIF

Portable Network Graphics……………………*.PNG

Tagged File Format…………………………*.TIF

LuRa Tech Wavelet…………………………*.LWF

Zsoft Paintbrush……………………………..*.PCX

Windows Icon……………………………….*.ICO

Enhanced Windows Metafile………………*.EMF

Truevision Targa…………………………….*.TGA.

EASE Page Designer

This opens the current picture in **EASE Page Designer,** allowing text annotations, multiple picture layouts, and editing of the page layout format before printing, or for use in printed reports and presentations.

Fast Open (standalone only)

This stores the paths of the last 10 open files. A left click will open the selected project directly.

Exit

This exits the EARS module.

Edit Menu

This menu accesses viewing, manipulation, and format conversion of **Room Response** and **Binaural Impulse Response Files**.

Make Binaural Response

This computes a **Binaural Filter** (.BIR) **File** from a three-dimensional response file (.RSP) for use in **Auralization**. To use this command:

1. Left Click on **Make Binaural Response**. This opens the **Binaural Impulse Response** window.

2. The first **Input RSP** window specifies the filename of the input file, the second window specifies the directory. Left click on **File** to browse the hard drive.

3. **Sampling Rate (Hz)** specifies the sampling rate for the .BIR files. This must match the sampling rate of the .WAV files used in **Auralization**.

4. **Sampling Rate, FFT Order** and **Resolution (Hz)** are interactive parameters that specify how the new file should be calculated. Any two can be specified, and EASE will compute the other.

5. The **Phase computation** window sets the phase method used to calculate the impulse response or the ETC from the input response file (*.RSP) to convolve it with the HRTF.

6. **SPL Gain** (dB) sets the gain of the **Convolution**. This could be used to adjust for different locations in the room or to prevent overload (clipping) distortion.

7. **Dummy Hor (deg)** specifies the horizontal orientation of the dummy head in the EASE model. Type in the window to change. This angle is referenced to +Y =Zero degrees.

8. **Dummy Ver (deg)** specifies the vertical orientation of the dummy head in the EASE model. Type in the window to change. Zero degrees is referenced to horizontal.

9. The first **Output BIR** window specifies the filename, the second window specifies the directory. EASE assigns defaults for both. To edit, type a new name in the windows, or Left Click **File** to browse the hard drive.

10. The **HRTF** drop-down window selects the **Head Related Transfer Function** to be used to create the **Binaural Impulse Response File**. The **Dummy Head** file is recommended for most **Auralization** work.

11. Left Click **OK** to create the **Binaural Impulse Response** or **Cancel** to abandon the calculation. Both choices will close the window.

Compute SIM File

This computes a **Binaural SIM File** from a three-dimensional (.RSP) for use with the **Lake CP4** or **Huron DSP** board. To use this command:

1. Left Click on **Compute SIM File**. This opens the **Lake SIM File** window.

2. The first **Input RSP** window specifies the filename of the **Input File**, the second window specifies the folder. Type **Filename** and path into these windows, or Left click on **File** to browse the hard drive.

3. **Sampling Rate (Hz)** specifies the sampling rate for the new SIM file. It should be at least 2X the highest audio frequency needed for **Auralization**, and must match the sampling rate of audio that will be convolved with the **SIM** file.

4. **Sampling Rate, FFT Order** and **Resolution (Hz)** are interactive parameters that specify how the new file should be calculated. Only two can be specified, and EASE will compute the other.

5. The **Phase computation** window sets the phase method used to calculate the impulse response or the ETC from the input response file (*.RSP) in convolving it with the HRTF.

6. **SPL Gain (dB)** sets the gain of the convolution. This could be used to adjust for different locations in the room or to prevent overload (clipping) distortion.

7. **Dummy Hor (deg)** specifies the horizontal orientation of the dummy head in the EASE model. Type in the window to change. This angle is referenced to +Y =Zero degrees.

8. **Dummy Ver (deg)** specifies the vertical orientation of the dummy head in the EASE model. Type in the window to change. Zero degrees is referenced to horizontal.

9. **Resolution (Hz)** is the resolution of the computed SIM file.

10. The **Output SIM** section specifies the filename, file type, and the number of datapoints for the SIM file to be computed..

11. A checkmark in the **Directional SIM File** area will force a calculation of a left and right tail SIM file and of 2 x 128 short SIM files to allow the localization in real time head turn operations when using the Lake CP4 or Huron.

12. The first **Output SIM** window specifies the filename, the second window specifies the directory. EASE assigns defaults for both. To edit, type a new name in the windows, or Left Click **File** to browse the hard drive.

13. **Data Points** shows the number of recommended data points for the SIM file. To change this parameter, type a new number in the window.

14. The **HRTF** window specifies the **Head Related Transfer Function** file to be used to create the **SIM File**. The **Dummy Head** file is recommended for most **Auralization** work.

15. Left Click **OK** to create the file or **Cancel** to abandon the calculation. Both choices close the window.

Convert File Format

This converts between supported file types such as .WAV, .TIM, .BIR, and .SIM.

Modify BIR File

This resamples or amplifies a BIR filter file.

Wave File Delay Padding

This allows the padding of as many zero samples to the wave file beginning as is defined by the associated delay; that is, the signal becomes delayed explicitly within the file. In EARS, wave files get assigned delays (the start time of the first file sample, relative to a certain reference time) and levels (the dB value corresponding to the maximum file amplitude, usually 32767) in order to represent natural sound signals. **Wave File Delay Padding** transforms this implicit delay into an explicit one, while the implicit delay is lowered to zero. For use with EARS devices like mixers or convolvers, both forms are equivalent. For the use of wave files with other software, this is a way to transfer a delay together with the file.

Insert Leading Zeroes

This inserts as many as (delay * sampling rate) leading zero samples in front of the wave file to convert its implicit delay into an explicit one. After execution, the implicit delay is almost zero (shorter than the reciprocal sampling rate, i.e. the time span between two consecutive file samples).

Remove Leading Zeroes

This removes leading zero samples from the wave file and adds the corresponding duration (number of those samples divided by sampling rate) to its implicit delay. After execution, the first file sample is different from zero.

Batch Processing

This allows processing a sequence of Binaural Impulse Response (BIR) files in batch mode, that is, in an unattended way, without further user interaction. These BIR files can either be generated from a Room Response File (.RSP), or used for offline auralization of a given signal (.WAV file). Both command types can appear interleaved.

After having entered the data of all processing steps desired, you can either **Save** this command sequence, or **Run** it for immediate execution.

If you choose to **Save** it into an **EASE Command File** (.ECF), you can execute it at any later time by **Execute Command File**; see next section.

Note that .ECF files are simple plain text files that can be edited manually. The example is almost self-explanatory:

EASE Command File   ;file identifyer, mandatory in 1.line

Version = 4.0

;general header info, can be omitted

User = Feistel

Firm = ADA

Time = 30.09.01 16:02:02

Logfile = D:\EASE\EASEBeta\SHOEBOX\command.log

;Process 1

FFTOrder = 13

Samplingrate = 44100

HRTF = Dummy

Phase = Runtime

InputRSP = D:\EASE\EASEBeta\SHOEBOX\shoebox_lst1.rsp

OutputBIR = D:\EASE\EASEBeta\SHOEBOX\shoebox_lst1.bir

ComputeBIR

;Process 2

FFTOrder = 13

Filter = D:\EASE\EASEBeta\SHOEBOX\shoebox_lst1.bir

InputWAV = C:\EaseData\WAVFiles\talker.wav

OutputWAV = D:\EASE\EASEBeta\SHOEBOX\output.wav

Convolve
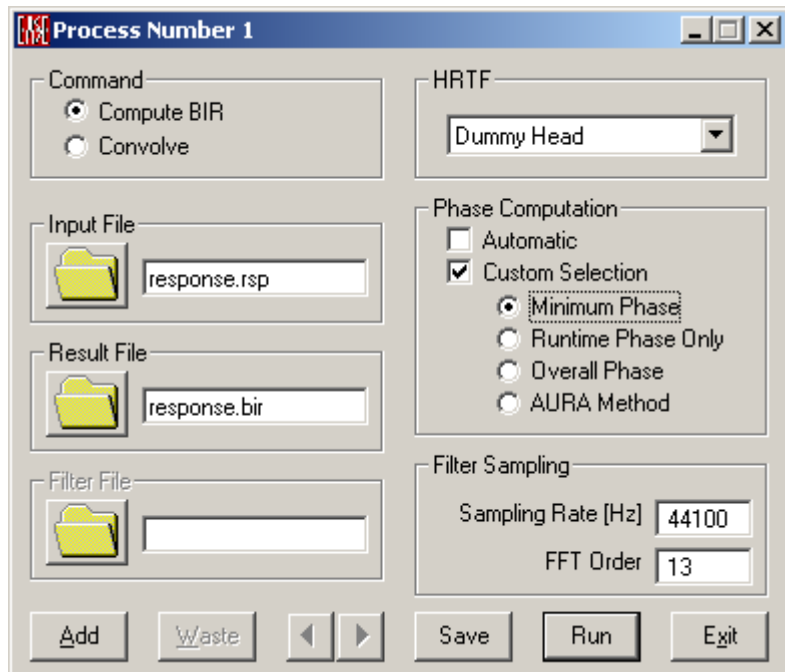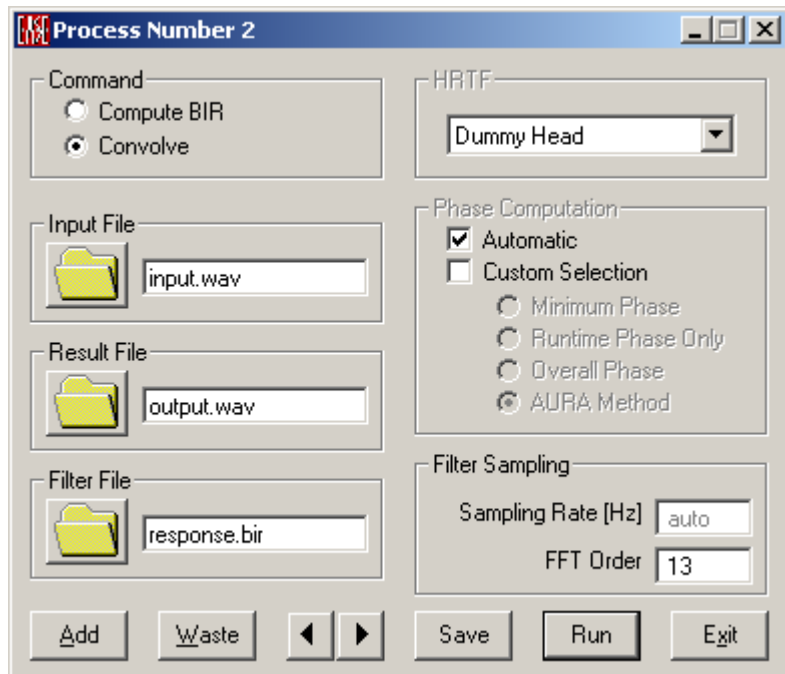
Execute Command File

This is to execute a previously created EASE Command File (.ECF), either by the EARS Batch Processing method, or edited manually.

The ECF file is read, its processing steps are checked for obvious errors, and in case no error is detected, the execution is started. After finishing, a log file is shown with a protocol of the execution progress and possibly occurred errors.

Graphs Menu

This menu displays Binaural Impulse responses and HRTF Balloons.

BIR Filter Info

This shows left and right impulse responses and provides information about the current BIR file.

HRTF Balloon

This displays the 3D directivity **Balloon** of a selected **Head Related Transfer Function**.

Dummy Head

This the standard **EASE Dummy Head** response.

KEMAR Head

This is the **KEMAR Dummy Head**.

Unity Sphere

This is a non-directional spherical response.

Unity Halves

This is a half-space spherical response.

Lambert Sides

This is a Lambert response (halves in cosine shaped form) directed to the side.

Lambert Front

This is a Lambert response (halves in cosine shaped form) directed forward.

Lambert Top

This is a Lambert response (halves in cosine shaped form) directed upward.

Tools Menu

This menu accesses the, generation, playing, recording, and **Auralization** of **Binaural Impulse Response Files**.

Auralization

This starts the **Lake Real-Time** or the **EARS Off-Line Convolver**.

Auralize WAV File

This **Auralizes** a selected **.WAV File** using a current **.BIR Response File.**

Stereo Convolver

Allows in online or offline mode to convolve binaural files with stereo dry music or speech signals. As an example, imagine a home stereo system. Left input channel is the signal delivered to the left speaker, left filter is the binaural room response of this speaker with respect to a listener. Correspondingly, right input channel is the signal delivered to the right speaker, right filter is the binaural room response of the right speaker. Incoming signals at the listener position are superimposed separately for both ears, providing the auralization of stereo system in a given room.

Use is not restricted to stereo systems: arbitrary one- or two-channel systems can be auralized binaurally as e.g. a speech source with a music or noise source emitted from different positions in the room.

For further details see Stereo Convolver window

Convolve and Mix

This allows multiple .WAV files to be convolved with the same or different **Binaural Impulse Response Files**, each with its own gain and delay settings, then combined (mixed) to a single **Output .WAV File**. All files must have the same sample rate. This very powerful tool is only available for **EARS Off-Line Auralization.**

For example, to **Auralize** a simple Left/Right stereo playback system, one would first compute the BIR file for the left channel loudspeaker(s) at a **Listener Seat** and a second BIR file for the right channel loudspeaker(s) at the same seat. **Convolve and Mix** would then be used to convolve the left channel of a stereo source track with the left loudspeaker's BIR file and to convolve the right channel of the source track with the right loudspeaker's BIR file. The resulting **Output File** would be an **Auralization** of the stereo Loudspeaker system playing a stereo source track.

Output WAV Files produced by **Convolve and Mix** take into account all of the **Convolution Level** and **Delay** settings.
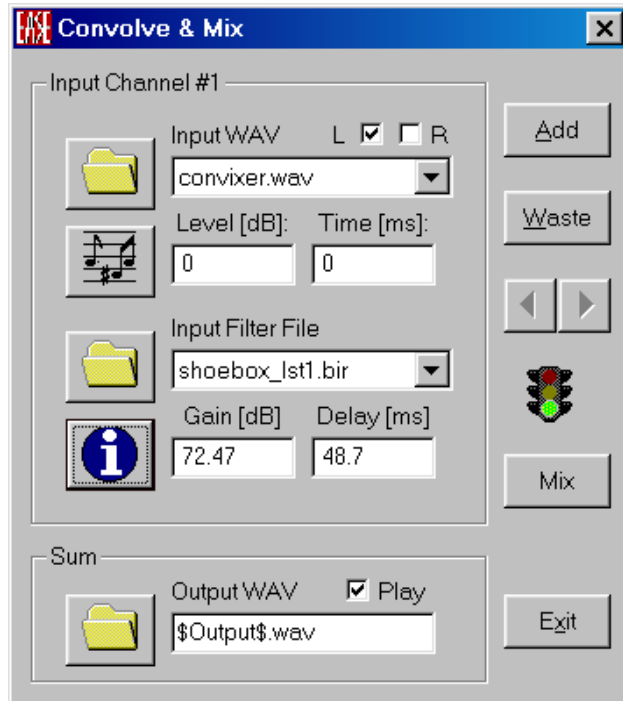
WAV File Mixer

This mixes different WAV files of the same sample rate, each with its own delay and level changes, to produce a new .WAV file. Input filenames, gain settings, and delay settings will be stored in the resulting *.WAV file. By checking **Mono** a monophonic file is produced instead of 16 bit stereo file. If **Play** is checked, the **Mixed File** will be **Played** immediately after being **Saved**.

Play WAV File

This plays a selected **WAV Sound File** using either the **EARS Player** or the **Windows Player**. NOTE: When EARS creates a .**WAV file**, it also keeps track of levels and delays associated with a **Convolution**. The **EARS Player** is aware of these settings, but the **Windows Player** is not, so the **EARS Player** should be used when playing .WAV files created by **EARS**.

EARS

A file selection window opens. When the file is selected, the **EARS Player** opens, plays the file, and remains open until closed. NOTE: When EARS creates a .**WAV file**, it also keeps track of levels and delays associated with a **Convolution**. The **EARS Player** is aware of these settings, but the **Windows Player** is not, so the **EARS Player** should be used when playing .WAV files created by **EARS**.

Windows

A file selection window opens. When the file is selected, the **Windows Player** opens but does not begin playing automatically.

Record WAV File

This opens the **Windows .WAV Recorder**.

CD Player

This plays an audio CD from the built-in CDROM device using either the **EARS CD Player** or the **Windows Player**.

Ears

This starts the **EARS CD Player**.

Windows

This starts the **Windows CD Player**. Use the **Windows CD Player** for **Lake Real Time Auralizations**.

Volume Control

This opens the mixer that is resident with the computer's sound card.

Generate Signal

This generates standard test signals, background noises, and other sounds and saves the result as a **.WAV File**. See also Generate Signal Window. To use this command:

1. Left Click on **Generate Signal**. This opens the **Generate Wave** window.
2. Select the desired sound and set desired parameters.
3. Left Click on **Generate Wave File.**

Window Menu

This menu sets up special screen layouts.

Screen Quarter

This allows placement of the active window into any of 5 positions.

Center

This places the open window in the center of the screen.

Upper Left

This places the open window in the upper left corner of the screen.

Upper Right

This places the open window in the upper right corner of the screen.

Lower Left

This places the open window in the lower left corner of the screen.

Lower Right

This places the open window in the lower right corner of the screen.

Cascade Windows

This makes all open windows appear in a stacked format.

Help Menu

This menu allows access to all forms of help.

Help Topics

This offers a list of commonly asked help subjects. We have made a concerted effort to develop the Help files and the manual together. If you need an answer as to what a particular command does go to the help files. You will likely find your answer there.

About

This displays information about your EASE program.

About XTC

This displays information about the **Cross-Talk-Cancellation** DLL File and parts of the license agreement.

About KEMAR

This displays information about the **Kemar HRTF Data File** and parts of the license agreement.

Memory Used

This tests and dynamically displays the computer memory actually used.

Generate Signal Window

This menu controls the built-in EARS test signal generator.
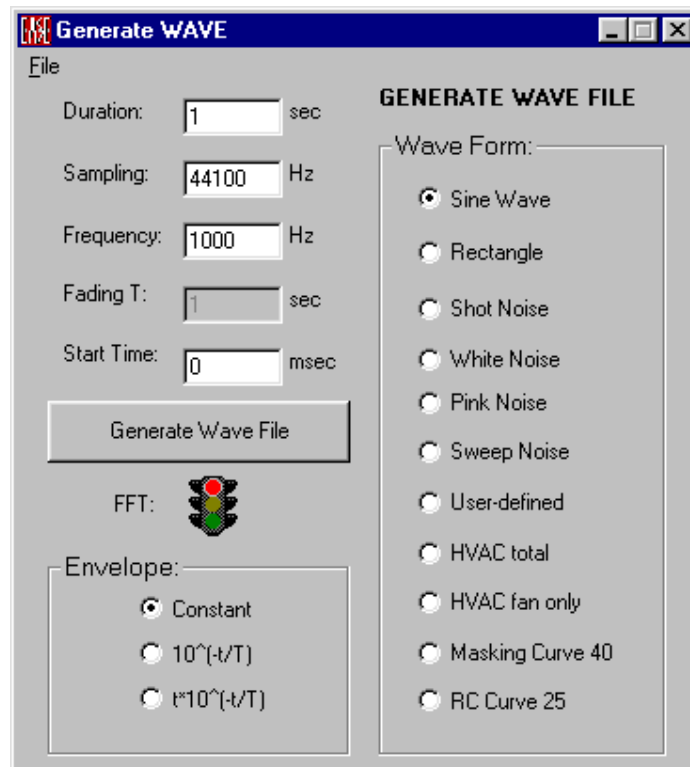
File Menu

Draw Wave File

This displays the generated (or any other) wave file as a graph in time format.

Make Frq File

This performs an FFT-on the wave file to generate an .FRQ frequency response file.

Draw Frq File

This displays a selected .FRQ file (frequency response) graphically.

Draw EARS 1.13 FRQ File

This displays a selected .FRQ file in old EARS 1.13 file format graphically.

Options

This opens the **Generate Wave Options** Window to view and set FFT and Sweep Noise Parameters.
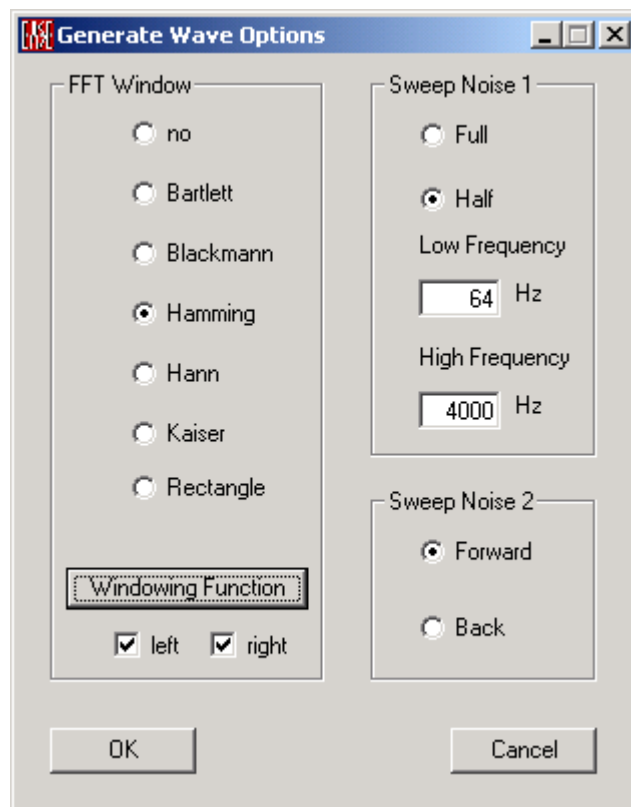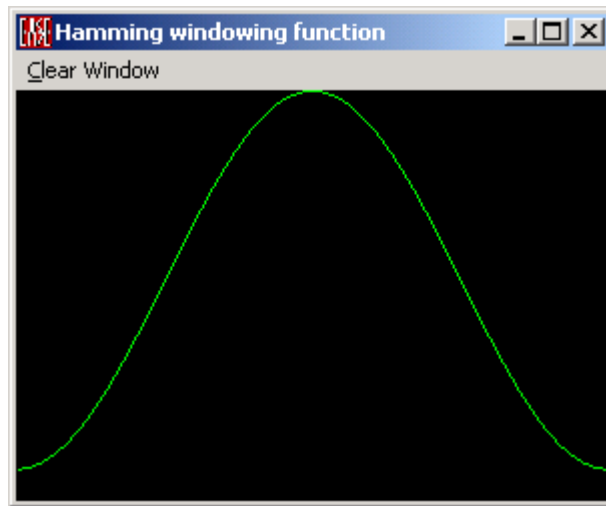
FFT Window

This allows to select a windowing function commonly used in signal processing. A window is a mathematical function by which a signal is multiplied to improve the characteristics of subsequent analysis. The EASE signal generator FFT applies the windowing function to each FFT time frame.

- No :   uses no window in FFT

- Bartlett :   multiplies the signal by the Bartlett triangle window

- Blackmann : multiplies the signal by the Blackmann window

- Hamming : multiplies the signal by the Hamming window

- Hann :   multiplies the signal by the Hann window

- Kaiser :   multiplies the signal by the Kaiser window

- Rectangle : multiplies the signal by a rectangle window , x % = 0 means that x % of the signal values are multiplied by 0 and the (100-x) % by 1

- Windowing Function : displays the window graph

- left, right boxes : if both boxes are checked the complete windowing function is used, otherwise only the right resp. the left part is used as the window function.

Sweep Noise 1

- Full :   generates a sweep signal which starts at the low frequency , goes to the high frequency and ends again at the low frequency or reverse (see Sweep Noise 2)

- Half :   generates a sweep signal which starts at the low frequency and ends at the high frequency or reverse (see Sweep Noise 2)

- Low frequency :   lowest start or end signal frequency

- High frequency :   highest start or end signal frequency

Sweep Noise 2

- Forward :   signal starts at the low frequency

- Back :   signal starts at the high frequency

Main Window

Exit

This exits the **Generator**.

Duration [sec]

This sets the length of the .WAV file to generate.

Sampling [Hz]

This sets the **Sampling Rate** for the .WAV file.

Frequency [Hz]

This sets the **Frequency** of sine wave, rectangular wave and shot noise signals. .

Fading T [sec]

This sets the time duration of a "fade to zero" level change.

Start Time [msec]

This window sets the **Time** the sound is **Started**.

Generate Wave File

Left click to accept all settings and **Generate** the .**WAV File**.

Wave Form

Sine Wave

A check here creates a single frequency **Sine Wave**.

Rectangle

A check here creates a single frequency **Square Wave** with only odd harmonics.

Shot Noise

A check here creates an impulse sound.

White Noise

A check here creates a test signal made up of all frequencies at equal level.

Pink Noise

A check here creates a test signal made up of all frequencies with equal power per percentage bandwidth.

Sweep Noise

A check here creates a **Swept Sine Wave**, with start and stop frequencies set in Generate Signals Options.

User-Defined

A check here creates a test signal spectrum that is controlled by the user.
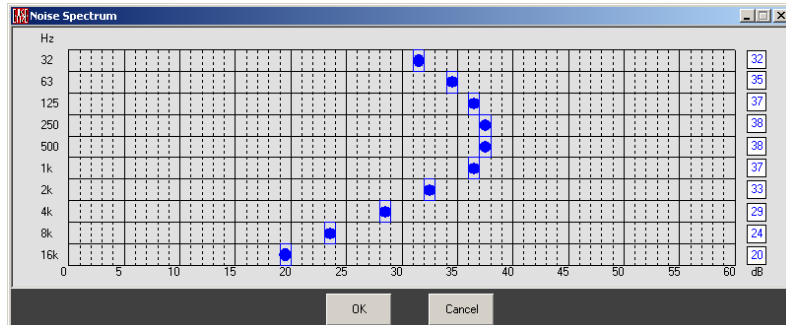
Here you can edit the spectrum of your signal

HVAC Total

A check here creates a test signal that mimics the spectrum of an operating HVAC system with fan operating.

HVAC Fan only

A check here creates a test signal that mimics an operating HVAC system fan.

Masking Curve 40

A check here creates an ASHRAE defined noise-masking spectrum.

RC Curve 25

A check here creates the Room Criteria spectrum of background noise.

Envelope

Constant

A check here creates a sound envelope that is at a constant level.

10(-t/T)

A check here creates a sound envelope that has an instant attack and slow decay.

t*10(-t/T)

A check here creates a sound envelope that has a slow attack and a slow decay.

Auralization Window

This Ears Convolver Window allows mathematically combining a sound from a .WAV file, the computer's line input, or the computer's CD Player with a **Binaural Room Response**. This can be done in real time or "off-line".

Note that this window can be resized to allow for better reading of labels and text displays.
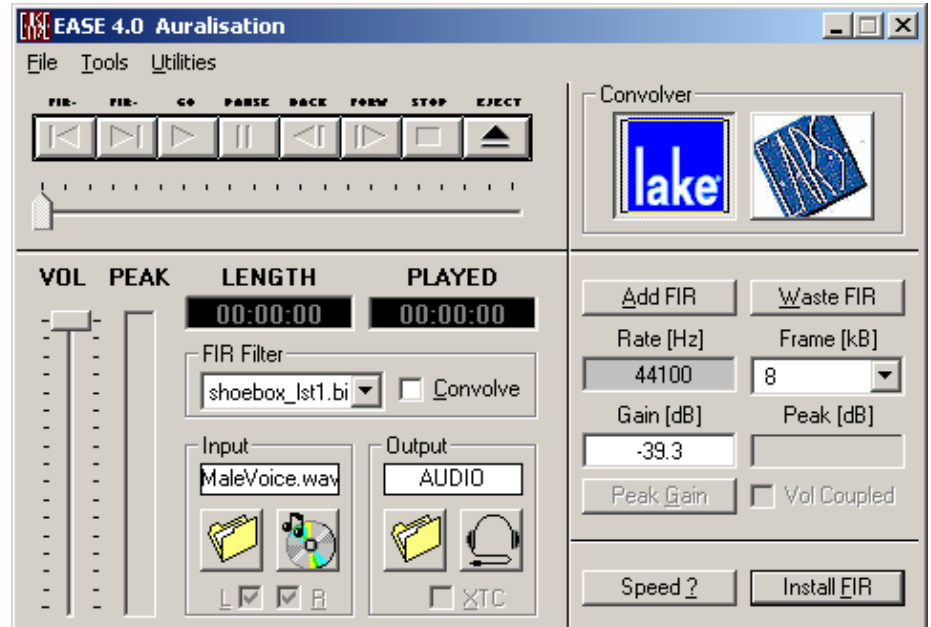
File Menu

This menu chooses **Input** and **Output .WAV Files** and installs the selected .BIR filter file.

Input WAV File

This selects a sound file for convolving with the room response. To use this command:

1. Left click on **Input WAV File**. This opens an **Open File** window.

2. Select a folder and Left click on the .WAV File name. Both stereo and monophonic files can be used.

3. Left click on the **Open** button.

Output WAV File

This specifies the filename and folder for the .WAV file that results from the Convolution. Note: This will be a binaural (stereo) .WAV file that can be played and edited like any other .WAV file. To specify the file:

1. Left click on **Output WAV File.** This opens a **Save File** window.

2. Select a folder and enter a .WAV File name.

3. Left Click on **Save**.

Install/Specify Filters

This command allows installation or specification of a calculated filter into the Convolver. Both the **Real Time Lake Convolver** and the **EARS "Off-Line"** **Convolver** can use this filter.

Exit

This exits the **Convolver**.

Tools Menu

Tools on this menu test the Convolver setup and configure it for use.

Convolver Speed (for real time convolution only)
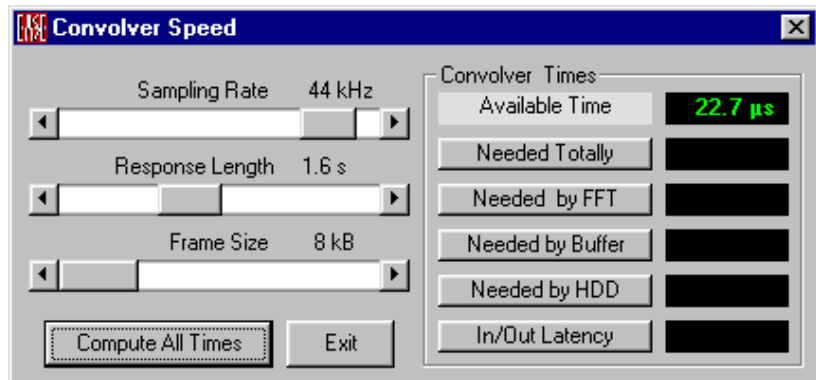
This utility program tests the computer for sufficient speed to convolve the filter. To test, left click on **Convolver Speed**, then **Compute All Times**. If any times shows in yellow color performance will be marginal, and if any are red the computer cannot convolve at this setting. If red or yellow, select a larger **Frame Size** to get all green results, and enter this frame size in the main Convolver window.

Show Filter Info Now

This shows the left and right ear responses for the current **Filter File**, and tabular information about how the **Filter File** was computed.

Show Info When Add

When checked, **Filter Info** will automatically be shown when loading a filter.

Add FIR Filter File

This **Adds** a **Filter** to the **Convolver**. This filter can include the **Binaural Room Response** in BIR, WAV and TIM (Hyperception) format.

Add Unity Filter

This filter can test the function of the **Convolver**. It is a 1:1 filter. What goes in will come out.

Left Ear

This applies a 1:1 filter to only the left ear.

Right Ear

This applies a 1:1 filter to only the right ear.

Binaural

This applies a 1:1 filter to both ears.

Add Decay Filter

This adds a decay filter to the **Convolver**.

Waste FIR Filter

This removes a selected filter from the **Convolver**.

Save FIR Gain

After running the **Convolver** the **Gain** can be set and corrected for online auralisation. This saves that setting.

When **Auralisation** is performed in **Real-Time**, the filter gain must be adjusted properly. Too high gains cause clipping, too low gains cause audible numerical noise. After a first convolution, **EARS** has recorded the peak level and shows it in the **Peak Level [dB]** field of the **convolver**. To adjust the filter gain optimally to this level, the **Peak Gain** button can be used. Usually this solves the level problem, sometimes a fine tuning in a second run may be required.

Save Filter Gain writes this filter gain into the current **BIR file**. When the file is loaded again, this gain is automatically used. This option is intended for the preparation of demonstrations, like talking on stage 'through the convolver', such that no further level adjustment is required when presenting the results.

Note the the gain saved into the BIR file can be inspected in the **Modify BIR Window** as **Convolver Gain.**

Save All FIR Gains

Saves gains required for **Real-Time Auralisation** of all installed filters simultaneously.

When **Auralisation** is performed in **Real-Time**, the filter gain must be adjusted properly. Too high gains cause clipping, too low gains cause audible numerical noise.

Real-Time Auralization allows having several filters stored together in the **convolver** and toggling them on the fly, i.e. while convolving, for a better aural comparison of the filter effects. After a first convolution, having used all filters once for a sufficient duration, **EARS** has recorded the peak levels and shows them in the **Peak Level [dB]** field of the convolver. To adjust the filter gains optimally to these levels, the **Peak Gain** button can be used. Usually this solves the level problem, sometimes a fine tuning in a second run may be required.

Save All FIR Gains writes the gains of all filters into their current **BIR files**. When called again, these gains are automatically used. This option is intended for the preparation of demonstrations, such that no further level adjustment is required when presenting the results.

Note that storing gains is only reasonable if the same filters are intended to be used again with the same sound source (or another with same level).

Utilities Menu

This menu holds utilities that make it easier to control the **Convolver**.

Keep to Auralize

Left click saves the current **Input, Output** and **Convolver** settings as the default settings for **Auralize Direct Sound** in **Area Mapping**, **Room Mapping**, the

Walker, and **Probe**. To use this command, an **Auralization** should be taking place using the form of **Auralization** (i.e., **Ears Off-Line** or **Lake Real Time**) desired in those modules.

Keep as Start Default

Left click saves the current **Input, Output** and **Convolver** settings as the default settings for **Auralization** from EARS. To use this command, an **Auralization** should be taking place using the desired form of **Auralization** (i.e., **Ears Off-Line** or **Lake Real Time**).

Silent When Clipping

When checked, the output will be muted when the **Convolver** clips.

Auto Foreground

When checked, the **Convolver** window is kept active during **Real Time Auralization**. This prevents **Auralization** from being muted if another window is selected.

Walker View Coupled

When checked, the **Walker** position is **Coupled** to the **Convolver** in the direct sound mode. As an example, imagine you **Walk** through the room in **EASE EYES** and run **Auralize Direct Sound** at selected locations. This causes the filters of these positions to pile up in the **convolver** (if you do not close it between the auralizations). When you now switch between the filters in the **convolver**, for instance 'on the fly' during **Real-Time Auralization**, and **Walker View Coupled** is checked, the **Walker** will move to the position where the actual filters was created. This makes it easier to compare the acoustical impression of different positions in the room.

FIR Info Coupled

When checked, as the **FIR** filter is changed the **Filter Info** will change too.

Volume Coupled (for real time convolution only)

When checked, the reproduction of all auralized files are relative in level to each other.

Play Input WAV File

This **Plays** the **Wave File** that is in the input window

Play Output WAV File

This **Plays** the **Wave File** that is in the output window

Convolver Window Functions

TAPE MACHINE CONTROL ICONS

Left click on these icons to choose between FIR filters or start, stop, and control the convolver in a manner similar to a tape recorder.

FIR -

Change to the previously listed FIR filter.

FIR +

Change to the next listed FIR filter.

GO

Start or continue playback.

PAUSE

Pause playback and hold the current point in the file.

BACK

Move play point toward beginning of file.

FORWARD

Move play point toward end of file.

STOP

End playback.

EJECT

Toggles view on and off of the right hand portion of the Convolver window.

VOL

This sets the audio output volume in playback mode.

PEAK

This displays the **Peak Level** of the **Convolved Output**.

LENGTH

This displays the **Length** of the **Output File**.

PLAYED

This displays the current time (referenced to the beginning of the file) when a file is being **Played**.

FIR Filter

This drop down window selects between installed **Binaural Impulse Response** filters.

Convolve

When checked, the **Output** will be the convolution between the **Input** and the selected FIR filter. When not checked, the **Output** will be a direct playback of the **Input**. Note: This box is automatically checked when using **EARS Off-Line Convolution**, but must be manually set when using **Lake Real Time Convolution**.

Input

This Specifies the **Input** for the **Convolver**.

Input File Window

This specifies the input for the **Convolver**. If **AUDIO** is selected, the record output of the Windows sound card will feed the **Convolver**. Otherwise a selected **File** will feed the **Convolver**.

File Source button

This opens a File browse window for selection of the **Input File**. Only audio from Sound Card inputs or the **Windows CD Player** can be used with the **Lake Real Time Convolver**. Monophonic or stereo .WAV files can be used with the **EARS Off-Line Convolver**.

CD ICON

This toggles the **Input** of the **Convolver** between the output of the **Sound Card's Recording Mixer** and the selected file. When the **CD Player** is selected, **AUDIO** will be visible in the **Input File Window**. Note: When **AUDIO** is selected, the sound card's **Recording Mixe**r can be set so that analog audio fed to the sound card's input and/or audio from the computer's internal **CD Player** is fed to the **Lake Real Time Convolver**.

L/R

Check marks here select the **Left Channel** of a sound file, the **Right Channel**, or their mono sum, as input to the **Convolver**.

Output

This specifies the **Output** of the **Convolver**.

Output Window

This specifies the Output of the Convolver. If AUDIO is selected, the Lake Real Time Convolver will feed the .WAV Playback Input of the computer's Sound Card. Otherwise the Convolver will write its output to a specified Output .WAV File. The EARS Off-Line Convolver can only produce an Output .WAV File.

Output File Button

This opens a File browse window for selection of the output folder and filename. The output will be a binaural (stereo) .WAV File.

Earphones Button

This toggles the **Convolver Output** between the .WAV playback input of the computer's **Sound Card** and a specified .WAV file.

XTC

A check mark here enables a **Cross-Talk-Cancellation Function** developed for EASE by The Harman Corporation. This allow listening to a 3-dimensional sound field without headphones. It currently works only with **Off-Line Convolution**. To use this command:

1.   Left Click to place a check mark in the XTC box.

2.   Select an input file.

3.   Select an output file.

4.   Set full range loudspeakers in front of you and set the angle correctly from your head to the loudspeakers. (+ or – 30 degrees).

5.   If you set the angles correctly you will be enveloped in a 3-dimensional sound field with directional characteristics.

Convolver

This selects between **Lake Convolution, both Real Time and Off-Line,** and **EARS Off-Line Convolution**.

LAKE

Left click selects **Real Time or Off-Line Convolution** using **Lake** software filters. Input must be a monophonic .WAV file or the output of the sound card's recording mixer. The recording mixer can be set to feed the internal **Windows CD Player** and/or analog audio from the sound card's input to the **Lake Convolver**. Output can be to the computer sound card (and thus to the sound card's output terminals) or to a stereo (binaural) **.WAV File**.

EARS

Left click selects **EARS Off-Line Convolution**. Input must be a monophonic or stereo **.WAV File**. Output will be written to a stereo (binaural) **.WAV File.** Note: The stereo (binaural) output of a convolution is solely the result of the room response. The input to a convolution is always a monophonic signal. If the source is stereo, the input to the convolution will be the left channel only, the right channel only, or the mono sum of both channels.

Stereo and multichannel convolutions can be achieved, however, by convolving the channel 1 signal with the BIR of channel 1 loudspeakers, channel 2 signal with the BIR of channel 2 loudspeakers, and up to channel n, then summing (mixing) the audio from those n convolutions.

Add FIR

Left click to **Add a Binaural Impulse Response** file to the **Convolver**. A file browse window will open for selection of the file.

Waste FIR

Left click to delete a selected **Binaural Impulse Response** file from the **Convolver**. A selection box will open to allow choice of the file to be deleted. This file will not be deleted from the hard disk, only from the **Convolver**.

Rate [Hz]

Shows the **Sampling Rate** of the selected files.

Frame [kB]

This drop down window shows the **Frame** size in Kbytes. Smaller frame sizes reduce latency. Use larger **Frame** sizes when **Speed?** tests indicate the computer is too slow for smaller **Frame** sizes.

Gain [dB]

This sets the gain of the **Convolution**. Use reduced gain if the convolved audio is distorted or if digital clipping is evident.

Peak [dB]

This shows the level of the highest **Peaks** of the signal referenced to digital clip.

Peak Gain Button

Left click to have **Auralization** automatically adjust its gain to the optimum setting for a selected input. It may take as long as 30 seconds to reach the right gain setting. Recommendation: First you have to play one time a convolved

signal. After that EASE finds automatically the highest peak in this signal and rescales the gain if you click on this peak gain button.

Volume Coupled

When checked, **Auralization** maintains level relationships between auralizations made at different locations within a room. Only active with **Real Time Auralizations**.

Speed?

Left click to open a diagnostic window to test your computer hardware to determine suitable parameters for Convolution. When the window opens:

1. Accept default 44KHz **Sampling Rate**, 4 sec **Response Length**, and 8 kB **Frame Size**.

2. Left click on **Compute All Times** to begin the test.

3. If all **Convolver** Times are green, Left click Exit and select 8kB for **Frame** size in the main **Convolver** Window.

4. If any time is yellow or red, increase the frame size and Left Click **Compute All Times** again. If all times are green, use this frame size. If not, repeat using a larger frame size until all times are green.

Install FIR

This **Installs** the selected **FIR** filter, closes the setup window, and makes the **Convolver** ready for use.

Binaural Impulse Response Window

This computes a **Binaural Filter** (.BIR) **File** from a three-dimensional response for use in **Auralization**.

Note that this window can be resized to allow for better reading of labels and text displays.

OK

This accepts calculation parameters, closes the setup window, and begins computing the selected file(s).

Cancel

This cancels the calculation and closes the window.

Input RSP File

The specifies the **Response** file to be used to compute a BIR file.

File button

 Left click on **File** to browse the hard drive.

File name window

This specifies the **Filename**. Accept the default type a new name, or Left click on **File** to browse.

Path Window

This specifies the path. Accept the default, type a new path, or Left click on **File** to browse the hard drive.

Output BIR File

This specifies the filename and path for the **BIR File** to be computed.

File

Left Click **File** to browse the hard drive for a suitable location for the new **.BIR File**.

File name window

This specifies the **Filename**. Accept the default, type a new name in the window, or Left click on **File** to browse the hard drive.

Path Window

This specifies the folder for the new file. Accept the default, type a new path, or Left click on **File** to browse the hard drive.

Filter Sampling

These interactive parameters specify how the new file will be calculated. Any two can be specified, and EASE will compute the other.

Sampling Rate [Hz]

This sets the digital **Sample Rate**. Upper frequency limit determines the sample rate. The sampling theorem (Shannon Formula) is $F_{digital} = >2*F_{analog}$. To reproduce 20K Hz the sample rate must be a minimum 40KHz. The default value is 44100 Hz.

FFT Order

This window sets and displays the **Order** of the **FFT** to be used in the computation. **Orders** between 8 and 16 can be used. The default value is 13.

Resolution [Hz]

This specifies the **Resolution** of the FFT used to compute the **BIR File**

Phase Computation

This sets the phase response of the HRTF filters.

Automatic

This setting is the recommended setting for the generation of the phase response. If selected the software will automatically choose the most appropriate calculation parameters. In most cases this will be the same as the AURA method.

Custom Selection

Minimum Phase

This selects Minimum Phase response.

Runtime Phase only

This selects Linear Phase Response and uses runtime phase only.

Overall Phase

This selects True Phase Response, i.e. the runtime phase and the phase of the devices .

AURA Method

This setting selects a Linear Phase Response that is applied along with a cubic (spline) interpolation of the frequency response data.

HRTF

These settings specify the **Dummy Head** type and orientation in the model.

SPL Gain (dB)

This sets the gain of the **Convolution**. This can be used to adjust for different locations in the room or to prevent overload (clipping) distortion.

Dummy Hor. (deg)

This specifies the **Horizontal Orientation** of the dummy head in the EASE model. Type in the window to change. This angle is referenced to +Y =Zero degrees.

Dummy Ver. (deg)

This specifies the **Vertical Orientation** of the dummy head in the EASE model. Type in the window to change. Zero degrees is referenced to horizontal.

Dummy Head Selection Window

This selects the type of **Dummy Head** for the calculation. The generic **Dummy Head** file is recommended for most **Auralizations**.

See also HRTF Balloon.

Lake SIM File Window

This computes a **Binaural SIM File** from a three-dimensional response for use with the **Lake CP4** or **Huron DSP Board**.

Note that this window can be resized to allow for better reading of labels and text displays.

OK
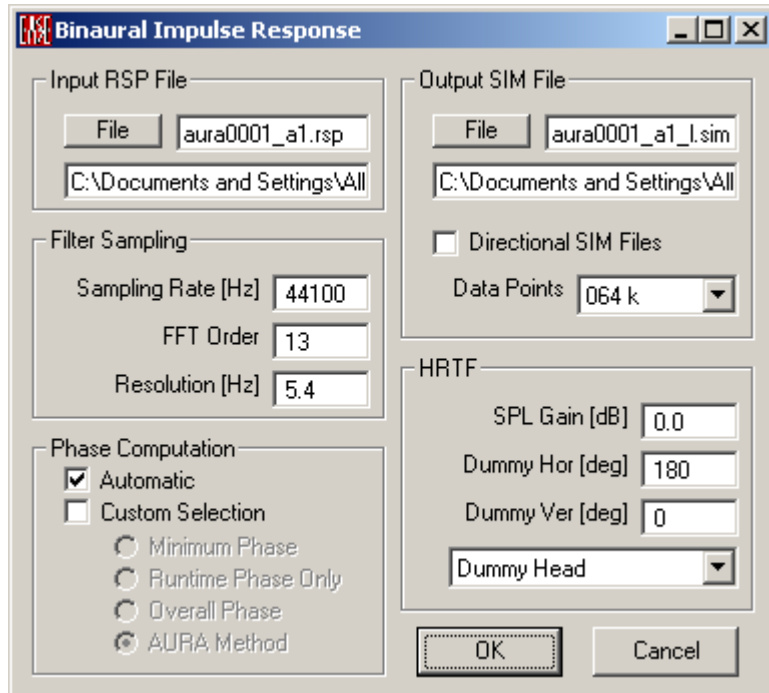
This accepts calculation parameters, closes the setup window, and begins computing the selected file(s).

Cancel

This cancels the calculation and closes the window.

Input RSP File

This specifies the **Response** file to be used to compute a BIR file.

File button

Left click on **File** to browse the hard drive.

File name window

This specifies the **Filename**. Accept the default type a new name or Left click on **File** to browse.

Path Window

This specifies the path. Accept the default, type a new path or Left click on **File** to browse the hard drive.

Output BIR File

This specifies the filename and path for the **BIR File** to be computed.

File

Left Click **File** to browse the hard drive for a suitable location for the new **.BIR File**.

File name window

This specifies the **Filename**. Accept the default, type a new name in the window, or Left click on **File** to browse the hard drive.

Path Window

This specifies the folder for the new file. Accept the default, type a new path, or Left click on **File** to browse the hard drive.

Filter Sampling

These interactive parameters specify how the new file will be calculated. Any two can be specified, and EASE will compute the other.

Sampling Rate [Hz]

This sets the digital **Sample Rate**. Upper frequency limit determines the sample rate. The sampling theorem (Shannon Formula) is $F_{digital} = >2*F_{analog}$. To reproduce 20K Hz the sample rate must be a minimum 40KHz. The default value is 44100 Hz.

FFT Order

This window sets and displays the **Order** of the **FFT** to be used in the computation. **Orders** between 8 and 16 can be used. The default value is 13.

Resolution [Hz]

This specifies the **Resolution** of the FFT used to compute the **BIR File**

Phase Computation

This sets the phase response of the HRTF filters.

Automatic

This setting is the recommended setting for the generation of the phase response. If selected the software will automatically choose the most appropriate calculation parameters. In most cases this will be the same as the AURA method

Custom Selection

Minimum Phase

This selects Minimum Phase response.

Runtime Phase only

This selects Linear Phase Response and uses runtime phase only.

Overall Phase

This selects True Phase Response, i.e. the runtime phase and the phase of the devices .

AURA Method

This setting selects a Linear Phase Response that is applied along with a cubic (spline) interpolation of the frequency response data.

Directional SIM Files

A check mark will force a calculation of a left and right tail **SIM File** and of 2 x 128 short **SIM Files** to allow the localization in real time head turn operations when using the **Lake CP4** or **Huron Board**.

Data Points Selection Window

Data Points shows the number of recommended **Data Points**. Accept this number or choose a different number from the drop down box.

HRTF

These settings specify the **Dummy Head** type and orientation in the model.

SPL Gain (dB)

This sets the gain of the **Convolution**. This can be used to adjust for different locations in the room or to prevent overload (clipping) distortion.

Dummy Hor. (deg)

This specifies the **Horizontal Orientation** of the dummy head in the EASE model. Type in the window to change. This angle is referenced to +Y =Zero degrees.

Dummy Ver. (deg)

This specifies the **Vertical Orientation** of the dummy head in the EASE model. Type in the window to change. Zero degrees is referenced to horizontal.

Dummy Head Selection Window

This selects the type of **Dummy Head** for the calculation. The generic **Dummy Head** file is recommended for most **Auralizations**.

See also HRTF Balloon under Graph.

Convert File Format Window

This converts from one supported **Response File** type to another.

Note that this window can be resized to allow for better reading of labels and text displays.
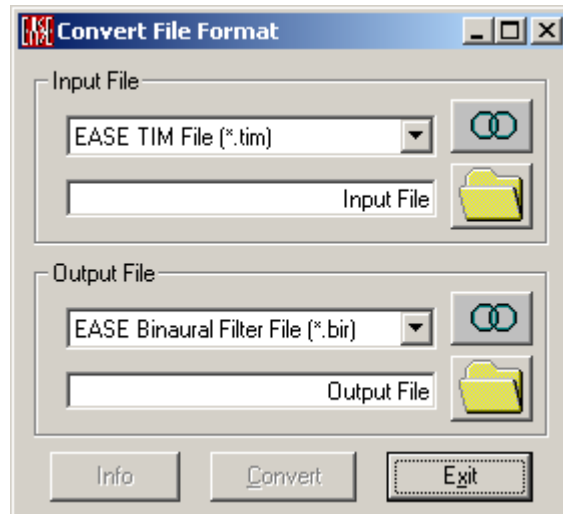
Info

This shows the left and right ear responses for the current **Filter File**, and tabular information about how the **Filter File** was computed.

Convert

Accept conversion parameters and begin the conversion.

Exit

Accept conversion parameters, begin the conversion, and close this window.

Input File

This specifies the input file type and filename.

File Format Selection Window

TextChoose the **Input File Format** from the drop down list.

Input File Name Window

This specifies the path and **Filename** of the input file.

Circles Button

One circle specifies a monophonic file. Two circles specifies a two-channel file.

File button

This browses the hard drive for the **Input File**.

Output File

This specifies the **Output File** type and filename.

File Format Selection Window

Choose the **Output File Format** from the drop down list.

Output File Name Window

This specifies the path and **Filename** of the **Output** file.

Circles Button

One circle specifies a **Monophonic File**. Two circles specifies a two-channel file. **Convert File Format** can convert a **Stereo .WAV** file to a **Monophonic .WAV File** that contains the mono sum of left and right channels, but it cannot separate left and right channels into two .**WAV Files.**

File button

This **browses** the hard drive for the location of the **Output File**. Choose a directory and type a **Filename**.

Modify BIR Window

This modifies a **Binaural Impulse Response File**.

Note that this window can be resized to allow for better reading of labels and text displays.
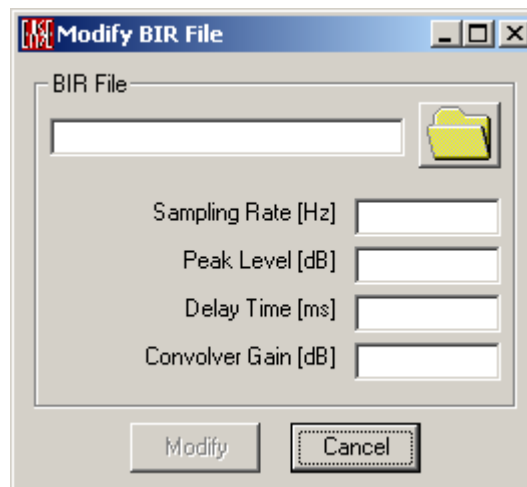
BIR File

This specifies the **.BIR File** to be modified. The modification is written back to the same file.

BIR File Name Window

This specifies the **Filename**, with path, of the **.BIR File** to be modified.

Open File Button

This opens a browse window for selecting the **.BIR File** to modify.

Sampling Rate (Hz)

This shows first the **Sampling Rate of the input file**. Here you can enter your target sample rate for modification.

Peak Level (dB)

This shows first the **Peak Level** of the Input **File** and here you can enter your target peak level for modification.

Delay Time (ms)

This shows first the **Delay Time** associated with the **File and here** you can enter your target delay time for modification.

Convolver Gain (dB)

This shows first the **Gain** setting used and saved for **Real-Time Convolution**. You can modify this value. See Save FIR Gain of the **Convolver** description.

BIR Filter Info Window

This provides Information about the current **BIR Filter File**.
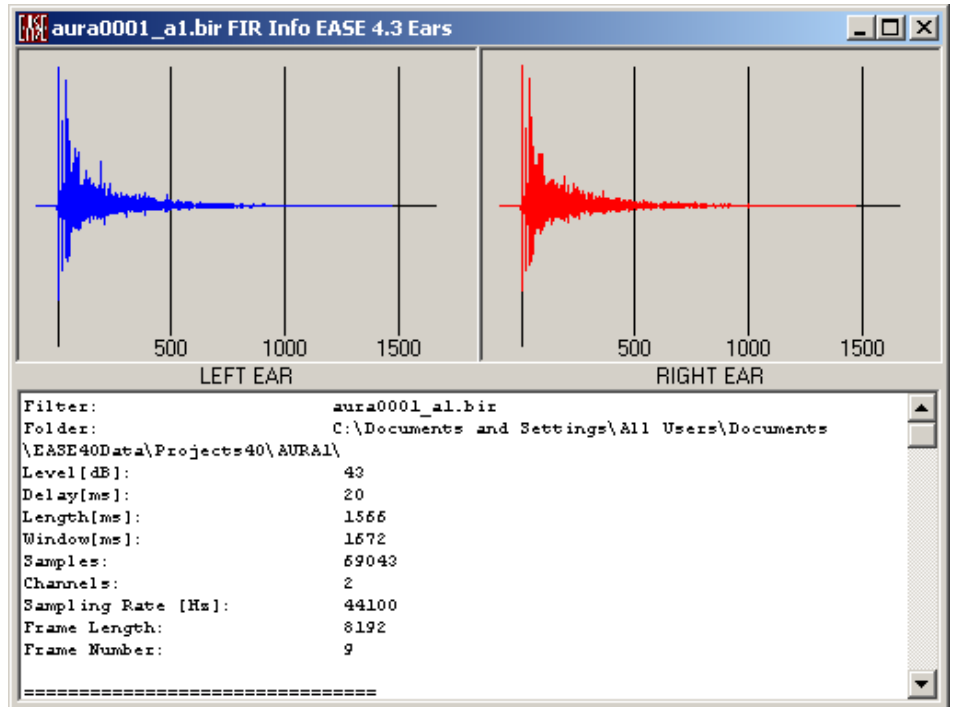
Left Ear

This shows the impulse response for the **Left Ear** filter.

Right mouse click into this or the Right Ear window allows to switch to frequency response and to apply several further options.

Right Ear

This shows the impulse response for the **Right Ear** filter.

Information Window

Provides **Information** about how the **BIR Filter** was computed and the characteristics of the room.

Convolve and Mix Window

This allows multiple .WAV files to be convolved with the same or different **Binaural Impulse Response Files**, each with its own gain and delay settings, then combined (mixed) to a single **Output .WAV File**. All files must have the same sample rate. This very powerful tool is only available for **EARS Off-Line Auralization.**

For example, to **Auralize** a simple Left/Right stereo playback system, one would first compute the BIR file for the left channel loudspeaker(s) at a **Listener Seat** and a second BIR file for the right channel loudspeaker(s) at the same seat. **Convolve and Mix** would then be used to convolve the left channel of a stereo source track with the left loudspeaker's BIR file and convolve the right channel of the source track with the right loudspeaker's BIR file. The resulting **Output File** would be an **Auralization** of the stereo Loudspeaker system playing a stereo source track.

Note that this window can be resized to allow for better reading of labels and text displays.
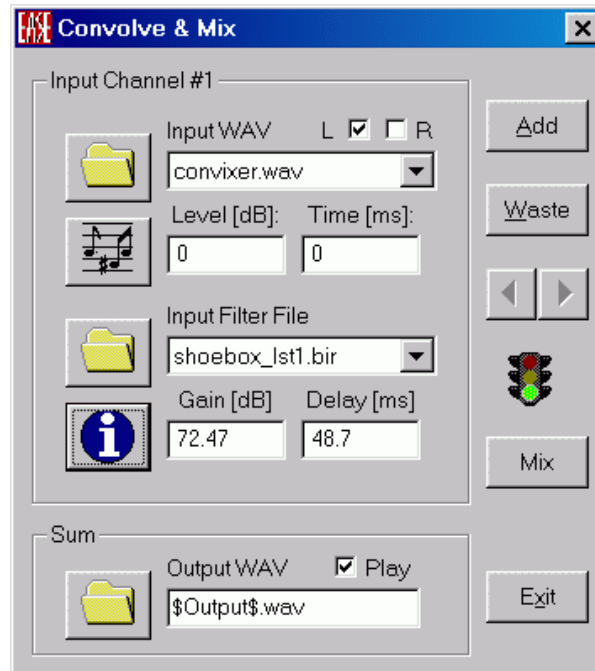
Add Button

This begins the process of **Adding** a next **to convolve Input File** Pair to the mix. Each **Convolution** can use the same or a different **Input .WAV File**, and each can be convolved with the same or a different **.BIR File**. Each **Convolution** will be assigned to a sequentially numbered **Input Channel**.

Waste Button

This removes the **Current Input Channel** from the mix.

Left Arrow Button

This selects the next lower numbered **Input Channel**.

Right Arrow Button

This selects the next higher numbered **Input Channel**.

Mix Button

This begins the **Convolution** and **Mixing** process, writing the result to the specified **Output File**.

Play

If checked, the resulting file will be **Played** after being saved.

Exit Button

This closes the **Convolve and Mix** window.

Input Channel #n

Each **Convolution** in the **Mix** is assigned a numbered **Input Channel "#n"**. This legend lists that number. The windows specify the filename and list its parameters.

Top Open File Button

Left click to browse for the **Input File** to add.

Musical Notes Button

This **Plays** the .WAV file in the **Input Channel Filename** box.

Input source File Selection Window

This specifies the **Input Source File** for the current **Input Channel**.

Level (dB)

This specifies the **Level** for the **Current Input Signal.**

Time (ms)

This specifies the **Start Time** for the **Current Input Signal**.

Middle Open File Button

Left click to browse for an **Input FIR (Binaural Impulse Response)** file.

Info Symbol

This shows the left and right ear responses for the current **Filter File**, and tabular information about how the **Filter File** was computed.

Input Filter File Selection Window

This specifies the **Binaural Impulse Response Filter File** for convolution with the **Current Input File**.

Gain (dB)

This specifies the **Gain** for the **Convolution** of the current **Input Filter File**.

Delay (ms)

This specifies the **Delay** for the **Current Input Filter File**.

Output WAV File

This specifies the **Output .WAV File** to hold the **Convolved and Mixed** audio.

Bottom Open File Button

Left click to browse for a folder for the **Output WAV** file and to specify the **Filename**.

Output File Name Window

This specifies the **Filename** for the **Output .WAV File**.

EARS Wave File Mixer Window

This **mixes** audio from two or more **Input .WAV Files** of the same sample rate to produce a single **Output .WAV File**. The Wave File Mixer can be used to combine two or more already convolved Auralization files. (e.g., the **Output File** for the left channel of a .WAV file convolved with a Left Loudspeaker .BIR file, mixed with the **Output File** for the right channel of the .WAV file convolved with a Right Loudspeaker .BIR file. The mixed Output .WAV file would be the Auralization of stereo playback through the stereo Loudspeaker system).

Note that this window can be resized to allow for better reading of labels and text displays.
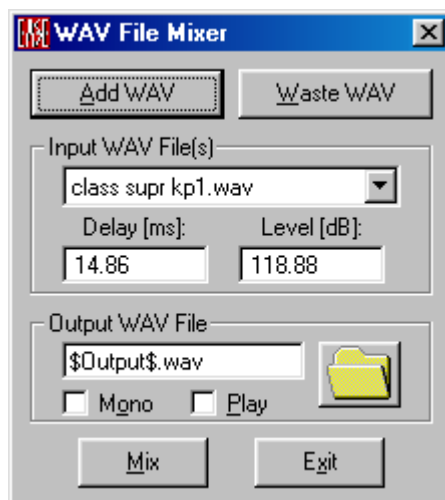
Add WAV

Left click to begin **Adding** a **.WAV File** to the mix. A file browse window will open for selection of the folder and filename.

Waste WAV

Left click to delete the **Current Input WAV File** from the mix.

MIX

Left click to accept the specified files and settings and produce the mixed **Output .WAV File**.

Exit

Left click to close the **.WAV File Mixer**.

Input WAV File(s)

Specifies the **Current Input .WAV Files**, along with **Gain** and **Delay** settings for each. Note: Level and Delay information for EARS-generated .WAV files is stored in the produced EARS Wave file directly.

Input WAV File Selection Window

Selects between specified **Input Files**. The file whose name is visibile is the **Current Input File**.

Delay (ms)

Specifies the delay for the **Current Input File** referenced to the beginning of the **Output File**.

Level (dB)

Specifies the **Gain** for the **Current Input File** to the mixed **Output File**.

Output WAV File

Specifies the **Output .WAV File** to contain mixed files.

Output WAV File Window

Specifies the **Output .WAV Filename**.

Browse Output Files Button

Left click to open a file browser to select a folder and specify a **Filename** for the **Output File**.

Mono

If checked, the **Output File** will be **Monophonic**.

Play

If checked, the **Output File** will be **Played** after being saved.

EASE Wave Player Window

This plays .WAV files created by EARS, using EARS .WAX Files if they are present to maintain level and delay settings.
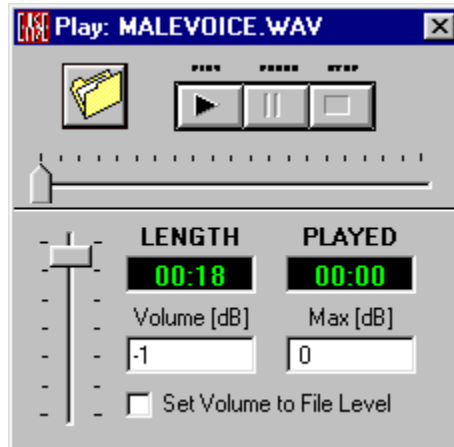
This plays .WAV files created by EARS, including level and delay settings.

File Button

Left click browses the hard drive for a **.WAV File**.

Play Button

Left click to Play the **.WAV File** beginning from the point in the file displayed in the **PLAYED** window.

Pause Button

Left click to pause playback without resetting the **PLAYED** counter.

Stop

Left click to stop playback and reset the **PLAYED** counter to zero (the beginning of the file).

Fader

This sets the **output level** sent to the computer sound card's mixer.

LENGTH

This displays the length of the current .WAV file.

PLAYED

This window displays the current point in the file.

Volume [dB]

The value entered here sets the desired playback level for the player (relative to digital clip).

Max (dB)

The value displayed here is the maximum peak level for all files played back. However if **Set Volume to File Level** is checked when any file exceeds the current **Max (dB)** level, both **Volume [dB]** and **Max (dB)** will be increased by the difference between previous and new maximum settings.

Set Volume to File Level

When checked, **EARS Wave Player** adjusts the playback level of multiple files to maintain their levels relative to each other. To use this function:

1. **Check Set Volume to File Level**.

2. Enter desired values for **Max (dB)** and **Volume [dB]**.

3. Play all the files to be compared. As they are played the first time, if any file's maximum exceeds the current **Max (dB)** setting, both **Volume [dB]** and **Max (dB)** will be automatically adjusted upward as required to maintain relative levels. [During this first playing pass, relative levels will not be correct if adjustments were required].

4. When all files have been played once with **Set Volume to File Level** checked, all subsequent playings will maintain the proper level relationships relative to each other.

Stereo Convolver

This allows a stereo WAV file or stereo audio source to be convolved with a right and a left **Binaural Impulse Response File**, to get a single binaural **Output .WAV File,** or binaural streaming audio output. Left input channel and right input channel are separately convolved each with its respective binaural filter; the resulting two binaural output signals are then mixed with adjustable gains and delays Files do not need to have the same sampling rate. This very powerful tool is available for both **EARS On- and Off-Line Auralization**.

Note that this window can be resized to allow for better reading of labels and text displays.
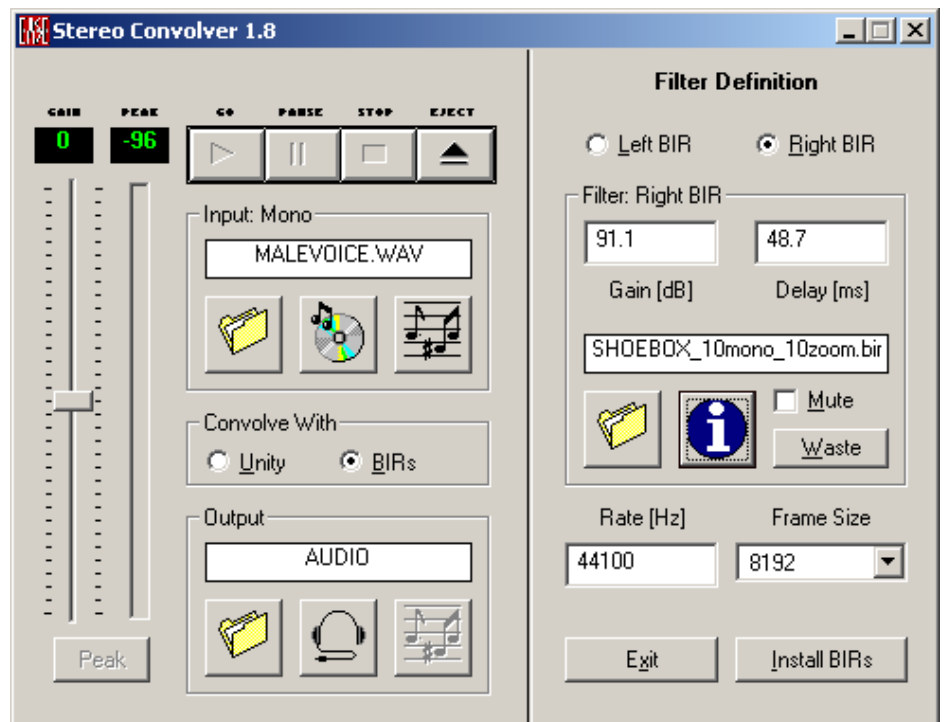
Filter Definition field (right panel)

Left BIR

This lets the binaural filter settings for the left input channel to be specified.

Right BIR

This lets the binaural filter settings for the right input channel to be specified.

Gain [dB]

This defines the gain of the selected BIR filter. Value can me modified manually.

Delay [ms]

This defines the delay of the selected BIR filter. Value can me modified manually.

Filter name field

This shows the filter file name. You may **drag&drop** a file into this field e.g. from the Windows Explorer. Double click opens the **Browse window**.

Folder button

Click to browse for the filter file

Info button

Click to diplay the filter in the **Filter Information Window**.

Mute

If checked, the selected channel is suppressed during auralization.

Waste button

This command removes the current filter.

Rate [Hz]

This is the sampling rate used during convolution and for output signal. Input information and filters will be resampled automatically.

Frame Size

This defines size of FFT blocks for convolution. Higher values speed up the mathematical operation but increase latency. Compared to one-channel convolution, stereo auralization has to process 4 filters simultaneously and speed may become crucial in online mode. Note that block size can reduce convolution latency but cannot circumvent the Windows streaming audio buffer delay.

Exit

This command closes the **Stereo Convolver**.

Install BIRs

This installs both stereo filters as specified and closes the **Filter Definition panel**.

Convolver field (left panel)

Gain slider

Adjust convolution gain while convolving. Only required for streaming audio output, which must by taylored on the fly into 16 bit integer amplitudes. File output is automatically scaled. Too high gain causes signal clipping (peak indicator goes red), too low gain causes bad S/N ratio. Use **Peak Button** to lower the gain to 0 dB peak value.

Peak indicator bar

The color bar goes red if clipping appears, and is green for low gain. Maximum peak value is stored and shown in the **peak field** on top, and is reset if **Peak Button** is pressed.

Peak button

Adjust the **gain slider** to the currently recorded peak level as shown in the **peak field**.

Go button

This command starts the **auralization**.

Pause button

This command stops the convolution, but preserves input file pointer, and continues as soon **Pause** is pressed again

Stop button

This command stops the convolution, resets input file pointer to start position

Eject button

If **Filter Definition field** is open, installs both stereo filters as specified and closes the **Filter Definition panel**. If **Filter Definition field** is closed, unloads current filters from the convolver and opens the **Filter Definition field**.

Input field

This shows the current input mode, either AUDIO in online mode or the input wave file name in offline mode. You may **drag&drop** a file into this field e.g. from the Windows Explorer. Double click opens the **Browse window**.

Folder button (Input)

This command opens the **Browse window** for input file selection and sets convolver input to offline mode.

CD button (Input)

This command sets convolver input to online mode. The signal is taken from the actual Windows input mixer device output. You can access this device from the EARS menu Tools/Volume Control.

Musical notes button (Input)

This command plays the current input wave file.

Convolve with

You may toggle on the fly between the input (**Unity option**) signal and the convolved one (**BIRs option**) for immediate comparison.

Output field

This shows the current ouput mode, either AUDIO in online mode or the output wave file name in offline mode. Double click opens the **Browse window** to enter the target file name.

Folder button (Output)

This command opens the **Browse window** for output file definition and sets convolver output to offline mode.

Earphones button (Output)

This command sets the convolver output to online mode. The convolved signal is sent to the "Wave" channel of the actual Windows playback mixer device. You can access this device from the EARS menu Tools/Volume Control.

Musical notes button (Output)

This command plays the current output wave file

Notes

Summing up, we compare the four EASE EARS Auralisation Tools

Function/ Property	EARS Conv.	Lake Conv.	Convolve & Mix	Stereo Conv.
File→File	yes	yes	yes	yes
File→Audio	-	yes	-	yes
Audio→File	-	yes	-	yes
Audio→Audio	-	yes	-	yes
Max Input Signals	1	1	32k	2
Max BIR Filters	1	32k	32k	2
Max BIR Length	any	4 s	any	any
Max FFT Blocks	32k	256	32k	32k
Swap on the fly	-	yes	-	-
Gain on the fly	-	-	-	yes
Auto Resampling	-	-	-	yes

Chapter IX : Ease Rays

EASE Rays

EASE offers several powerful **Ray Tracing** tools:

Simple **Ray Tracing** sends a large number of rays out of a sound source (e.g. **Loudspeaker**) and follows them around the room model. **EASE** keeps track of where and how the rays are reflected from **Faces,** through multiple bounces, and how much energy is lost both at the **Faces** and in the air.

Ray Tracing with **Impacts** allows the computation of reflection paths between one or more sound sources and one or more selected receiver points. It can do so using either a mathematical *Ray Tracing Model* or a mathematical *Image Model.*

The *Image Model,* (EASE calls it **Mirror Image**), allows a systematic search for all possible reflections and produces more accurate results than the *Ray Tracing Model*. This accuracy comes at a cost, and the expense is far greater computation time. In the *Image Model*, computation time grows exponentially. (Computation Time is proportional to number of Faces $^{(Reflection\ Order)}$). Because the **Mirror Image** method is so time-consuming, **EASE** can also use a hybrid method to speed up calculations while still providing good accuracy. It is called **Ray Tracing** with **Impacts**. To begin with, **Ray Tracing** with **Impacts** uses the random emission of rays from the source, and then finds the intersections of those rays with an imaginary 1-meter radius sphere drawn around a selected **Listener Seat**. If a ray intersects this balloon, **Ray Tracing** stops while this ray is recalculated using the calculated sequence of **Faces** and the **Mirror Image** method. The data for that ray is then stored in a file, if so requested. **Ray Tracing** is then resumed until another ray intercepts the balloon and the process is repeated until the specified **Number Of Rays** is radiated. The combination of all these computed rays which impact the **Listener Seat** are stored as an **Impact File**, and can be displayed as a **Reflectogram**. The hybrid method used by **EASE** when **Ray Tracing Impacts** is selected approaches the results of **Mirror Image** when the number of rays become large enough and will be identical as the number approaches infinity.

The normal location of the **EASE** sound reception tool is at a **Listener Seat**. The data output produced can be thought of as the signal of an ideal, but imaginary, omni-directional microphone located at a point at the center of a listener's head. It also has the ability to determine the time and the direction of each sound arrival (**Ray**), both direct and reflected. It can also determine the magnitude and phase response of each arrival at each frequency. The Ray Tracing module computes and saves all of the directional data with the other information, so the directional orientation of the **Listener Seat** where rays are calculated is important. The **Listener Seat** can be oriented in any desired direction for purposes of "listening".

Three types of result files are produced by these calculations, each having a specialized purpose.

Trace (.TRC) Files are calculated by randomly sending many rays out in all directions from one or more selected sound sources (e.g. **Loudspeaker).** We then follow the rays around the room and keep track of their paths, their impacts and bounces from all **Faces** and their energy loss. This is done without concentrating on any particular observation point within the room. The principal use of **Trace Files** is the general study of where sound goes when it leaves a sound source (e.g. **Loudspeaker**) and how sound bounces around a room, i.e. general reflection studies.

Impact (.MPC) Files are calculated by sending many rays out in all directions from one or more selected sound sources (e.g. **Loudspeaker**), but only those rays that **Impact** one or more selected **Listener Seats** are documented in the **Impact (.MPC) File** for the future study of specific reflection paths. **Impact Files** contain all of the information for the rays and their paths that a **Trace File** would contain, but <u>only</u> for those rays that impact the selected **Listener Seats.** All other rays are computed but then discarded if they are not needed. The principal use of **Impact Files** is the study of sound propagation, the acoustic quality of the room and the performance of a sound system and specific seat reflections in a particular seat or group of seats. **Trace** files can also be used to produce **Impact Files**.

Response (.RSP) Files are essentially reduced **Impact Files –** they document only the reception of rays at a single selected point of observation, but have no other information about the path of those Rays. **Response (RSP) Files** include the magnitude, phase, arrival time, and direction of arrival of those Rays that Impact the selected point.

Response Files can be viewed (in **Probe**) as a **Reflectogram**, and as a Waterfall (i..e, a family of Frequency Response curves at different arrival times), as a 3D Hedgehog, as a frequency response for a selected arrival, and other plots.

A **Head Related Transfer Function (HRTF)** describes the directional response of the human head**.** By convolving an **HRTF** with a **Response File,** the **Response** is transformed into two responses that are a function of frequency-and direction of arrival to produce a **Binaural Impulse Response (.BIR) File.** The **.BIR File** includes the directional response of the human ear/head at the computed receiver location, and both Left and Right responses are contained within a single **.BIR File. AURA** is also able to compute and save a **Binaural Impulse Response (.BIR) File** with also saving a **Response (.RSP) File**.

This **Binaural Impulse Response File** is quite useful, because it is the mathematical relationship that describes how an electrical audio signal fed to a loudspeaker will sound to a human listener. The **BIR File** includes the directional response of the **Loudspeaker**, its interaction with the **Room**, and the response of human hearing. Convolving a .WAV file for that electrical signal with the **Binaural Impulse Response** will produce a new resultant .WAV file that, when reproduced through a stereo pair of loudspeakers, simulates what a human listener would hear at the location for which the response was computed!

EASE Probe can be called to post process Response Files created by Rays and AURA to study room acoustics and sound system performance. [The Probe is not included with EASE Jr.] The **Auralization** module, **EARS** (An extra option with EASE) can be called to perform the convolutions that produce **Binary Impulse Response Files**, and the convolution of a source .WAV file to produce the **Auralized** resultant .WAV file.

Note that **EASE Rays** cannot be used until **Check Data** has been successfully executed.

Ray Tracing Main Window

Rays and/or Impacts can be stored in **Trace Files** (*.trc) and **Impact Files** (*.mpc). These files can be studied in the appropriate **View** option by using the **Probe** and **Movie** tools. On accessing the Ray Tracing module a message box inquires "View Project?". After confirmation the project data windows too but only in the View mode to make the ray calculation results visible.

Key Conventions

F1	**Help**
F9	**Options**
Ctrl+O	**Acquire Project Data**

File Menu (Normal Mode)

This menu accesses **File** management, **Printing**, and program **Options**.

Acquire Project Data

This asks for or **Acquires** all current project data from the **EASE Main** window. **Acquire Data** should be used when changes have been made to **Room Data,** such as the addition of **Loudspeakers**, changes to the Loudspeaker settings, changes to the **Wall Material**s, etc and the user wants the new data to be used in the calculations.

Shortcut: Ctrl+O

Note: There are special instances when **Acquire Data** might not be appropriate. For example, an old set of data can be used for calculations in the current window and compared with a new set of data computed in a different window.

View Protocol File

This displays basic information about how the most recent calculation was made. It only keeps the latest calculation and is copied over each time a new calculation is made.

Send Picture To

This allows the current active picture to be sent to the Clipboard, a File, or EASE Page Designer.

Clipboard

This copies the picture to the clipboard for use in other applications.

File

This saves the picture to a file. The files can be saved in many formats, including:

Windows Bitmap…………………………*.BMP

JPEG……………………………………*.JPG

CompuServe GIF…………………………*.GIF

Portable Network Graphics………………….*.PNG

Tagged File Format………………………..*.TIF

LuRa Tech Wavelet…………………………*.LWF

Zsoft Paintbrush…………………………..*.PCX

Windows Icon………………………………*.ICO

Enhanced Windows Metafile……………….*.EMF

Truevision Targa……………………………*.TGA.

EASE Page Designer

This opens the current active picture in the **EASE Page Designer** module, allowing modifications to and annotations of the picture before printing.

Options

This opens the Options Window to set parameters for **EASE Rays** and **EASE Rays Tables**.

Shortcut: F9

Exit

This exits **EASE Rays**.

File Menu (Standalone mode)

This menu accesses **File** management, **Printing**, and program **Options**.

Open Project

This allows opening of EASE 3.0, 4.x project files for **Ray Tracing**.

To use this command:

1. Left click on **Open Project**.
2. This will open the Open File Window.
3. Using the **Look In** portion of the window find the folder holding the project file.
4. Left click on the project file name.
5. Left click on the **Open** button.

View Protocol File

This displays basic information about how the most recent calculation was made. It only keeps the latest calculation and is copied over each time a new calculation is made.

Send Picture To

This allows the current active picture to be sent to the Clipboard, a File, or EASE Page Designer.

Clipboard

This copies the picture to the clipboard for use in other applications.

File

This saves the picture to a file. The files can be saved in many formats, including:

    Windows Bitmap…………………………*.BMP

    JPEG…………………………………………*.JPG

    CompuServe GIF……………………………*.GIF

    Portable Network Graphics…………………..*.PNG

    Tagged File Format…………………………*.TIF

    LuRa Tech Wavelet…………………………*.LWF

    Zsoft Paintbrush……………………………..*.PCX

    Windows Icon……………………………….*.ICO

    Enhanced Windows Metafile……………….*.EMF

    Truevision Targa……………………………*.TGA.

EASE Page Designer

This opens the current active picture in the **EASE Page Designer** module, allowing modifications to and annotations of the picture before printing.

Options

This opens the Options Window to set parameters for **EASE Rays** and **EASE Rays Tables**.

Shortcut: F9

Exit

This exits **EASE Rays**.

Item Menu

This menu allows selection and/or manipulation of **Items** for use in the **Rays** calculations.

Loudspeakers On

This selects **Loudspeakers** to be used for calculations.

To use this command:

> 1. Left click on **Loudspeakers On.** This lists all **Loudspeakers** that have been defined.
>
> 2. Select **Loudspeakers** using the LMB. Right click on **OK** selects All or on **Cancel** deselects All.
>
> 3. Left click on **OK**.

Listener Seats On

This selects **Listener Seats** to be used for calculations.

To use this command:

1. Left click on **Listener Seats On.** This lists all **Listener Seats** that have been defined.

2. Select Listener Seats using the LMB. Right click on **OK** selects All or on **Cancel** deselects All.

3. Left click on **OK**.

Faces On

This activates **Faces** to be used for calculations.

To use this command:

1. Left click on **Faces On.** This lists all **Faces** that are defined.

2. Select **Faces** using the LMB. Right click on **OK** selects All or on **Cancel** deselects All.

3. Left click on **OK**.

Note: You may also activate the faces by using the View Project Data Window. After picking a face you can activate this face with RMB/Activate or with the Activate Items or Activate Mode command under Mouse.

Use Only Selected Faces

A check here means that only the **Faces** selected using **Faces On** will be used in **Ray Tracing** calculations. If **Faces On** is not selected first then **All Faces On** will be the selected default. This function can be used to study reflections from the selected **Faces** only.

Draw Only Reflected Rays

A check here causes only **Reflected Rays** to be displayed, without **Direct Energy** from the source. This is can make it easier to see reflections and is very important to use when at an outdoor venue.

View Menu

This menu accesses the viewing functions in **Ray Tracing**.

View Project

This opens the **Project Data** (Room Editor) module in viewing mode to show ray propagation in the **Room**.

Show Active Items

If the project includes **Active Items** this toggle function will display them in the selected highlight color.

Rays Menu

This menu accesses the calculation and file management selections for **Ray Tracing** and **Impact Tracing.**

Ray Tracing

This causes rays to be generated from one or more **Loudspeakers** in a random manner and to continue to bounce around the project room until they have reached one of the cutoff criteria.

See also **Ray Tracing Main Window**

To use this command:

1. Left click on **Ray Tracing.** This will open a Ray Tracing Window.

2. Click on **Loudspeaker** to display a list of all sound sources (e.g. **Loudspeakers**) that have been defined.

3. Select **Loudspeakers** for the calculation using the LMB. Right click on **OK** selects All or on **Cancel** deselects All.

4. Left click on **OK**.

5. Use **Lspk Group** for group selection in the same way.

6. **Rays per Loudspeaker:** Enter the number of rays to be used. Use normally less than 1,000 for basic reflection patterns, use 100,000 or more for detailed investigations only exceptionally.

7. **Trace Control** by: Select the cutoff parameters by marking one or more.

   - **Order**: Number of reflection order in computation. Use a small number (2-7) for basic reflection patterns, a larger number for Auralization.

   - **Time (ms)** Only Rays whose total path time is under the limit set will be included in the calculation.

   - **Loss (dB)**: This sets the loss of ray energy at the cutoff point. -60 dB is a useful limit that can be used.

   - **Directed Emission**: If **Directed Emission**s is <u>not</u> checked, then the default is **Undirected Emissions Rays** will be emitted at random directions, but their <u>amplitude</u> will be proportional to the amplitude of the directionality balloon of the sound source (e.g. **Loudspeaker**) under this radiation angle. . **Undirected Emissions** are to be used for all acoustical studies other than Face specific reflections.

      If **Directed Emission** is checked, all **Rays** will be at the same amplitude, but the <u>density</u> of **Rays** versus radiation angle will be proportional to the amplitude directivity balloon of the selected sound source (e.g. **Loudspeaker)**. In other words, **Directed Emissions** concentrates the <u>number</u> of **Rays** in the direction of strongest radiation from the **Loudspeaker**, and is most useful for finding problematic reflecting surfaces.

8. **Tracing Options**: Select the display and file functions.

   - **Draw Trace Rays**: This displays the rays as they are computed without pausing the computation. This view may be 3D, x, y or z –View.

   - **Show Every Ray**: This displays each ray as it is computed, pausing the computation for each ray allowing the study of reflection paths and levels. Left click on OK to resume.

   - **Brief Ray Info**: This displays the reflection path, level and arrival time of each computed ray without pausing the computation.

   - **Make Trace File**: This saves all computed rays to a **Trace File** (.TRC).

9. If **Make Trace File** is selected the **Save File** Window will open. Select a folder and enter a filename in the window.

10. Left Click on the **Save** button.

11. Click on **OK** will start the **Ray Tracing** calculation.

12. If **Make Trace File** is selected the View Trace or Impact File Window will open at the conclusion of the calculations.

View Trace File

This opens a previously saved **Trace File**.

See also **View Trace or Impact File Window**.

To use this command:

1. Left click on **View Trace File**. This will open a file selection Window.

2. Select the desired **Trace File**

3. Left click on **Open**.

Ray Tracing Impacts

This calculates **Ray Paths** between selected sound sources (e.g. **Loudspeaker**) and **Listener Seats**. This calculation captures all rays that pass through a one-meter radius spherical counting balloon surrounding each selected **Listener Seat** and stores the result in an **Impact (.MPC) File** that can be **Saved** and used later to produce a **Reflectogram**.

See also **Ray Tracing Impacts Window** and **View Trace or Impact File Window.**

To use this command:

1. Left click on **Ray Tracing Impacts** to open a Find Impacts/Ray Tracing Window.

2. Click on **Loudspeaker** to display a list of all **Loudspeakers** that have been defined.

3. Select **Loudspeakers** for the calculation using the LMB. Right click on **OK** selects All or on **Cancel** deselects All.

4. Left click on **OK**.

5. Use **Lspk Group** for group selection in the same way.

6. Click on **Listener Seat** to open a window displaying all **Listener Seats** that have been defined.

7. Select **Listener Seats** using the LMB. Right click on **OK** selects All or on **Cancel** deselects All.

8. Left click on **OK**.

9. Use **Seat Group** for group selection in the same way.

10. Set **Impact Control by** selecting the cutoff parameters by marking each:

    - **Time (ms)**: Rays of total path time under this limit will be included in the calculation.

11. **Search Options**: Select the display and file functions.

    - **Draw Impact Rays**: This displays the impact rays as they are computed, without pausing the computation. This view may be 3D, x, y or z –View.

    - **Show Every Impact**: This displays each impact ray as it is computed, pausing the computation for each ray allowing the study of reflection paths and levels. Left click on OK to resume.

- **Brief Ray Info:** This displays the reflection path, level and arrival time of each computed impact ray, without pausing the computation.

- **Read Trace File:** This opens a selected **Trace File** and recalculates an **Impact (.MPC) File** from it.

12. **Make Impact File**: This saves all computed rays to an **Impact File** (.MPC). This option is strongly recommended, because it allows extensive viewing and post processing options. **For more information on the uses of theses files see the Appendix under Ray Tracing and its Uses.**

13. **OK** will open the Ray Tracing Window(see above).

14. .If **Make Impact File** is selected this will open the **Save File** Window.

15. Select a folder for the **Impact File** to be saved to and enter a file name in the window.

16. Left Click on **Save**.

17. Click on **OK** will start the **Ray Tracing** process.

18. If **Make Impact File** is selected this will open the View Trace or Impact File Window.

Mirror Image Impacts

This calculates ray paths between the sound source (e.g. **Loudspeaker**) and **Listener Seats**. All possible reflections at the selected **Order Number** are calculated. This calculation can be saved and used later to produce a **Reflectogram**.

See also View Trace or Impact File Window.

To use this command:

1. Left click on **Mirror Image Impacts.** This opens a Mirror Image Impact Window.

2. Click on **Loudspeaker** to list all **Loudspeakers** that have been defined.

3. Select **Loudspeakers** using the LMB. Right click on **OK** selects All or on **Cancel** deselects All.

4. Left click on **OK**.

5. Use **Lspk Group** for group selection in the same way.

6. Click on **Listener Seat** to list all **Listener Seats** that have been defined.

7. Select **Listener Seats** using the LMB. Right click on **OK** selects All or on **Cancel** deselects All.

8. Left click on **OK**.

9. Use **Seat Group** for group selection in the same way.

10. **Impact Control by**: Select the cutoff parameters by marking each

- **Order**: Number of reflection order in computation. Use a small number (2-7) for basic reflection patterns, a larger number for Auralization.

- **Delay (ms)**: Rays of total path time under this limit will be included in the calculation.

- **Loss (dB)**: This sets the loss of ray energy at the cutoff point. -60 dB is a useful limit that can be used.

11. **Mirror Options**: Select the display and file functions.

    - **Draw Impact Ray**: This displays the impact rays as they are computed, without pausing the computation. This view may be 3D, x, y or z –View.

    - **Show Every Impact**: This displays each impact ray as it is computed, pausing the computation for each ray allowing the study of reflection paths and levels. Left click on OK to resume.

    - **Brief Ray Info:** This displays the reflection path, level and arrival time of each computed impact ray, without pausing the computation.

    - **Make Impact File**: This saves all computed rays to an **Impact File** (.MPC). This option is strongly recommended, because it allows extensive viewing and post processing options.

12. If **Make Impact File** is selected the **Save File** Window will open. This option is strongly recommended, because it allows extensive viewing and post processing options. Also, a **Response (.RSP) File** can be extracted from an **Impact File (.MPC)** using **Save as Response File** from the **Tools** Menu. The **Ears** module can convolve a **Response (.RSP) File** with a Head Related Transfer Function to produce a **Binary Impulse File** for **Auralization**.

13. Select a folder for the **Impact File** to and enter its file name in the **File** window.

14. Left Click on the **Save** button.

15. Left click on **OK** will start the ray tracing process.

16. If **Make Impact File** is selected this will open the View Trace or Impact File Window.

Local Ray Tracing

Local Ray Tracing begins a **Ray Tracing** calculation for a selected position and sends the result to optionally either the **Probe** reflectogram analysis tool, or to **EARS Auralisation**. This option uses the detailed ray propagation geometry only internally and immediately leads to the room response at the selected location. This compacted reflection computation is also available from **EASE Eyes** and **EASE Mapping** modules.. To use **Local Ray Tracing**:

1. Left click on Local Ray Tracing. If no location is selected, a Listener Seat selection window will open.

2. Choose a Listener Seat and Left click OK. The Reflectogram at window will open.

3. Click on Loudspeaker to list all Loudspeakers that have been defined.

4. Select Loudspeakers using the LMB. Right click on OK selects All or on Cancel deselects All.

5. Left click on OK.

6. Use Lspk Group for group selection in the same way.

7. Rays per Loudspeaker: Enter the number of rays to be used. Use less than 1,000 for basic reflection patterns, use 100,000 or more for Auralization.

8. Control by: Select the cutoff parameters by marking each

9. Order: Number of reflection order in computation. Use a small number (2-7) for basic reflection patterns, a larger number for Auralization.

10. Delay (ms): Rays of total path time under this limit will be included in the calculation.

11. Select Computation Method

12. Mirror Image Impacts: Check here to use the Mirror Image model. This computation is more accurate, but takes much longer.

13. Ray Tracing Impacts: Check here to use the Ray Tracing Impacts model. This computation is faster, but lacks the accuracy when a low number of rays are used.

14. Choose a Destination for the results of the Calculation.

15. Probe: Check here to use the Probe to view the results, and optionally further send them to EARS for Auralisation.

16. Ears: Check here to immediately use Ears to Auralize the results of the calculation. The Ears module can convolve a Response (.RSP) File with a Head Related Transfer Function to produce a Binary Impulse File for Auralization.

17. Left click OK to begin the calculation, or cancel to abandon it.

18. A Save File window will open. Enter a folder and file name for the Response File (.RSP) to contain the computed result, and Left click OK to begin the calculation.

View Impact File

This opens a previously saved **Impact File** for viewing and analysis.

See also View Trace or Impact File Window

To use this command:

1. Click on **View Impact File**. This will open the **Open Impact File** window.

2. Select the folder holding the impact file and Left click on the desired **Impact File**.

3. Left click on the **Open** button to open the View Trace or Impact File Window.

Split Impact File

This **Splits** an **Impact File** calculated for multiple **Listener Seats** into individual **Listener Seat** files at one operation.

To use this command:

1. Click on **Split Impact File** to open a file selection window.

2. Select **Impact File** to be split. Multiple files will be written, one for each **Listener Seat**, named using the **Project Name** and the **Listener Seat** names combined.

Save As Response File

This **Saves** a **Response File** extracted from a selected .MPC file. The **Ears** module can convolve a **Response (.RSP) File** with a **Head Related Transfer**

Function to produce a **Binary Impulse File** for **Auralization**. To use this command:

1. Click on **Save As Response File** to open a file selection window.

2. Select the **Impact File** for use and Left click **OK**.

3. A Save File window will open. Choose a directory and enter a file name for the **Response File**.

4. Left click **OK**.

Update Trace File

This **Updates** a **Trace File** when **Wall Materials, Speaker Models, Loudspeaker Hor, Ver, Rotation Angles,** are changed. This eliminates the need for recalculation of the Reflectogram when these non-geometric parameters are changed. **Delay** or Alignment changes do not require updates. Geometric changes cannot be accommodated, such as **Loudspeaker x, y and z location, Listener Seat x, y and z location** or differently arranged **Faces**.

Inspect Trace File

This displays the calculation parameters and results in a tabular format for a selected **Trace or Impact** file.

To use this command:

1. Click on **Inspect Trace File** to open a file selection window.

2. Select the **Trace** or **Impact File** to **Inspect** and Left click **OK**.

Export Trace File

This Exports the T**race File** in an ASCII (*.DAT) format for use in a text document/spread sheet or for other types of post processing. This file may be formatted using the Table Options that open on selection of this command.

Window Menu

This menu allows access to different commands that affect the open window.

Screen Quarter

This allows placement of the active window into any of 5 positions.

Center

This places the open window in the center of the screen.

Upper Left

This places the open window in the upper left corner of the screen.

Upper Right

This places the open window in the upper right corner of the screen.

Lower Left

This places the open window in the lower left corner of the screen.

Lower Right

This places the open window in the lower right corner of the screen.

Cascade Windows

This makes all open windows appear in a stacked format.

Help Menu

This menu allows access to all forms of help.

Help Topics

This offers a list of commonly asked help subjects. We have made a concerted effort to develop the Help files and the manual together. If you need an answer as to what a particular command does go to the help files. You will likely find your answer there.

About

This displays information about your EASE program.

Memory Used

This tests and dynamically displays the computer memory actually used.

Ray Tracing Window

This window sets the parameters for and begins the calculation of reflections using **Ray Tracing**. This assumes a random emission of rays from the source. The user can set the amplitude and length of the response to be computed.

OK

Applies changes and closes window.

Cancel

Discards changes and closes window.

Loudspeaker

This lists **Loudspeakers** that have been defined and allows the selection of **Loudspeakers** to be used as sound sources for the **Ray Tracing** computation.

Lspk Group

This lists **Loudspeaker Groups** that have been defined and allows the selection of **Loudspeaker Groups** to be used as sound sources for the **Mirror Image** computation.

Rays per Loudspeaker

Enter the number of rays to be used. Use less than 1,000 for basic reflection patterns, use 100,000 or more for detailed investigations.

Trace Control by

Sets the criteria for a calculation of a ray to be considered complete.

Order

Order is always checked thus setting the highest ordered reflection that will be computed. Use a small number (5-7) for basic reflection patterns; a larger number should be used for detailed investigations.

Time

Rays of total path time under this limit will be included in the calculation.

Loss

This sets the loss of ray energy at the cutoff point. -60 dB is a useful limit that can be used.

Directed Emission

Directed Emission: If **Directed Emission**s is <u>not</u> checked, then the default is **Undirected Emissions. Rays** will be emitted at random directions, but their <u>amplitude</u> will be proportional to the amplitude of the directionality balloon of the sound source (e.g. **Loudspeaker**) under this radiation angle. **Undirected Emissions** are to be used for all acoustical studies other than Face specific reflections.

If **Directed Emission** is checked, all **Rays** will be at the same amplitude, but the <u>density</u> of **Rays** versus radiation angle will be proportional to the amplitude directivity balloon of the selected sound source (e.g. **Loudspeaker**). In other words, **Directed Emissions** concentrates the <u>number</u> of **Rays** in the direction of strongest radiation from the **Loudspeaker** and is most useful for finding problematic reflecting surfaces.

Tracing Options

This area controls the file handling and viewing functions

Draw Trace Ray:

This displays the rays as they are computed without pausing the computation. This view may be 3D, x, y or z –View.

Show Every Ray:

This displays each ray as it is computed, pausing the computation for each ray allowing the study of reflection paths and levels. Left click on OK to resume.

Brief Ray Info:

This displays the reflection path, level and arrival time of each computed. The ray color will follow the protocol in effect for the color-coding of rays set in **Rays Options**. On a fast computer, this display may be updated so quickly that it will not be readable.

Make Trace File:

This saves all computed rays to a **Trace File** (.TRC).

Mirror Image Impact Window

This window sets parameters for, and begins the calculation of, Impacts using an **Image Model**. This method assumes a location for a virtual source, which is the **Mirror Image** of the real source about every reflecting **Face**, allowing an imaginary line to be drawn between the virtual source and the **Listener Seat** through the point where the reflection intersects every reflecting **Face**.

OK

Applies changes and closes window.

Cancel

Discards changes and closes window.

Loudspeaker

This lists **Loudspeakers** that have been defined and allows the selection of **Loudspeakers** to be used as sound sources for the **Mirror Image** computation.

Lspk Group

This lists **Loudspeaker Groups** that have been defined and allows the selection of **Loudspeaker Groups** to be used as sound sources for the **Mirror Image** computation.

Listener Seat

This lists **Listener Seats** that have been defined, and allows the selection of **Listener Seats** to be used for points of observation for **Mirror Image** computation.

Listener Seat Group

This lists **Listener Seat Groups** that have been defined, and allows the selection of **Listener Seat Groups** to be used for points of observation for **Mirror Image** computation.

Impact Control by

Sets the criteria for a calculation of a ray to be considered complete.

Order

Order is always checked thus setting the highest ordered reflection that will be computed. Use a small number (5-7) for basic reflection patterns; a larger number should be used for Auralization.

Delay

Rays of total path time under this limit will be included in the calculation.

Loss

This sets the loss of ray energy at the cutoff point. -60 dB is a useful limit that can be used.

Mirror Options

This area controls the file handling and viewing functions

Draw Impact Ray

This displays the impact rays as they are computed, without pausing the computation. This view may be 3D, x, y or z –View.

Show Every Impact

This displays each impact ray as it is computed, pausing the computation for each ray allowing the study of reflection paths and levels. Left click on OK to resume.

Brief Impact Info

This displays the reflection path, level and arrival time of each computed impact ray in a table format. The ray color will follow the protocol in effect for the color-coding of rays set in **Rays Options**. On a fast computer, this display may be updated so quickly that it will not be readable.

Make Impact File

This saves all computed rays to an **Impact File** (.MPC) for later study. This option is strongly recommended, because it allows extensive viewing and post processing options. A **Response (.RSP) File** can be extracted from an **Impact File (.MPC)** using **Save as Response File** from the **Rays** Menu.

Ray Tracing Impacts Window

This window sets parameters for, and begins the calculation of, reflections using **Ray Tracing** impacts with a **Listener Seat**. This uses random emission of rays from the source with an imaginary 1-meter radius sphere drawn around the selected **Listener Seats**. If a ray intersects this balloon, ray tracing is paused while this ray is recalculated using the **Mirror Image** method. **Ray Tracing** is then resumed until another ray intercepts the balloon and the process is repeated until the **Number Of Rays** used is reached.

The **Ray Tracing Window** appears after the closure of the **Find Impacts** window, if **Read Trace File** is not used.

OK

Applies changes and closes window.

Cancel

Discards changes and closes window.

Loudspeaker

This lists **Loudspeakers** that have been defined and allows the selection of **Loudspeakers** to be used as sound sources for the **Ray Tracing Impacts** computation.

Lspk Group

This lists **Loudspeaker Groups** that have been defined and allows the selection of **Loudspeaker Groups** to be used as sound sources for the **Ray Tracing Impacts** computation.

Listener Seat

This lists **Listener Seats** that have been defined and allows the selection of **Listener Seats** to be used for points of observation for **Ray Tracing Impacts** computation.

Listener Seat Group

This lists **Listener Seat Groups** that have been defined and allows the selection of **Listener Seat Groups** to be used for points of observation for **Ray Tracing Impacts** computation.

Impact Control by

Sets the criteria for a calculation of a ray to be considered complete.

Time

Rays of total path time under this limit will be included in the calculation.

Search Options

Select the display and file functions.

Draw Impact Ray

This displays the impact rays as they are computed, without pausing the computation. This view may be 3D, x, y or z –View.

Show Every Impact

This displays each impact ray as it is computed, pausing the computation for each ray allowing the study of reflection paths and levels. Left click on OK to resume.

Brief Impact Info

This displays the reflection path, level and arrival time of each computed impact ray. The ray color will follow the protocol in effect for the color-coding of rays set in **Rays Options**. On a fast computer, this display may be updated so quickly that it will not be readable.

Read Trace File

This opens a selected **Trace File** and recalculates an **Impact (.MPC) File** from it using a 1-meter spherical balloon around the selected **Listener Seat**.

Make Impact File

This saves all computed rays to an **Impact File** (.MPC) for later study. This option is strongly recommended, because it allows extensive viewing and post processing options. A **Response (.RSP) File** can be extracted from an **Impact File (.MPC)** using **Save as Response File** from the **Rays** Menu. The **Ears** module can convolve a **Response (.RSP) File** with a Head Related Transfer Function to produce a **Binary Impulse File** for **Auralization**.

See also: Find Impacts/Ray Tracing Window

Find Impacts/Ray Tracing Window

This window sets the parameters for and begins the calculation of reflections using **Ray Tracing** to find the **Impacts**. This assumes a random emission of rays from the source. The user can set the amplitude and length of the response to be computed.

OK

Applies changes and closes window.

Cancel

Discards changes and closes window.

Loudspeaker

This lists **Loudspeakers** that have been defined and allows the selection of **Loudspeakers** to be used as sound sources for the **Ray Tracing** computation.

Lspk Group

This lists **Loudspeaker Groups** that have been defined and allows the selection of **Loudspeaker Groups** to be used as sound sources for the **Mirror Image** computation.

Rays per Loudspeaker

Enter the number of rays to be used. Use less than 1,000 for basic reflection patterns, use 100,000 or more for Auralization.

Trace Control by

Sets the criteria for a calculation of a ray to be considered complete.

Order

Order is always checked thus setting the highest ordered reflection that will be computed. Use a small number (5-7) for basic reflection patterns; a larger number should be used for Auralization.

Time

Rays of total path time under this limit will be included in the calculation.

Loss

This sets the loss of ray energy at the cutoff point. -60 dB is a useful limit that can be used.

Directed Emission

Directed Emission: If **Directed Emission**s is <u>not</u> checked, then the default is **Undirected Emissions. Rays** will be emitted at random directions, but their <u>amplitude</u> will be proportional to the amplitude of the directionality balloon of the sound source (e.g. **Loudspeaker**) under this radiation angle.   **Undirected Emissions** provides the most accurate ETC and are to be used for all acoustical studies other than Face specific reflections.

If **Directed Emission** is checked, all **Rays** will be at the same amplitude, but the <u>density</u> of **Rays** versus radiation angle will be proportional to the amplitude directivity balloon of the selected sound source (e.g. **Loudspeaker**). In other words, **Directed Emissions** concentrates the <u>number</u> of **Rays** in the direction of strongest radiation from the **Loudspeaker** and is most useful for finding problematic reflecting surfaces It does not compute an accurate ETC.

Tracing Options

This area controls the file handling and viewing functions.

Draw Trace Ray:

This displays the rays as they are computed without pausing the computation. This view may be 3D, x, y or z –View.

Show Every Ray:

This displays each ray as it is computed, pausing the computation for each ray allowing the study of reflection paths and levels. Left click on OK to resume.
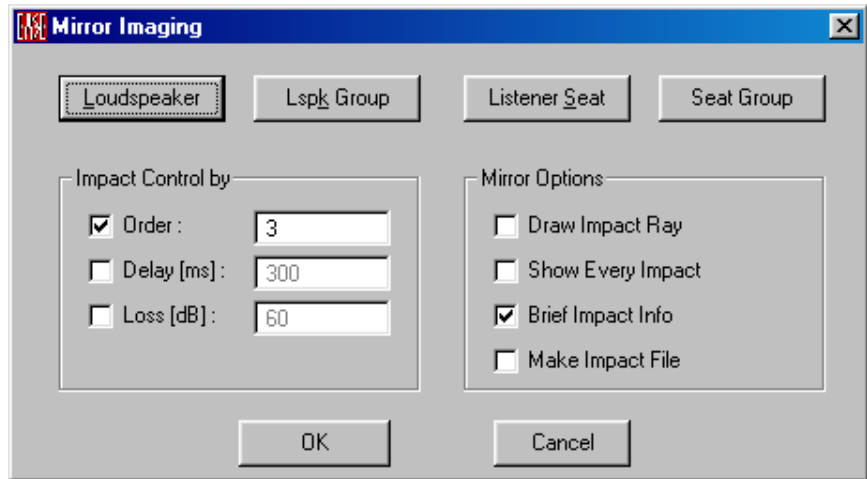
Brief Ray Info:

This displays the reflection path, level and arrival time of each computed ray in a table format. The ray color will follow the protocol in effect for the color-coding of rays set in **Rays Options**. On a fast computer, this display may be updated so quickly that it will not be readable.

Make Trace File:

A check here stores all computed **Rays** used to produce the Impact **File** (.MPC) to a **Trace File** (.TRC) whether the ray will intercept the balloon or not. This option is not highly recommended, because it occupies a huge memory space on the hard disk.

Impact Chance

In **Ray Tracing Impact Mode,** with I**mpact Control** set by checking and entering a **Time** (in the **Find Impacts** window), **Impact Chance** shows the percentage of all of the possible rays that can be expected to be calculated compared to a Mirror Image calculation. The **Impact Chance** algorithm is affected by the ratio of the number of rays compared to the time of cutoff. **Impact Chance** should be 80% or more for accurate results.

Local Ray Tracing Window

Local Ray Tracing begins a **Ray Tracing** calculation for a selected **Listener Seat** and then sends the result to the **Probe** or **Auralization**.
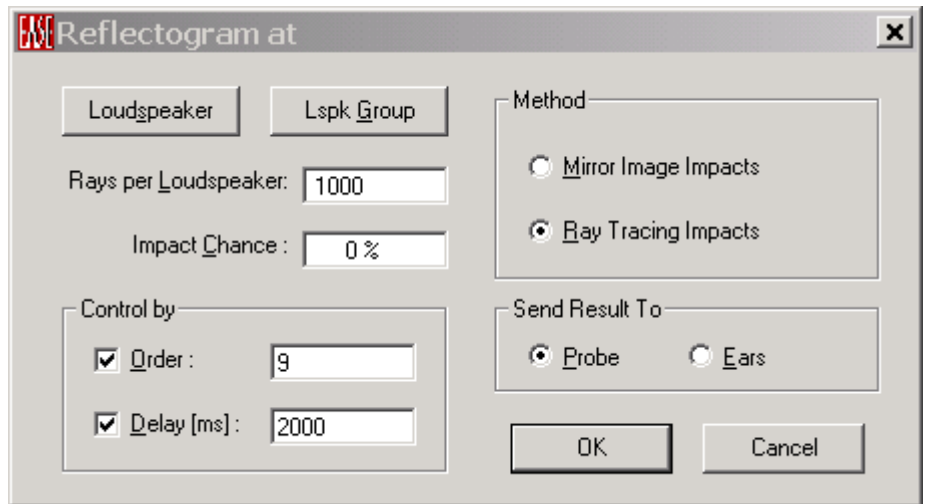
OK

Applies changes and closes window.

Cancel

Discards changes and closes window.

Loudspeaker

This lists **Loudspeakers** that have been defined, and allows the selection of **Loudspeakers** to be used as sound sources for the **Local Ray Tracing** computation.

Lspk Group

This lists **Loudspeaker Groups** that have been defined, and allows the selection of **Loudspeaker Groups** to be used as sound sources for the **Local Ray Tracing** computation.

Rays per Loudspeaker

Enter the number of rays to be used. Use less than 1,000 for basic reflection patterns, use 100,000 or more for Auralization.

Impact Chance

In **Local Ray Tracing Mode,** with **Control** set by checking and entering a **Delay Time** (in **ms**), **Impact Chance** shows the percentage of all of the possible rays that can be expected to be calculated using **Ray Tracing Impacts** compared to a **Mirror Image** calculation. The **Impact Chance** algorithm is affected by the ratio of the number of rays compared to the time of cutoff. **Impact Chance** should be 80% or more for accurate results.

Control by:

Sets the criteria for the calculation of a ray to be considered complete.

Order

Order is always checked thus setting the highest ordered reflection that will be computed. Use a small number (5-7) for basic reflection patterns; a larger number should be used for Auralization.

Delay

Rays of total path time under this limit will be included in the calculation.

Method

This selects the computation **Method** or type of computation.

Mirror Image Impacts

Check here to use the **Mirror Image** method. This computation is more accurate, but takes much longer.

Ray Tracing Impacts

Check here to use the **Ray Tracing Impacts** model. This computation is faster, but lacks the accuracy when a low number of rays are used.

Send Results to:

This selects how the results will be used or evaluated.

Probe

Check here to use the **Probe** to examine the results of the **Local Ray Tracing** computation.

Ears

Check here to use **Ears** to **Auralize** the results of the **Local Ray Tracing** calculation. To see how it is used in Ears please read the appendix and Ray Tracing and its Uses.

View Trace or Impact File Window

This sets parameters for displaying a **Trace** or **Impact** file graphically or in table form.

File Tab
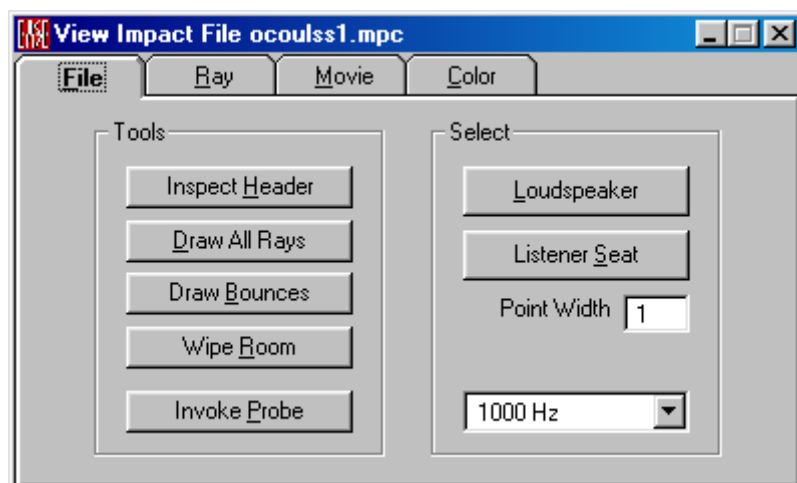
Tools

This area contains the functions used to set the parameters for the visual display of the results contained in a **(.TRC)** or **(.MPC)** file.

Inspect Header

This displays the calculation parameters and results in a tabular format for a selected **Trace or Impact** file.

Draw All Rays

This draws all of the rays that have been calculated, within the room model (view mode). There is no abort function so this may take time.

Draw Bounces

This draws all **Bounce** or reflection points that have been calculated within the room model.

Wipe Room

This clears all previously drawn rays from the room model.

Invoke Probe (only in Impact Mode)

This invokes the **Probe** to allow more detailed studies of the Reflectogram and other acoustic parameters. This function only works with **Impact** (*.MPC) **Files**

See also EASE **Probe**.

Select

Loudspeaker

This list of **Loudspeakers** allows the selection of sound source to be used in displaying a calculated Trace or Impact file.

Listener Seat (only in Impact Mode)

This list of **Listener Seats** allows the selection of **Listener Seats** to be used for points of observation for **Ray Tracing Impacts** computation. This function only works with **Impact** (*.MPC) **Files**.

Point Width

This sets the size of the bounce points in pixels.

Frequency

This selects the frequency band to be used for frequency dependent investigations.

Ray Tab

This tab contains the controls for the display of individual rays. Rays are ordered internally i) by **Loudspeaker**, ii) by **Listener Seat** (**Impact mode** only), iii) by arrival time within each Speaker/Seat pair. The currently selected rays becomes

highlighted simultaneously in the **Room Drawing** and in the **Probe Reflectogram** if **EASE Project** module and/or **EASE Probe** module are invoked from within the **EASE Rays** module (Doesn't work in the stand alone probe mode!).
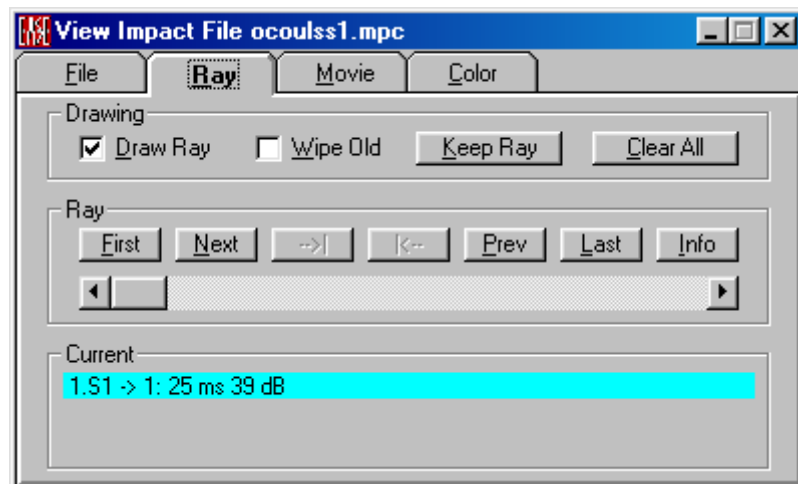
Drawing

This area contains the controls or settings for display and selective filing of rays.

Draw Ray

If checked, this will draw the selected ray within the room. If **Probe** (only in **Impact** Mode) is used, this setting is needed to see a reflection path in the room model that is selected using the reflectogram.

Wipe Old

This erases all of the previously displayed rays and only shows the currently selected ray.

Keep Ray

This stores the current ray in an internal table to be used for comparisons with other rays.

Clear All

This clears the internal ray table.

Ray

This area holds the controls for the selection of the ray itself as well as the display of ray specific tabular information.

First

This selects the first ray for display as the current ray.

Next

Steps forward through the ray list. The sequence of rays is set i) by **Loudspeaker**, ii) by **Listener Seat** (**Impact mode** only), iii) by arrival time within each Speaker/Seat pair. **Next** proceeds to the next active ray, if rays are deactivated from within the linked Probe module.

→|

Proceeds to the beginning of the next Loudspeaker/Listener Seat pair group of Rays

|←

Proceeds to the beginning of the previous Loudspeaker/Listener Seat pair group of Rays

Previous

Steps backward through the ray list. The sequence of rays is set i) by **Loudspeaker**, ii) by **Listener Seat** (**Impact mode** only), iii) by arrival time within each Speaker/Seat pair. **Previous** proceeds to the nearest previous active ray, if rays are deactivated from within the linked Probe module.

Last

This selects the last ray for display as the current ray.

Info

This displays a detailed table of information about the current ray. See below Ray Info Windowand the Table Tab under Table Tab.

Selection Slider

This slider allows the rapid selection of rays by sliding the button thru the ray list. The arrows provide a way for single-stepping through even deactivated rays.

Current

This area contains the brief tabular display information about the currently selected ray.

Movie Tab

This tab contains the controls for the **Movie** type display of rays.
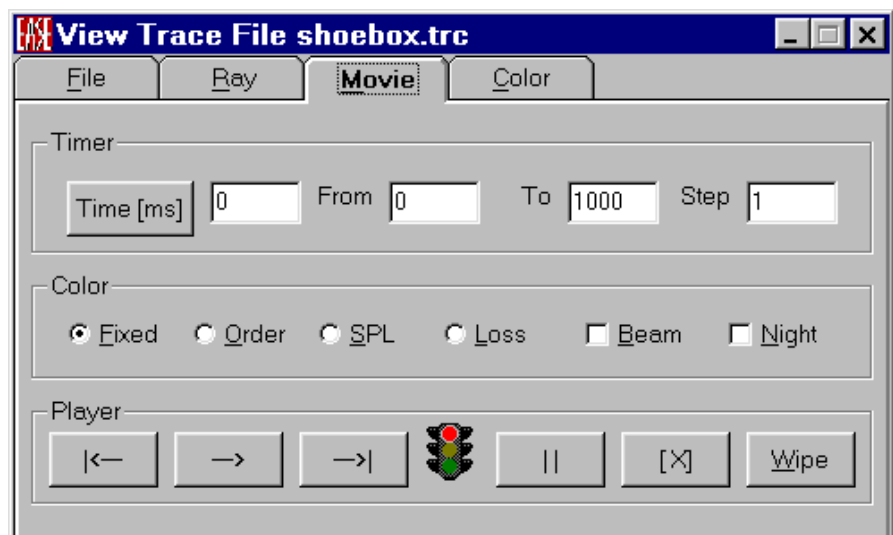
Timer

This area contains the controls and settings for control of the time period of the display.

Time [ms]

This button sets the **Movie** display to the time entered in the data entry field. This allows the study of ray activity at specific time periods

From

This sets the **Movie** start time.

To

This sets the **Movie** end time.

Step

This sets the **Movie** step time interval between frames.

Color

This area allows the setting of specified colors to the display rays to indicate specific information graphically about the rays in the movie.

Fixed

Uses the same color to display the beams. This color is different than the active point of the beam.

Order

This selection allows different colors to indicate changes in the **Reflection Order** of the rays. These colors are selectable in the **Color** tab.

SPL

This selection allows different colors to be used to show **Sound Pressure Level** changes in the displayed beams at the selected frequency. These colors are selectable in the **Color** tab.

Loss

This selection allows different colors to be used to show the **Loss Of Energy** at the selected frequency in the beams shown. These colors are selectable in the **Color** tab.

Beam

This selection allows the color of the active point of the beam to be saved in the beam to show lines rather than point information.

Night

This selection allows the **Movie** to be displayed on a different colored background for easier observation of the display in certain circumstances.

Player

This area contains the controls for use in running of the **Movie.** These controls operate very much like a video player.

Player |<==

This moves the **Movie** backward one step.

Player ==>

This starts the **Movie** from the current time.

Player ==>|

This moves the **Movie** forward one step.

Player ||

This causes the **Movie** to hold or pause at the time it was pressed.

Player [x]

This causes the **Movie** to stop and return to the start time.

Wipe

This clears the model of all rays drawn.

Color Tab
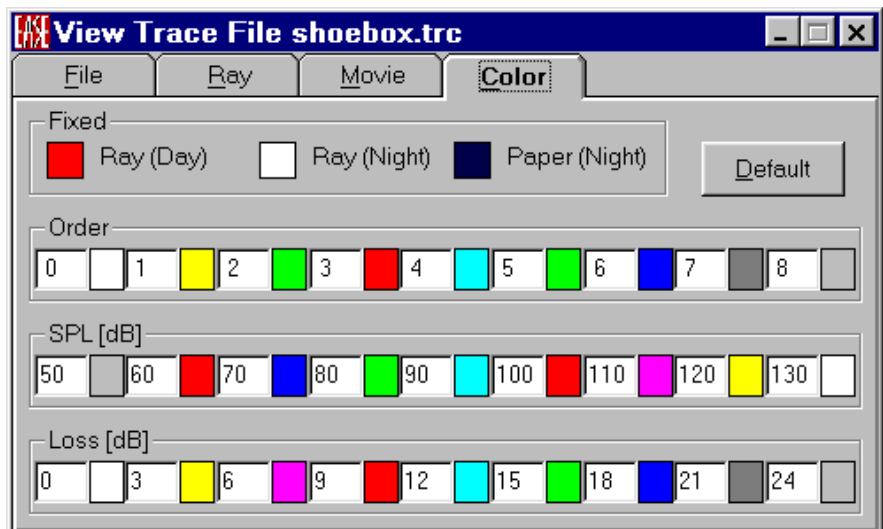
Fixed

This allows selection of ray fixed colors and night background color.

Order

This allows selection of the correspondence reflection orders and display colors.

SPL

This allows selection of the corresponding values of energy in SPL and display colors.

Loss

This allows selection of the corresponding values of energy loss and display colors.
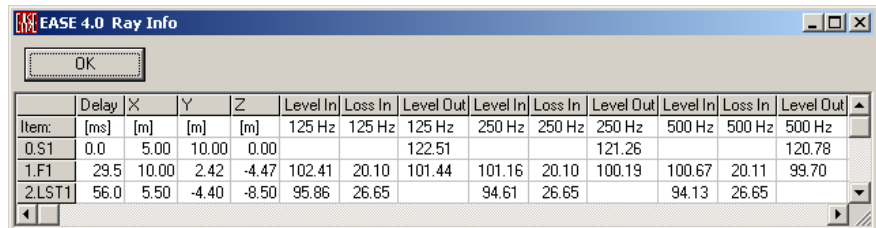
Default

This brings back the default colors.

Ray Info Window

This window displays detailed information such as the coordinates, losses and running times for every bounce point. This information is for the current ray only. The calculation is paused to allow the user to view this data. Left click on **OK** button to close this data and resume the calculation.

To understand the parameters in this window compare the Table Tab in the File/Options Window.

Item:	Delay [ms]	X [m]	Y [m]	Z [m]	Level In 125 Hz	Loss In 125 Hz	Level Out 125 Hz	Level In 250 Hz	Loss In 250 Hz	Level Out 250 Hz	Level In 500 Hz	Loss In 500 Hz	Level Out 500 Hz
0.S1	0.0	5.00	10.00	0.00			122.51			121.26			120.78
1.F1	29.5	10.00	2.42	-4.47	102.41	20.10	101.44	101.16	20.10	100.19	100.67	20.11	99.70
2.LST1	56.0	5.50	-4.40	-8.50	95.86	26.65		94.61	26.65		94.13	26.65	

View Protocol File Window

This displays basic information about how the most recent calculation was made.

```
C:\Program Files\EASE 4.0\Easepath\Protocol.txt
File  Edit

C:\Program Files\EASE 4.0\Easepath\Protocol.txt on 9/18/01 10:01:39
AM

Project:        shoebox

Mirror Image Impact Computing Protocol

Begin   Tuesday, September 18, 2001, 10:01:33 AM
End     Tuesday, September 18, 2001, 10:01:39 AM
Time [s]        6.1
        1.Order:        6 Impacts
        2.Order:       18 Impacts
        3.Order:       38 Impacts
        4.Order:       65 Impacts
        5.Order:       96 Impacts
        6.Order:      126 Impacts
          Overall:    349 Impacts
```

File Menu

This accesses Printing and File Management functions.

Save As

This **Saves** the current Protocol data to an ASCII file (.TXT). To use this command:

> 3. Left click on Save As to open a file save window.
>
> 4. Choose the desired directory and enter a file name.

Print Selected Text

This **Prints Selected Text.**

Print File Ctrl + P This **Prints** the open window without the window frame, e.g. without the command buttons and scroll bars.

Exit

This closes the **View Protocol File** window.

Edit Menu

This accesses File Editing functions.

Copy   Ctrl + C

This copies Selected Text.

Select All Ctrl + A

This selects all the text for copying and pasting into other documents.

Options Window

This window shows preset options and allows custom configuration of the **Ray Tracing** display.
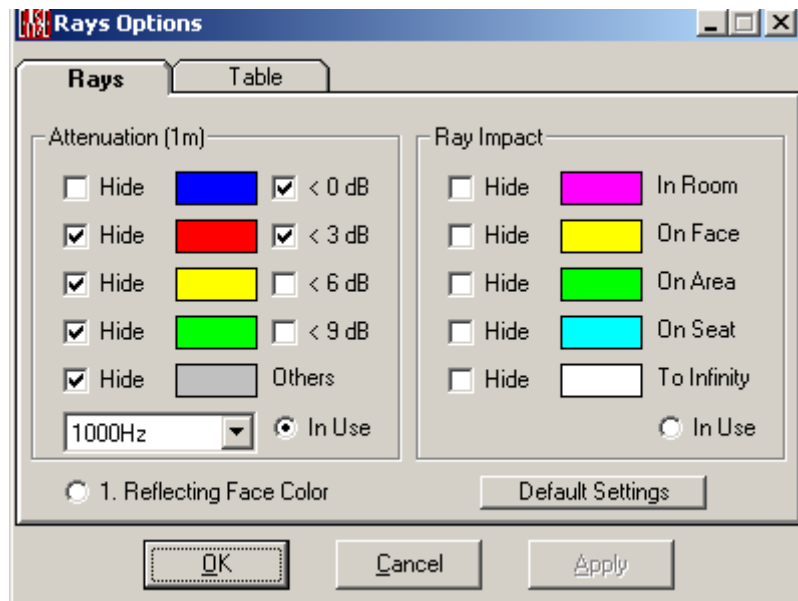
OK

Applies changes and closes window.

Cancel

Discards changes and closes window.

Apply

Applies changes and keeps window open.

Rays Tab

This tab holds settings for graphical display of **Rays within the room model**. Note: These settings do not affect the **Movie** display.

1. Reflecting Face Color

Shows the first order rays in the same color as the color of the corresponding reflecting faces.

Default Settings

This restores **Default** settings for the color display of calculated **Rays.**

Attenuation (1m)

This area contains the settings for the control of the rays that are displayed and the color-coding of them based on the **Loudspeaker** coverage contour from which they originate. Left click on a **Color** for a **Color Palette** to assign a different **Color**.

Hide

A check mark here will not allow the display of a ray within the selected coverage cone level or less.

<0 dB

A check mark in the **Hide** box will not allow the display of rays emitted from sectors of the attenuation balloon where the attenuation is negative, that is, where the emitted sound level exceeds the 1m on-axis level of the speaker. This case is especially frequent for cluster balloons due to interference of the array components.

Note: Without check mark it shows the direct sound normally

<3 dB

A check mark in the **Hide** box will not allow the display of all rays in the 0-3 dB coverage cone. A check in the right box will use the assigned color and allow the display of the rays within the 0-3 dB coverage cone.

<6 dB

A check mark in the **Hide** box will not allow the display of all rays in the 3-6 dB coverage cone. A check in the right box will use the assigned color and allow the display of the rays within the 3-6 dB coverage cone.

<9dB

A check mark in the **Hide** box will not allow the display of all rays in the 6-9 dB coverage cone. A check in the right box will use the assigned color and allow the display of the rays within the 6-9 dB coverage cone.

Others

A check mark here will hide all rays above the 9 dB coverage cone.

Frequency

Allows **Frequency** selection for the attenuation balloon where the above level criteria are to be applied, using a drop down box.

In Use

A mark here enables this specific **Loudspeaker** coverage criterion to be used for the display of the calculated Rays.

Ray Impact

This area contains the settings for the control of the rays that are displayed and the color-coding of them based on the way the calculation is terminated. Left click on a **Color** for a **Color Palette** to assign a different **Color**.

Hide

A check mark here will not allow the display of a ray of the selected termination type.

In Room

This color ray indicates the ray has ended in space after reaching a **Loss** or **Time** limit. A check here does not allow the display of this class of **Ray**.

On Face

This color ray indicates the ray has ended on a **Face** after reaching a **Loss** or **Order** limit. A check here does not allow the display of this class of **Ray**.

On Area

This function is not yet implemented!

On Seat

This color ray indicates the ray has ended at a selected Listener Seat as an impact. A check here does not allow the display of this class of **Ray**.

To Infinity

This indicates that the ray is not intercepting an object or selected item. A check here does not allow the display of this class of **Ray**.

In Use

A mark here enables this specific **Impact** termination criterion to be used for the display of the calculated Rays.

Table Tab

This tab contains the settings for the **Tabular** display of calculated **Rays in Ray Info under View Trace or View Impact File.**
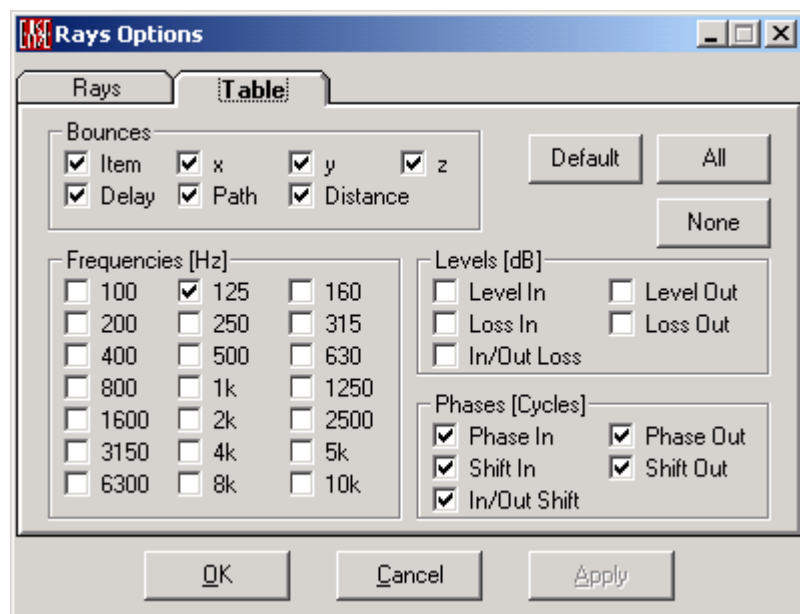
Default

This restores the **Table** settings to their default parameters.

All

This places a check in all boxes, setting all parameters for display and printing.

None

This clears the checks in all boxes, clearing all parameters for display and printing.

Bounces

This area contains the selection boxes that allow basic data to be displayed and printed using the selected information only.

Item

A check mark here will show the names of the Items that the ray emits from or strikes to be displayed or printed.

Delay

A check mark here will show the Delay time of the ray emission and running time delay for each bounce point to be displayed or printed.

X, Y and Z

A check mark here will allow the Geometric coordinates of the emitter points as well as all bounce points of the ray emission to be displayed or printed.

Path

A check mark here will allow the tabular display or printing of the complete path of the ray from Emitter to the termination point.

Distance

A check mark here will allow the display or printing of the distance the ray actually covered between bounces.

Frequencies

This area contains the selection boxes for the display and printing of Frequency dependent data.

100-10K (1/3 Octave)

Theses boxes allow the display and printing of the selected frequency data of the selected rays.

Levels (dB)

This area contains the selection boxes for the display and printing of level information of the selected rays.

Level In

This box allows the display and printing of the ray's level <u>before</u> hitting a face.

Level Out

This box allows the display and printing of the ray's level emitted by a loudspeaker or <u>after</u> hitting a face.

Loss In

This box allows the display and printing of the ray's Overall Loss of Energy, relative to the source, along the path before hitting a face.

Loss Out

This box allows the display and printing of the ray's Overall Loss of Energy, relative to the source, after hitting a face.

In/Out Loss

This box allows the display and printing of the Internal loss caused by absorption due to hitting face.

.

Phases (Cycles)

This area contains boxes that allow the display and printing of phase information of each bounce. It gives phase information for the ray along his travel path caused by internal loudspeaker phase and wall materials (currently not yet supported by the database - as long as reflection phase shifts are not supported by material data, several of the following options remain redundant). Runtime phase differences $2*Pi*f*t$ are NOT included because they are very frequency sensitive and can only be given for a sharp frequency, not as an average value for a third octave band.

Phase In

This box allows the display and printing of the ray's phase <u>before</u> hitting a face.

Phase Out

This box allows the display and printing of the ray's phase emitted by a loudspeaker or <u>after</u> hitting a face.

Shift In

This box allows the display and printing of the ray's overall Phase difference, relative to the source, along the path before hitting a face.

Shift Out

This box allows the display and printing of the ray's overall Phase difference, relative to the source, after hitting a face.

In/Out Shift

This box allows the display and printing of the Internal phase difference caused by reflection due to hitting face.

Chapter X : Ease Speaker Base

EASE Speaker Base

EASE Speaker Base is an editor and viewer for **Speaker Model** data supplied by manufacturers and the user, including **Balloon**, **Level**, and **Case** outlines. **Speaker Base** can also construct and edit **Clusters**, calculate information about a **Cluster**, and display and save graphs showing performance of **Speaker Models**.

Note that starting with EASE version 4.2, the GLL loudspeaker format was introduced as the general successor to the SPK data format. EASE SpeakerLab, the software module to import measurement data and compile GLL files, ships with every version of EASE and should be used to create EASE loudspeaker data instead of the EASE Speaker Base program.

Speaker Base Main Window

This displays, edits, creates, and saves **Speaker Model** data. When displaying graphics, the left scrollbar zooms the display, the lower scrollbar turns the display horizontally, and the right scrollbar turns the display vertically.

Key Conventions

F1	Help
F4	Open **Speaker Data** Window
F9	**Options**
F10	**Statusbar** Options
F11	Zoom In
F12	Zoom Out
D	Activates the Drag Function Mouse mode
P	Activates the Pick Function Mouse mode
T	Activates the Track Function Mouse mode
x	x-View
y	y-View
z	z-View
3	3D-View
Left Arrow	Moves the horizontal rotation scrollbar to the left
Right Arrow	Moves the horizontal rotation scrollbar to the right
Up Arrow	Moves the vertical rotation scrollbar upwards
Down Arrow	Moves the vertical rotation scrollbar downwards

PgUp	Zoom In
PgDn	Zoom Out
Home	Full View

Ctrl+

N	**New Speaker**
O	**Open Speaker**
S	**Save Speaker**
A	**Save Speaker As**
B	Displays the speaker **Balloon**.
M	Shows next balloon **Meridian**
P	Shows next balloon **Parallel**
PgUp	**Frequency** +1/3 Octave
PgDn	**Frequency** –1/3 Octave

Shift+

C	Activates Fixed Center Mouse Mode

Mouse Conventions

Mouse Wheel

Mouse wheel spinning allows zooming in and out.

Statusbar Conventions

Hor	This is the **Horizontal** angle of the speaker **Balloon** relative to the window. 0 degrees is in the –Y direction.
Ver	This is the **Vertical** angle of the speaker **Balloon** relative to the window. 0 degrees is horizontal.
Freq	This is the **Frequency** of the current display
Sensitivity	This is the **Sensitivity** speaker at the current frequency
Directivity (Q)	This is the **Directivity (Q)** at the current frequency
Mer./Par	This is the selected **Meridian** or **Parallel** .

File Menu

This accesses **File** management, **Printing**, and the **Speaker Base Options** Window.

New Speaker

This creates a new **Speaker Model** using data supplied by the user.

Shortcut: Ctrl+N

To use this command:

1. Left Click on **New Speaker**. This opens a graphics window.

2. Left click on **Save As**. to open a **File Save** Window.

3. Choose a folder for the new **Speaker Model**, enter a **Filename** for the new **Speaker Model,** and Left click **OK**.

Open Speaker

This opens EASE 3.0 , 4.x **Speaker Models** for viewing and editing.

Shortcut: Ctrl+O

To use this command:

1. Left click on **Open Speaker**. This opens the **Open File** Window.

2. Use **Look In** to find the folder holding the **Speaker Model Fil**e and Left click on the **Speaker Model Filename**.

3. Left click on the **Open** button.

New Cluster

This begins the process of creating a **New Cluster**, i.e. the new balloon is been calculated for the farfield and rescaled to 1 m or 4 ft.To use this command:

1. Left Click on **New Cluster**. The **Room Editor** will open. The process of adding a **Cluster** takes place in the **Room Editor,** including all of the steps which follow.

2. If a project is open that holds the **Loudspeakers** to be **Clustered**, choose them (i.e. activate them). If the **Loudspeakers** to be clustered are not in the **Room Editor**, add them in **Room Editor** using **Insert Loudspeaker**.

3. Make sure data is checked using **Check Data** in the **Edit Menu**.

4. Left click on Insert / **Recompute Cluster.** This opens the **Cluster Options** window**.**
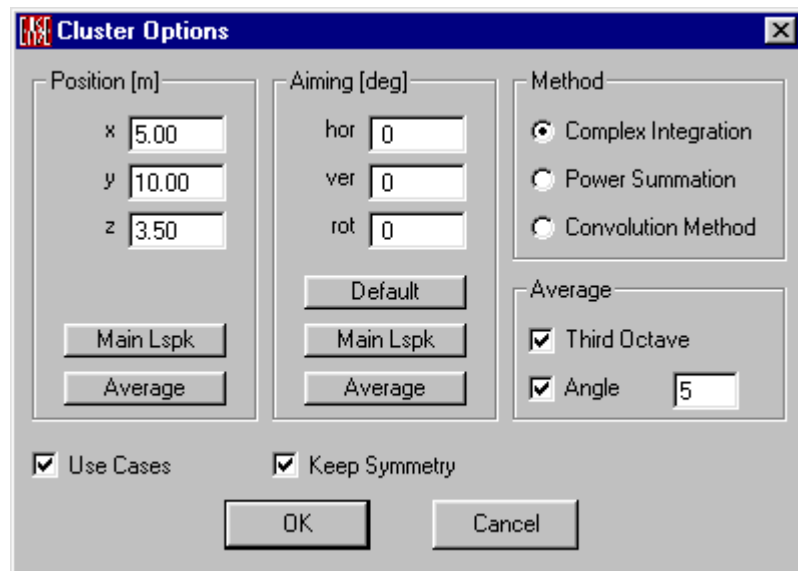
5. The **Position** is the desired resultant new point of reference (POR) of the **Cluster**.

    a. If **Average** is selected, **Position** shows the average location of the PORs of the **Active Loudspeakers**.

    b. If **Main Lspk** is selected, a window will open allowing the selection of a **Loudspeaker**. The POR **Position** is then set to the position of the chosen **Loudspeaker**.

6. This **Aiming** is the resultant direction of the maximum SPL of the cluster.

   a. If **Average** is selected, **Aiming** shows the average direction of the active loudspeakers.

   b. If **Main Lspk** is selected, a window will open allowing the selection of a loudspeaker. The **Aiming** direction is then set to the direction of the chosen **Loudspeaker**.

7. **Method:** Select the formula used to calculate the cluster balloon:

   a. **Complex Integration**: This uses complex interference to calculate the new directivity balloon.

   b. **Power Summation**: This uses simple energy addition to calculate the cluster balloon.

   c. **Convolution Method**: This simplified approximation uses formulae developed by Mark Ureda.

8. **Average**: This allows selection of the method that mathematically smoothes the cluster balloon:

   a. **Third Octave** averages the energy over the frequency bandwidth of 1/3 octave.

   b. **Angle** averages the energy over the angle chosen.

9. **Use Cases**: This command allows the use of the **Active Loudspeaker Cases** to construct the **Case** of the new **Cluster Speaker Model**. When used in the room the **Cluster Case** will appear as all of the individual **Loudspeaker Cases** but the single **Cluster Loudspeaker** will be used to compute acoustic performance.

10. **Keep Symmetry**: This **Keeps Symmetry** of the cluster balloon if the **Active Loudspeakers** are arranged symmetrically and the **Speaker Models** (cases, balloons) are **Symmetric**.

11. Left click on **OK**.

12. This will open a **Save File** window. Select path and filename for new **Cluster Speaker Model**. Left click on **Save**.

13. The **Busy** window will open, indicating it is calculating the balloon of the new cluster.

14. The next window will ask **"Replace Active Loudspeakers?"**

15. Left click on **Yes** to replace the **Active Loudspeakers** by the new **Cluster Loudspeaker.**

16. The next window will ask **"Show Balloon?"** Left click on **Yes** to render the computed **Cluster Balloon.**

Open Cluster

This opens EASE 3.0, 4.x **Clusters** for viewing and editing. Note: EASE **Cluster** data will look a lot like a single **Speaker Model**, but "behind the scenes," EASE keeps track of the individual **Loudspeakers** and **Speaker Models** that make up the **Cluster**. In all calculations, however, the **Cluster** will be used. To Open a Cluster:

1. Left click on **Open Cluster**. This will open the **Open File** window.

2. Use **Look In** to find the folder holding the **Cluster Fil**e, left click on the **Cluster Filename**, and left click on **Open.**

Load EASE Balloon Mapping (DLL/GLL Only)

You can load an EASE Balloon Mapping file (*.ebm) into the speaker base to show directivity index, coverage, frequency response and also the 3D balloon properties.

Save EASE Balloon Mapping (DLL/GLL Only)

After calculating a balloon for a speaker DLL (in a fixed distance and a fixed frequency resolution) you are able to save this file for later post processing.

Save Speaker (Not for DLL/GLL)

This saves the current **Speaker Model** data to the current .SPK file. The file contains **Balloon**, **Level** and **Case** outline data. In child mode this causes **EASE Speaker Base** to reload.

Shortcut: Ctrl+S

Save Speaker As (Not for DLL/GLL)

This saves the current **Speaker Model** to a new **.SPK Filename**. This allows different versions of the same speaker.

Shortcut: Ctrl+A

To use the command:

1. Left click on **Save Speaker As** to open a **Save File** window.

2. Use **Save In** to select a folder, enter the new **Filename** in the **File** window, and Left click on **Save**.

Install Loudspeaker Array

This installs an EASE Loudspeaker Array file (*.fla or *.zip) for use in a running project. This array file was previously saved under Project Data using the object routines to hold the components of an array in one file.

To use this command:

1. Left click on **Install Loudspeaker Array**. This opens the **Install EASE Loudspeaker Array** Window.

2. Use **Look In** to find the folder holding the **Array File** and Left click on the **Array Filename**.

3. Left click on the **Open** button.

Import ASCII

This imports **Comma And Quotes Delimited** files saved by spreadsheet programs, allowing automatic entry of properly formatted data. For an example, see the …Easepath\Examples_ASCII\Speakers folder. To use this command:

1. Left click on **Import ASCII** to open an **Open File** window.

2. Use the **Look In** window to find the folder holding the import file, Left click on the ASCII filename (.**XHN**) to **Import,** and Left click on **Open** button.

Import Impulse Response (Not for DLL/GLL)

 This allows to enter data stored as Impulse Responses in time-domain files. EASE will extract complex data (magnitude and phase) automatically and when it is finished, will ask whether or not to check the 'Use Phase Data'

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checkbox in the 'Speaker Model' dialog. The file formats supported by EASE are:

1. The .TIM format used by the program MLSSA from DRA Laboratories (www.mlssa.com). This format allows data measured at 5° increments for a quarter, half or full sphere. EASE currently will create a data set with 1/3 octave resolution.

2. Impulse Responses stored as standard .WAV files (i.e. TEF20 MLS files). This format allows data measured at 5° increments for a quarter, half or full sphere. EASE currently will create a data set with 1/3 octave resolution.

To use this command:

1. Left click on **Import Impulse Response** to open an **Open File** window.

2. Select Sub-TAB for single direction or balloon import

3. Select Path and file format to find the folder holding the import file(s),

4. Left click on the filename (.WAV or .TIM) to Import, and Left click on Set button to finish the Import.

See also Import Impulse Response Window**.**

Convert EASE 2.1 Catalog

This **Converts** and **Imports** selected **Speaker Models** from an EASE 2.1 manufacturer or project **Catalog (.LSP) File**. Note: All **Imported Speaker Models** are marked "**Not Authorized.**"
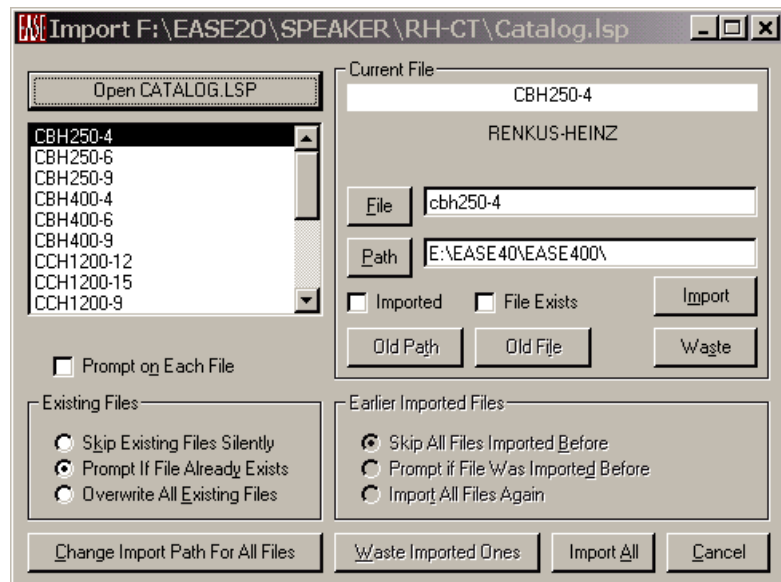
Open CATALOG.LSP

This opens an Open File Window. Browse to find the desired **CATALOG (.LSP) File,** Left click to select it, and Left click Open.

Speaker Model List Window

This window lists the **Speaker Models** in the selected CATALOG.LSP. When the window opens, the first file will be highlighted and listed in the **Current File** field.

Current File

This is the file selected in the **Speaker Model** List Window. The **Manufacturer's Name** will be listed below the window.

File

This Filename will be used for EASE 4.4 **Speaker Model** data. Left click **File** to use the EASE 2.1 **Speaker Model**, or type a new name in the data window.

Path

This Path will be used for EASE 4.4 **Speaker Model** data. Accept the path shown,, Left click on **Path** button to browse for a new path, or type a new path. *Note: This changes the Path only for the current selected Speaker Model. To change the **Path** for all **Speaker Models**, use **Change Destination Path for All Files**.*

Imported

A check mark indicates an **Imported Speaker Model** with that name is already in the **Global Database**.

File Exists

A check mark for **File Exists** indicates a **Speaker Model** with that name is already in the **Global Database**.

Import

Left click on **Import** immediately saves the selected **Speaker Model** to the file name and path.

Prompt on Each File

If checked, EASE will ask before Importing Each File.

Old Path

If **Imported** or **File Exists** are checked, Left click on **Old Path** will **Import** the current **Speaker Model** to the **Path** where its EASE 2.1 data is located.

Old File

If **Imported** or **File Exists** are checked, Left click on **Old File** will **Import** the current **Speaker Model** to the **Path** where its EASE 2.1 data is located and use the **Speaker Model** as a filename.

Waste

Left click to remove the selected **Speaker Model** from the import list.

Existing Files

This selects the criteria for file replacement. **Skip Existing Files Silently** will automatically not overwrite existing files. **Prompt If File Already Exists** will

ask before overwriting. **Overwrite All Existing Files** will not ask and will
Overwrite.

Earlier Imported Files

This selects criteria for overwriting previously imported **Speaker Models**. **Skip
All Files Imported Before** will not **Import** a **Speaker Model** already Imported.
Prompt if File Was Imported Before asks whether to overwrite a previously
Imported Speaker Model. Import All Files Again converts the selected
Speaker Models and overwrites existing files**.**

Change Import Path for All Files

This opens a Browse Window to select a path for all **Speaker Models**.

Waste Imported Ones

Left click to remove **Speaker Models** from the import list that already exist in
the **Global** database.

Import All

Left click to **Import All Speaker Models** in the selected CATALOG.LSP
according to the settings of the options.

Cancel

Left click **Cancel** to stop all **Import** operations and close the window.

See **Import/Export** for detailed information.

Send Picture To

This sends the current picture to the Clipboard**,** a File**,** or EASE Page Designer**.**

Clipboard

This copies the current picture to the **Windows Clipboard.**

File Location

This saves the picture to a file. Supported formats are:

> Windows Bitmap……………………………*.BMP
>
> JPEG…………………………………………*.JPG
>
> CompuServe GIF……………………………*.GIF
>
> Portable Network Graphics……………….*.PNG
>
> Tagged File Format………………………..*.TIF
>
> LuRa Tech Wavelet………………………*.LWF
>
> Zsoft Paintbrush……………………….…*.PCX
>
> Windows Icon………………………………*.ICO
>
> Enhanced Windows Metafile………………*.EMF
>
> Truevision Targa……………………………*.TGA.

EASE Page Designer

This opens the current picture in **EASE Page Designer,** allowing text annotations, multiple picture layouts, and editing of the page layout format before printing or use in printed reports and presentations.

Print

This prints the current window without the window frame, e.g. without the command buttons and scroll bars

Options

This opens the Options Window to view and set parameters for **Speaker Base**.

Shortcut: F9

Modify Toolbar

This opens a window for modification and construction of toolbars. Buttons and commands may be added or subtracted as needed.

Exit

This exits **Speaker Base**.

Edit Menu (Not for DLL/GLL)

This menu accesses **Speaker Model** data in graphic or tabular form.

Speaker Model

This views and edits the **Speaker Model** name/number, **Manufacturer** name, data **Symmetry** status, and whether **Phase Data** is to be **Used** in calculations. This window views, but does not edit, the reference point position, the status of data checking for symmetry, and the authorization status. The reference point value can be edited in **Edit Case Data**. **Authorized** means that the data been provided by the manufacturer.

See Speaker Model Window

Speaker Data

This window allows editing the **Speaker Model's** electrical properties and the 3, 6, and 9 dB coverage cones. Left click on **Compute Cones** to compute the cones from the **Attenuation Data**.

Shortcut: F4

See Speaker Data Window.

Attenuation Data

This accesses **Speaker Model** amplitude directional data in tabular form (in 2664 fields you have to enter 2522 measuring values or import them with File / Import ASCII). See Attenuation Data Window

Phase Data

This accesses data for** Speaker Model **phase response versus direction in tabular form (in 2664 fields you have to enter 2522 measuring values or imported with File / Import ASCII). See Compute Elliptic Lobe

Left click accepts only a single **Horizontal Polar** and a single **Vertical Polar** as data. Speaker Base then estimates all other data points using an **Elliptical Lobe** calculation, overwriting all other data with the **Elliptical Lobe** estimate. You have to enter the following way:

Symmetrical Lobes: 0°, 90° and 270° columns for left side, right side is symmetrical (180° will be overwritten).

Asymmetrical Lobes: 0°, 90°, 180°, 270° columns for interpolation of quarters.

Save and Exit

This saves **Attenuation Data** and closes the **Attenuation Data** Window.

Apply

This applies current **Attenuation Data** but does not **Save** it, thus allowing it to be used in a calculation.

Exit

This **Exits** the **Attenuation Data** Window without saving data.

Phase Data Window

Modify

This menu allows to post-process imported balloon data.

Mirror

This command mirrors one half of the balloon data to the other half. This option is particularly useful if the loudspeaker directivity pattern is symmetrical and only the half balloon was measured and imported.

Rotate

This command rotates the balloon data around the loudspeaker axis. This is often useful if the balloon measurements have been started at an angle that does not coincide with the starting angle assumed by EASE during the data import.

Disable Backside

This command is used to create data balloons for flush-mounted loudspeakers (ceiling or wall speakers) for which the backside of the balloon is disregarded. Data for these loudspeakers is normally only measured and imported for the front hemisphere, so the back hemisphere can be set to high attenuation values using the command.

Case

This opens the project data module in case editing mode. See also **Edit Case Data.**

Cluster

This opens the project data module in cluster editing mode. See also **Edit Cluster Data.**

Text File

Left click opens an ASCII (.TXT) file having the same path and filename as the current **Speaker Model** in a basic text editor. This file can be used by manufacturers and users to provide specifications or applications information about the **Speaker Model**.

View Menu

This menu allows access to all viewing tools.

View Data

This allows viewing of specific data selected. For DLL's and GLL's the only available options are Text file, PDF File and Bitmap.

Speaker Model

This views the **Speaker Model** name/number, **Manufacturer** name, data **Symmetry** status, whether **Phase Data** is to be **Used** in calculations, the reference point during measurement, the **Data Checked** status for symmetry, and **Authorization** status. The reference point position value can be edited in **Edit Case Data**. **Authorized** means that the data was provided by the manufacturer.

Speaker Data

This views the electrical properties of the **Speaker Model** and the 3, 6, and 9 dB coverage cones.

Shortcut: F4

Attenuation Data

This views the table of **Speaker Model** amplitude response as a function of spherical angle.

Phase Data

This views the table of **Speaker Model** phase response as a function of spherical angle.

Cluster Info

This views information about a **Cluster**.

Case

This opens the project data module in **Case** viewing mode.

Cluster

This opens the project data module in **Cluster** viewing mode.

Text File

Left click opens an ASCII (.TXT) file having the same path and filename as the current **Speaker Model** in a basic text editor. This file can be used by manufacturers and users to provide specifications or applications or other information about the **Speaker Model**.

PDF File

Left click opens a **PDF**-Reader or Editor to view a **Speaker Model .PDF** file having the same path and filename as the current **Speaker Model**. When this command is used for the first time the program will ask for the path and the

filename of the **PDF**-viewer/editor. Note: PDF files are an optional feature that may not be present for all **Speaker Models**.

Bitmap

Left click opens a bitmap (.BMP) file with the same path and filename as the **Speaker Model**. Note: .BMP files are an optional feature that may not be present for all **Speaker Models**.

3D Perspective

This command has four preset angles, e.g. (60 deg X –30 deg). This displays the object isometrically.

Side View (x)

This displays the object in the YZ-Domain. This is otherwise known as the X-View.

End View (y)

This displays the object in the XZ-Domain. This is otherwise known as the Y-View.

Plan View (z)

This displays the object in the XY-Domain. This is otherwise known as the Z-View.

Redraw

This forces a drawing update.

Full View

This forces the drawing to fit the window to a fixed tolerance and causes immediate redraw.

Zoom In

This increases the zoom percentage. This can also be accessed using PgUp or F11.

Zoom Out

This decreases the zoom percentage. This can also be accessed using PgDn or F12.

Frequency Band

This opens a popup menu allowing the selection of the frequency to be used for the drawing. The frequency resolution of the program is 1/3 octave starting at 100 Hz and ending at 10 kHz.

Select Balloon Meridian

This selects and highlights a meridian for viewing the balloon, allowing investigations of angles other than 0° and 90°.

0°

Left click selects the 0° meridian (half of the horizontal polar).

45°

Left click selects the 45° meridian.

90°

Left click selects the 90° meridian (top half of half of the vertical polar).

135°

Left click selects the 135° meridian.

180°

This selects the 180° meridian (half of the horizontal polar).

225°

Left click selects the 225° meridian.

270°

Left click selects the 270° meridian (bottom half of the vertical polar).

315°

Left click selects the 315° meridian.

Next

Left click selects the meridian 45° higher in angle.

Shortcut: Ctrl + M

Previous

Left click selects the meridian 45°lower in angle.

None

Left click deselects all meridians.

Select Balloon Parallel

This selects and highlights a parallel for viewing the **Balloon**, allowing investigations of angles other than 0° and 90°.

45°

Left click selects the 45° parallel.

90°

Left click selects the 90° parallel.

135°

Left click selects the 135° parallel.

Next

Left selects the next parallel moving up 45° in angle.

Shortcut: Ctrl + P

Previous

Left click selects the next parallel moving down 45° in angle.

None

Left click deselects all parallels.

Graphs Menu

This menu allows graphical representation of speaker parameters including coverage, power and other electrical properties.

Frequency Response

Left click displays **Speaker Model Attenuation** data at 12 off-axis angles and one-third octave frequency bands. In the **Settings** window, select the degree increment and select from positive and/or negative horizontal or vertical responses. This data answers the question, "if the system is tuned 'flat' on axis, how will it sound at some off-axis location?"

Directivity

Left click graphs the on axis **Directivity Index** DI by one-third octave frequency band.

Q Factor

Left click graphs the on axis **Q factor** by one-third octave frequency band.

Sensitivity

Left click graphs on-axis **Sensitivity** by one-third octave frequency band.

Max. Power

Left click graphs **indicated Rated Power** for each one-third octave frequency band, with only that band being driven by pink noise. This power is used as maximum power during the simulation.

Max. SPL

Left click graphs the sound pressure level for the maximum power used for each one-third octave band at 1m distance, when only one one-third octave band is driven at a time by pink noise.

Polars

These selections display various polar graphs.

2D

Left click shows horizontal and vertical polar graphs of the attenuation in a selected frequency band.

3D Horizontal

This shows a horizontal polar graph of attenuation in all frequency bands with the current frequency band highlighted in yellow.

3D Vertical

This shows a vertical polar graph of attenuation in all frequency bands with the current frequency band highlighted in yellow.

Polar Coverage

This shows a polar graph of the 3,6,9-dB coverage lines.

Cartesian Coverage

This shows the 3,6,9-dB coverage lines in a x-y coordinate domain.

Coverage Lines

This toggles the display of coverage lines vs. angle.

3 dB

A check here displays the 3dB coverage line.

6 dB

A check here displays the 6dB coverage line.

9 dB

A check here displays the 9dB coverage line.

All

A check here displays all three coverage lines.

Attenuation Balloon

This displays the **Magnitude** of the **Speaker Model's** directional response as a wire frame 3D balloon.

Shortcut: Ctrl B

Phase Balloon (Not for DLL/GLL)

This displays the **Phase** of the **Speaker Model's** directional response as a wire frame 3D balloon.

Mapping Menu

This menu accesses rendered views of the **Speaker Model's** directivity.

Attenuation Map

Left click opens a polar response map in the **Draw Balloon** module. See **EASE Balloon.**

Render Balloon

Left click opens the **Directivity Balloon** in the **Draw Balloon** module. See **EASE Balloon.**

x – Plane Map (DLL/GLL Only)

Shows longitudinal direct sound propagation in the vertical domain along a virtual plane.

y – Plane Map (DLL/GLL Only)

Shows transversal direct sound propagation in the vertical domain along a virtual plane.

z – Plane Map (DLL/GLL Only)

Shows longitudinal direct sound propagation in the horizontal domain along a virtual plane.

Calculation Menu (DLL/GLL Only)

Allows calculating the distance depending propagation properties of a speaker DLL or GLL.

Compute Direct SPL

Calculates the distance depending propagation properties of a speaker DLL or GLL, see the Calculation Setup Window (for Speaker DLL/GLL only).

Utilities Menu

This accesses the **Spin** function.

Spin

This starts the **Spin** function. The rendered balloon is rotated at a rate set on the **Options** menu.

Mouse Menu

This menu sets the functional mode of the **Mouse**.

Pick

A check mark enables the **Pick** mode, so that a left click will select a response curve or other displayed item.

Center

A check mark enables **Center** mode, so that a left click at a point pans the display to center that point in the window.

Drag

A check will enables **Drag** mode, so that left mouse button can drag the graph around the window. RMB aborts the action.

Track

A check mark enables track mode, which functions like a "rotational Drag mode." Left click on a point on the balloon to turn, then hold the LMB and move the mouse to where that point should be rotated.

Zoom In

A check enables Zoom In mode. To **Zoom In**, left click on where one corner of the new zoom window should be and hold the LMB while dragging to the opposite corner of the new window. When the LMB is released the zoom will activate.

Zoom Out

A check enables **Zoom Out** mode. To **Zoom Out**, left click on the part of the screen where one corner of the new zoom window should be and hold the LMB while dragging to the point on the screen where the current window should fit into. When the LMB is released the zoom will activate.

Share Menu

This function allows different windows to automatically share selected setup parameters. In general, those parameters that can be displayed in the status bar for a window will be **Shared** if set to do so.

Frequency

When checked, **Frequency** is a common viewing parameter.

Horizontal Angle

When checked, the **Horizontal Angle** is a common viewing parameter.

Vertical Angle

When checked, the **Vertical Angle** is a common viewing parameter.

Window Menu

This menu sets the display layout for **Speaker Base**.

Screen Quarter

This allows placement of the active window into any of 5 positions.

Center

This places the open window in the center of the screen.

Upper Left

This places the open window in the upper left corner of the screen.

Upper Right

This places the open window in the upper right corner of the screen.

Lower Left

This places the open window in the lower left corner of the screen.

Lower Right

This places the open window in the lower right corner of the screen.

Cascade Windows

This makes all open windows appear in a stacked format.

Help Menu

This menu allows access to all forms of help.

Help Topics

This offers a list of commonly asked help subjects. We have made a concerted effort to develop the Help files and the manual together. If you need an answer as to what a particular command does go to the help files. You will likely find your answer there.

About

This displays information about your EASE program.

Memory Used

This tests and dynamically displays the computer memory actually used.

RMB Menu

Lock Coverage

A check mark locks the selected scale of the **Coverage Lines** in **Polar** or **Cartesian** displays.

Options

This opens the Options Window to view and set parameters for **Speaker Base**.

Shortcut: F9

Speaker Model Window

This views and edits the **Speaker Model** name/number, **Manufacturer's** name, data **Symmetry** status, and whether **Phase Data** is to be **Used** in calculations. This window views, but does not edit, the Point of Reference (POR), the status of data checking for symmetry, and authorization status. The POR value can be edited in **Edit Case Data**. **Authorized** means that the data been provided by the manufacturer.

Speaker Model

This ASCII data field is intended for the **Speaker Model** Name/Number. To edit, type in the field.

Manufacturer

This ASCII data field is used to identify the **Speaker Model Manufacturer**. To edit, type in the field.

Symmetric

A check mark sets **Symmetry** on for directivity data.

Use Phase Data

A check mark enables the use of phase data in the EASE calculations.

Details

Left click to expose or hide the **Speaker Model Symmetry** and **Data Good** table. The first column shows the one-third octave frequency bands defined by the program. In the **Band** column, **Good** indicates the **Speaker Model** can be used in this frequency in the EASE model. The **Coverage Line** column indicates symmetrical or asymmetrical 3,6,9 dB Coverage. The **Balloon** column indicates symmetrical or asymmetrical attenuation. The **Phase** column indicates symmetrical or asymmetrical phase response.

Point Of Reference

This is the offset of the Speaker Case Origin to the Reference Point of the loudspeaker. This point of reference is the point of rotation used for the measurement of the loudspeaker data and must be published by the manufacturer. The Speaker Case Origin is a convenient location on the device used as a reference for the insertion location of the device. EASE uses the Point of Reference for all of it's acoustic calculations. The default values are 0,0,0, t.e. the Reference Point is the Speaker Case Origin.

Authorized

Yes indicates that the data has been checked by the Manufacturer and has been **Authorized** as valid data by the Manufacturer. Any changes to this data after authorization will show a **No** and will display a question mark (means: "Speaker data not authorized") in the mapped data.

Date and Version

This is data provided by the manufacturer.

Checked

This displays the **Checked Status** of the **Speaker Model**. An asymmetrical case will cause the **Speaker Model** to fail **Check Data** when mixed with a **Symmetric Speaker Model**. Symmetry is defined as having **Symmetric** check marked or vice versa.

Check Speaker

Left click on **Check Speaker** will check for correlation of **Symmetric Speaker Case** and **Symmetric Data**. Conditions:

- Check speaker runs in all cases, even if speaker data symmetry is different than speaker case symmetry

- In an nonsymmetric room model all kinds of speaker symmetry are allowed.

- In a symmetric room model only symmetric speaker data are allowed. Only symmetric cases are shown, otherwise the symbol sign pops up instead.

OK

Left click to accept all changes to **Speaker Model** data and close the **Speaker Model** window.

Speaker Data Window

This window views and edits electrical properties and coverage cone data of the **Speaker Model**.
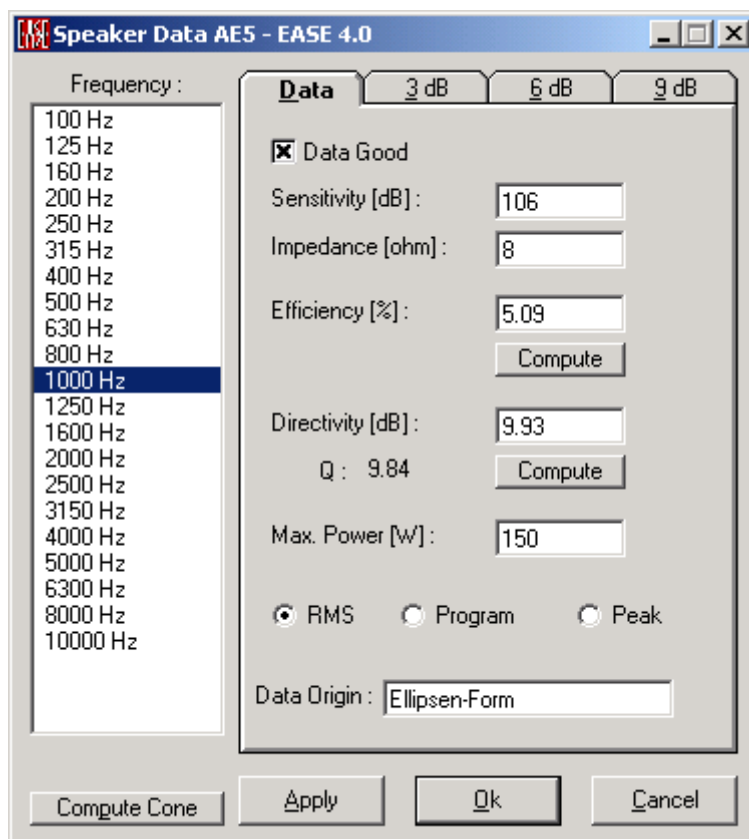
Frequency

Left click selects the one-third octave band to be edited or displayed.

Compute Cone

Left click **computes Coverage Cones** from current **Attenuation Balloon Data** at the selected frequency. The results are shown under the 3, 6, 9 dB tabs.

Apply

This **Applies** all current data and leaves the **Speaker Data** window open.

OK

This **Applies** all current data and closes the **Speaker Data** Window.

Cancel

This abandons all changes not **Applied** and closes the **Speaker Data** window.

Data Tab

This tab holds all electrical and acoustical data for the **Speaker Model** that is not **Balloon** data.

Data Good

A check mark indicates this data can be used for this **Speaker Model** in this frequency band. For example, a mid/high box rated for use from 500 Hz to 15KHz would have no **Data Good** check marks below 500 Hz and this **Speaker Model's** data would not be used in calculations below 500 Hz.

Sensitivity

This is the **Speaker Model's Sensitivity** in the selected one-third octave band in dBSPL for 1 watt of pink noise at 1 meter.

Impedance

This is the **Speaker Model's Impedance** averaged over the selected one-third octave band.

Efficiency

This is the **Speaker Model's Efficiency** averaged over the selected one-third octave band. **Speaker Base** calculates **Efficiency** from the data.

Compute

Left click will compute the **Efficiency** based on other data.

Directivity

This is the **Speaker Model's Directivity Index** ($10* \log_{10} Q$)at the selected frequency, where **Q** is the Axial Q (that is, the on-axis Q). [Q is the ratio of the SPL at a single point on the sphere divided by the average of the SPL integrated over the entire surface of the sphere.] **Speaker Base** can calculate **Directivity Index** and **Q** from the **Attenuation Balloon** data.

Compute

Left click causes **Speaker Base** to compute **Directivity** from the **Attenuation Balloon** data.

Max. Power

This is the **Speaker Model's** maximum rated power if driven by pink noise spectra limited to the selected one-third octave band.

You can use three radio buttons RMS, Program and Peak to indicate which power the manufacturer uses.

Data Origin

This indicates whether the **Attenuation Balloon** speaker data was measured and/or calculated. **Elliptical Lobe** indicates that spherical data was computed from data for only the horizontal and vertical rotation.

3/6/9 dB Tabs

These Tabs open tables for the 3, 6, and 9 dB coverage cones for viewing and editing. These tables can be entered directly or **EASE Speaker Base** can compute them from **Attenuation Balloon** data.

Chart

These coverage cones tables can be entered directly or **EASE Speaker Base** can compute them from **Attenuation Balloon** data.

Attenuation Data Window

This window opens **Attenuation Balloon** data tables for viewing, editing, and data entry. The left window selects the one-third octave frequency band. The right window holds the data.

Chart

The number at each position in this table is according to Ahnert/Steffen, page 88-89 /1/ the angular directivity gain at each spherical angle relative to the **Speaker Model's** directivity gain on axis, of course expressed in dB. This is nothing else than a three-dimensional polar plot. In effect, this normalizes all directional data to the on-axis directivity gain in each frequency band, and the numbers entered here can be thought of as attenuation. Negative values are not permitted.

The chart shows the polars in line values from 0 degrees to 180 degrees. 0 Degrees is on axis with the front of the speaker and 180 degrees is looking at the back of the speaker. This looks like a wedge or slice taken from an orange.

The column angles from 0 degrees to 355 degrees are taking the slice and tilting it. 0 degrees is the left half horizontal polar and 180 degrees is the right half of the horizontal polar. At 90 degrees the half of the polar we are seeing is the upper vertical and at 270 degrees we see the lower vertical half.

/1/ Ahnert, W., Steffen, F.: Sound Reinforcement Engineering E & FN Spon London 2000

Attenuation Data Menu

This menu accesses the estimation of data using an **Elliptical Lobe** calculation, and allows changes to be **Applied**, **Saved**, or abandoned.

Compute Elliptic Lobe

Left click accepts only a single **Horizontal Polar** and a single **Vertical Polar** as data. Speaker Base then estimates all other data points using an **Elliptical Lobe** calculation, overwriting all other data with the **Elliptical Lobe** estimate. You have to enter the following way:

Symmetrical Lobes: 0°, 90° and 270° columns for left side, right side is symmetrical (180° will be overwritten).

Asymmetrical Lobes: 0°, 90°, 180°, 270° columns for interpolation of quarters.

Save and Exit

This saves **Attenuation Data** and closes the **Attenuation Data** Window.

Apply

This applies current **Attenuation Data** but does not **Save** it, thus allowing it to be used in a calculation.

Exit

This **Exits** the **Attenuation Data** Window without saving data.

Phase Data Window

This window opens Attenuation Balloon Phase data tables for viewing, editing, and data entry. The left window selects the one-third octave frequency band. The right window holds the data.

Chart

The number at each position in this table is the **Measured Phase** Number at each spherical angle expressed in degrees. This allows entry of direct measurements of balloon phase data at each frequency.

You can see positive and negative numbers. No phase consideration, like in EASE 3.0 data, is expressed with Phase number = 0°.

The chart shows the polars in line values from 0 degrees to 180 degrees. 0 Degrees is on axis with the front of the speaker and 180 degrees is looking at the back of the speaker. This looks like a wedge or slice taken from an orange.

The column angles from 0 degrees to 355 degrees are taking the slice and tilting it. 0 degrees is the left ½ horizontal polar and 180 degrees is the right half of the horizontal polar. At 90 degrees the half of the polar we are seeing is the upper vertical and at 270 degrees we see the lower vertical half.

Phase Data Menu

This menu accesses the estimation of data using an **Elliptical Lobe** calculation, and allows changes to be **Applied, Saved**, or abandoned.

Compute Elliptic Lobe

Left click accepts only a single **Horizontal Polar** and a single **Vertical Polar** as data. Speaker Base then estimates all other data points using an **Elliptical Lobe** calculation, overwriting all other data with the **Elliptical Lobe** estimate.

Compute Minimum Phase

Left click computes by means of a Hilbert Transform **Phase Data** from **Attenuation Data** assuming that response is **Minimum Phase**.

Save and Exit

This saves the **Phase Data** and closes the **Phase Data** Window.

Apply

This applies current **Phase Data** but does not **Save** it, thus allowing it to be used in a calculation.

Exit

This **Exits** the **Phase Data** Window without saving data.

Options Window

This sets all **Options** for **EASE Speaker Base**. .
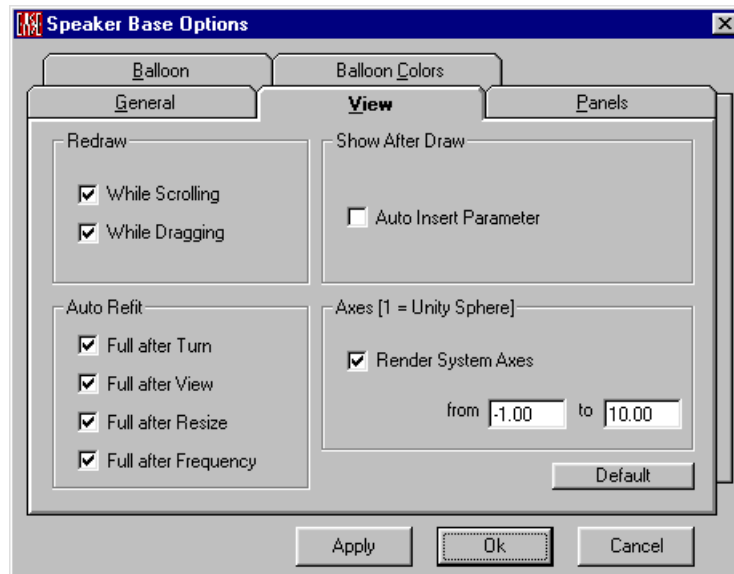
Apply

Left click **Applies** changes and keeps **Options** window open.

OK

Left click **Applies** changes and closes **Options** window.

Cancel

Left click Discards changes and closes **Options** window.

View Tab

This Tab sets basic display **Options** for graphics in **EASE Speaker Base**.

Redraw

While Scrolling

If checked, windows will be redrawn dynamically **While Scrolling**.

While Dragging

If checked, windows will be redrawn dynamically **While Dragging**.

Show after Draw

Allows launching actions after drawing

Auto Insert Parameter

If checked, a legend will be inserted in the upper left corner identifying the data in the display.

Auto Refit

Establishes the conditions under which the view will be automatically resized to fit the window.

Full after Turn

If checked, the view will be reset to full size after a turn.

Full after View

If checked, the view will be reset to full size after a change of view.

Full after Resize

If checked, the view will be reset to full size after a resize.

Full after Frequency

If checked, the view will be reset to full size after a change in frequency.

Axes [1 = Unity Sphere]

Establishes conditions for the rendering of **System Axes**.

Render System Axes

If checked, the **System Axes** will be displayed in **Speaker Base** graphics displays.

From / To Window

The dimensions entered here set the length of the rendered **System Axes**.

Default

Left click will reset **View** parameters to their default settings.

General Tab

The Tab sets Options for **Background Colors**, and for **Zooming** and **Spinning** the **Balloon** display.

Zoom Scope

This sets the zoom range in percent of full size.

Factor [%] Windows

These numbers set the zoom range as a percentage of full size.

Spinning

These parameters control the **Spinning** of the **Balloon** display.

Time Step [ms]

This sets how long the display stops at each step when **Spinning**.

Angle [deg]

This sets the **Angle** of balloon rotation for each step when **Spinning**.

Colors

This sets basic display colors.

Background / …

The color in the display box shows the background color for graphics displays. Left click on the color box or on the [**…**] button opens a color palette to choose a different color.

Graphs / …

The color in the display box shows the curve color in some graphs. Left click on the color box or on the […] button opens a color palette to choose a different color.

Grid / …

The color in the display box shows the curve color of the grids in some graphs. Left click on the color box or on the […] button opens a color palette to choose a different color.

Balloon Tab

This tab sets how the balloon should be displayed.
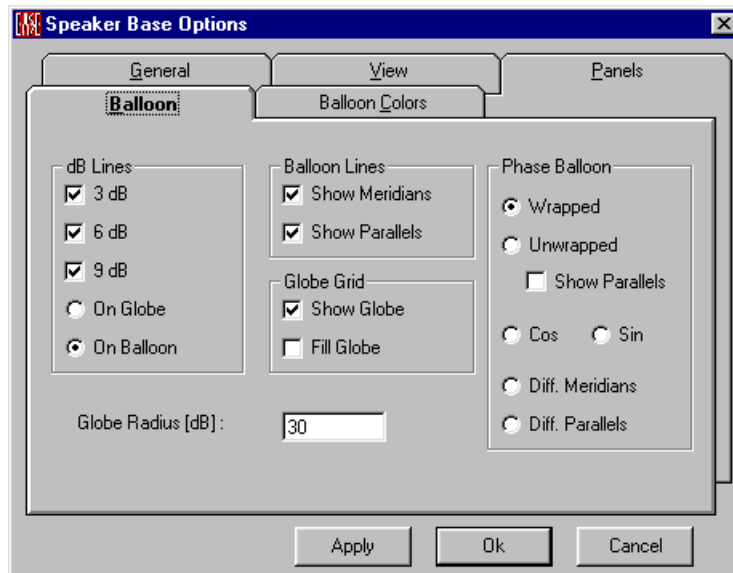
dB Lines

This area controls display of speaker directionality in **Graphs/Balloon**. Check marks enable the display of **3**, **6**, and **9** dB coverage lines. This speaker directionality can be displayed **On** the surface of the **Balloon** or **On** the surface of the **Globe**.

Globe Radius [dB] Window

This sets the amplitude scale for the **Globe**.

Balloon Lines

A check for **Show Meridians** displays longitudinal lines on the **Balloon**.

A check for **Show Parallels** displays latitudinal lines on the **Balloon**.

Globe Grid

A check for **Show Globe** displays globe grid lines.

A check for **Fill Globe** hides the rear lines on the globe.

Phase Balloon

These settings control how the **Phase Balloon** will be displayed.

Wrapped

If Checked, the Phase Balloon will show Phase Wrapping between +180 degrees and -180 degrees.

Unwrapped

If Checked, the Phase Balloon will show Phase Unwrapped. The origin is the max. positive phase number and outside are the negative ones.

Show Parallels

If Checked, Parallels will be shown on the Phase Balloon.

Cos

Here the phase will be cosine weighted to smooth jumps.

Sin

Here the phase will be sine weighted to smooth jumps.

Diff. Meridians

Here the phase will have a weighted derivative behavior along the meridians to smooth jumps.

Diff. Parallels

Here the phase will have a weighted derivative behavior along the parallels to smooth jumps.

Balloon Colors Tab
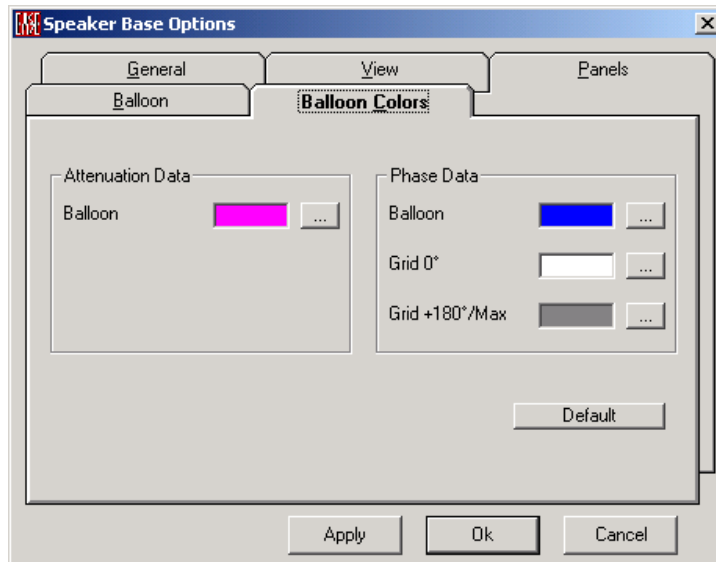
This Tab sets colors for display of **Balloon Data** in **Speaker Base**.

Attenuation Data

The color box shows the color assigned to Balloon Attenuation Data.

Balloon / …

The color box shows the color assigned to Balloon Attenuation Data. Left click in the color box on on the [. . .] button for a color palette the change the color assignment.

Phase Data

These settings control colors for the **Phase Balloon** display.

Balloon / …

The color box shows the color assigned to the **Phase Balloon's Data.** Left click in the color box on on the [. . .] button for a color palette the change the color assignment.

Grid 0 deg / …

The color box shows the color assigned to the **Phase Balloon's 0° Grid.** Left click in the color box on on the [. . .] button for a color palette the change the color assignment.

Grid + 180 deg / Max /…

The color box shows the color assigned to the **Phase Balloon's 180°** Grid or in the unwrapped form the max. balloon grid. Left click in the color box on on the [. . .] button for a color palette the change the color assignment.

Default

Left click to reset colors to their defaults.

Panels Tab

This tab selects the parameters displayed on the status bar at the bottom of the **Speaker Base** window.
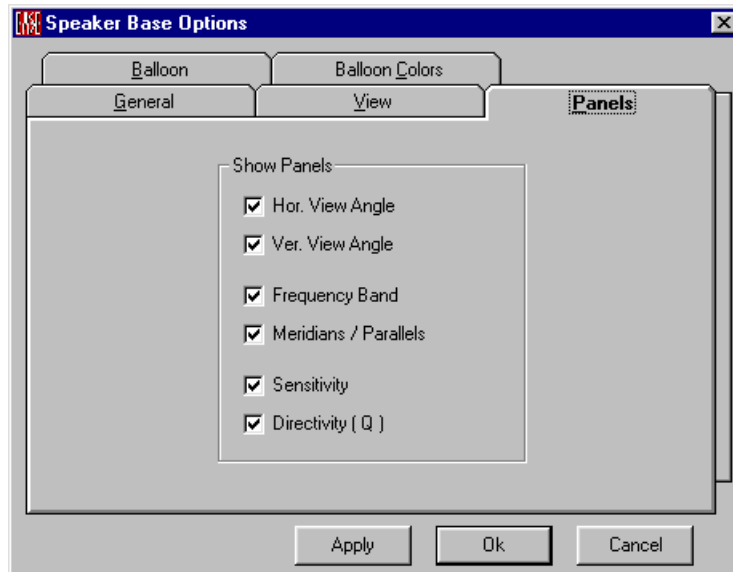
Show Panels

Hor. View Angle

If checked, Horizontal Viewing Angle will be displayed on the Status Bar.

Ver. View Angle

If checked, Vertical Viewing Angle will the displayed on the Status Bar.

Frequency Band

If checked, frequency band of the displayed data will be displayed on the Status Bar.

Meridians / Parallels

If checked, Meridians and Parallels that are set for display on the Balloon will be listed on the Status Bar.

Sensitivity

If checked, the **Speaker Model's Sensitivity** will be displayed on the Status Bar.

Directivity (Q)

If checked, the Axial Directivity Index and Axial Q will be displayed on the Status Bar.

Calculation Setup Window (for Speaker DLL/GLL only)

This window sets parameters for and begins a calculation of **Direct SPL** at a user specified distance from the **Speaker Model DLL or GLL**. When the calculation is complete, it will be rendered on the current display.

Calculation Tab
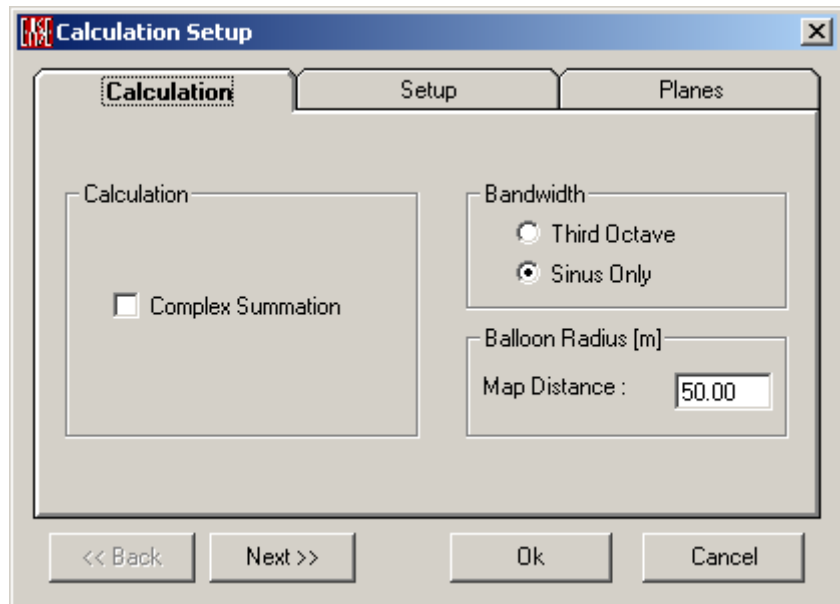
Calculation

This shows the calculation method.

Interference Sum

Is always checked for specific DLLs and GLLs, in this case the direct sound will be calculated in a manner that shows interference between **Loudspeaker components**. See Appendix A for a discussion of how this computation is made.

Bandwidth

Third Octave

If checked, calculations will be made for all one-third octave bands of white noise.

Sinus Only

If checked, calculations will be made for a single sine wave at the center frequency of all frequeny bands .

Balloon Radius [m or ft]

Map Distance: (length number)

This sets the distance at which Direct SPL will be computed.

Setup Tab

This shows constants to be used in the calculation.
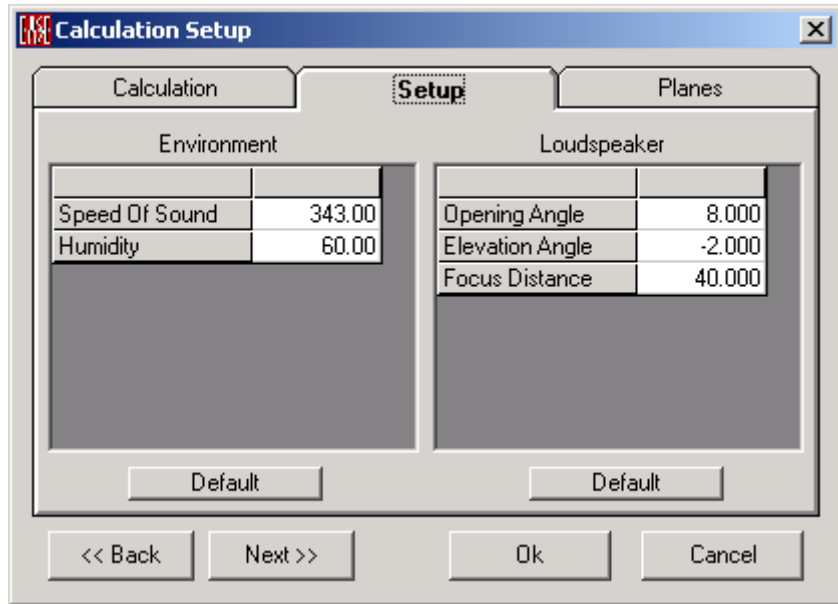
Environment

Speed of Sound

This shows the **Speed of Sound** in m/sec. Type in the window to change.

Humidity

This shows the Relative Humidity for the calculation. Type changes in the window.

Default

Sets the default values.

Loudspeaker

Setting parameter of the corresponding speaker DLL/GLL.

Default

Sets the default values.

Planes Tab

This shows dimension settings to be used in the calculation. Here virtual plane settings are selected to show the propagation behavior of the speaker DLL/GLL.
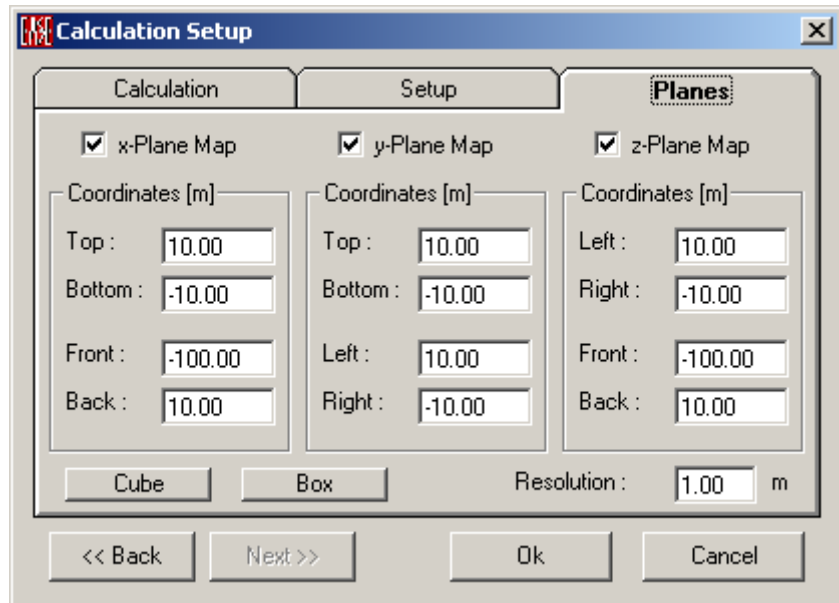
x, y, z coordinates can be entered to build virtual planes. Cube and Box entries help to build planes rapidly. Resolution is selectable.

<<Back

You go back to the previous Tab.

>>Next

You go on to the next Tab.

OK

Left click to accept parameters, begin the calculation, and close the **Calculation Setup** window.

Cancel

Left click to abandon the calculation and close the **Calculation Setup** window.

Import Impulse Response Window

Import Impulse Response (WAV, TIM, FRQ)

This option allows you to directly import measured impulse responses in time-domain files in a WAV format. It will also allow import of MLSSA TIM time-domain files and FRQ frequency domain files. This procedure automatically generates complex speaker data in the native resolution of EASE.

A file can be specified for a single direction angle as shown in the following dialog box:
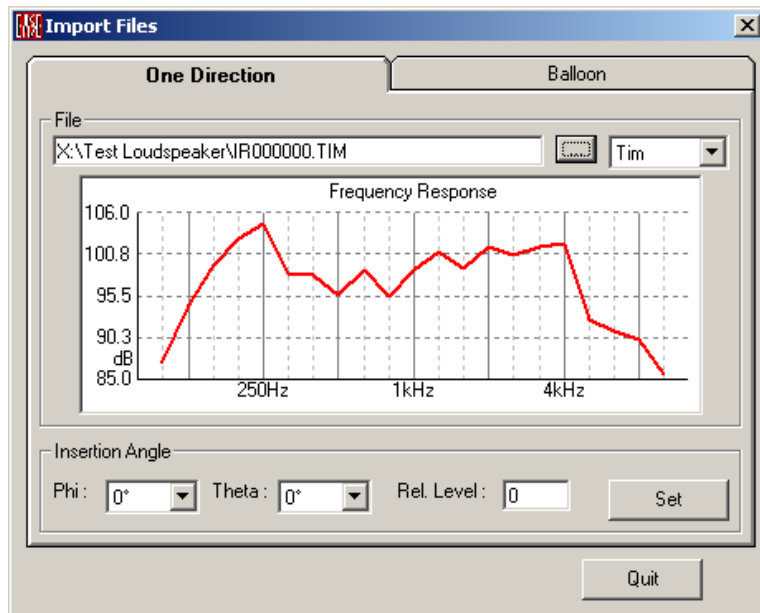
A file-naming mechanism has been created in order to minimize cross-platform issues with Operating Systems by limiting them to an 8.3 format. All IR wave files will be stored in the form 'IRppptttt.ext'.

ext is the placeholder for the file extension. WAV, TIM and FRQ are the valid extensions that should be used for standard wave files or MLSSA files, respectively.

ppp represents the 3 digit value from 0 to 355 for the angle of PHI (meridians). The horizontal polar consists of the values at 0° and, optionally, 180°. The vertical polar consists of the values at angle 90° and, optionally, 270°. When looking INTO the mouth of a horn (it is pointed at you), 0 degrees is to the right and increases in a counter-clockwise direction. (90° is to the top looking into the mouth of a horn.)

ttt represents the 3 digit value from 0 to 180 for the angle of THETA (parallels). 0 degrees is the on-axis aiming point.

All angle values are padded with zeroes to three places so that all file names are of a uniform length. In the future, this will also allow an angular resolution as fine as 1°.

Here is an example of the import of a full sphere data set:
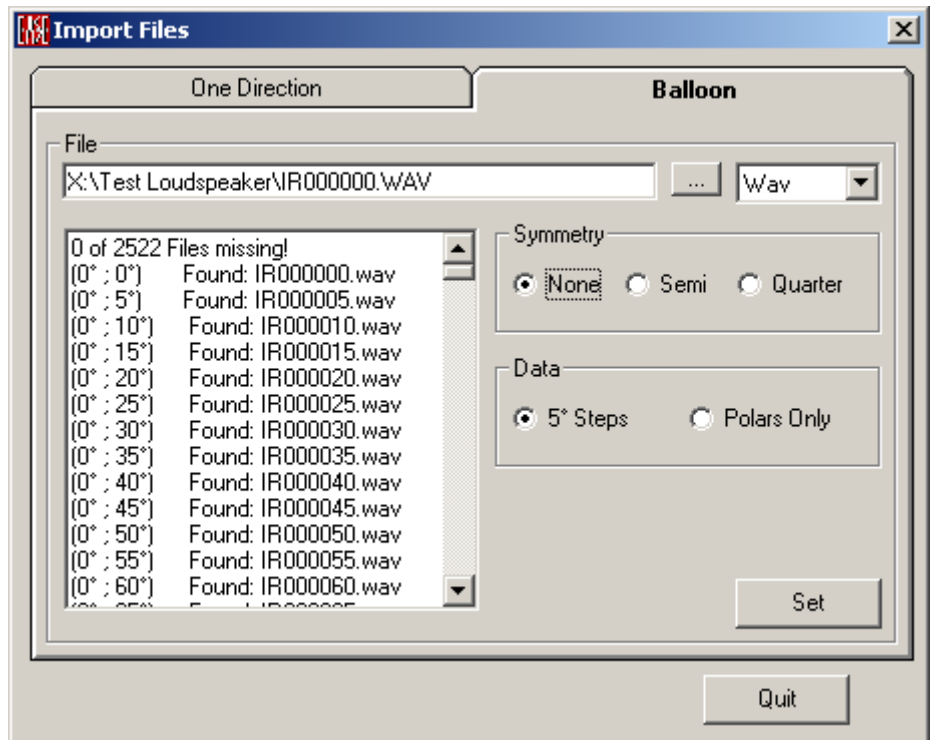
The Theta resolution is always 5°, consisting of 37 values from each meridian 0°-180°. The Data and Symmetry selections in the figure above refer to the number of Phi angles that are in the set. There are six possible file set sizes, three for polar only data and three for 5-degree data sets. From the smallest set to the largest they are defined as follows:

Polars Only - Full Symmetry (a Quarter Sphere of data)   72 files

IR000000.ext (1 file)

IR000005.ext - IR000175.ext (35 files)

IR090005.ext - IR090175.ext (35 files)

IR000180.ext (1 file)

Polars Only - Half Symmetry (a Half Sphere of data)   107 files

IR000000.ext (1 file)

IR000005.ext - IR000175.ext (35 files)

IR090005.ext - IR090175.ext (35 files)

IR270005.ext - IR270175.ext (35 files)

IR000180.ext (1 file)

Polars Only - No Symmetry (a Full Sphere of data) 142 files

IR000000.ext (1 file)

IR000005.ext - IR000175.ext (35 files)

IR090005.ext - IR090175.ext (35 files)

IR180005.ext - IR180175.ext (35 files)

IR270005.ext - IR270175.ext (35 files)

IR000180.ext (1 file)

5° Steps - Full Symmetry (a Quarter Sphere of data) 667 files

IR000000.ext (1 file)

IR000005.ext - IR085175.ext (630 files)

IR090005.ext - IR090175.ext (35 files)

IR000180.ext (1 file)

5° Steps - Half Symmetry (a Half Sphere of data)   1297 files

IR000000.ext (1 file)

IR000005.ext - IR085175.ext (630 files)

IR090005.ext - IR090175.ext (35 files)

IR270005.ext - IR355175.ext (630 files)

IR000180.ext (1 file)

5° Steps - No Symmetry (a Full Sphere of data)   2522 files

IR000000.ext (1 file)

IR000005.ext - IR085175.ext (630 files)

IR090005.ext - IR175175.ext (630 files)

IR180005.ext - IR265175.ext (630 files)

IR270005.ext - IR355175.ext (630 files)

IR000180.ext (1 file)

Note:

There is only one file each required for the Theta angles of 0° and 180°.

Data for the 1/3-octave bands for sensitivity and impedance from 100-10,000Hz should be stored in a text file with the extension 'txt'. The file name should be the filename used to designate the loudspeaker. It will be used as the filename for the Speaker Model in EASE. All the data for the other loudspeaker parameters can be stored in this text file. EASE will read the data it needs and ignore the rest. This file must conform to the DOS/Windows standard for text files. Each line must be terminated with a carriage return and line feed pair of characters.

Chapter XI : Ease Balloon

EASE Draw Balloon

EASE Draw Balloon is a **Rendering Module** for **Speaker Model Directional Data** and **HRTF** data. **Draw Balloon** has no editing capabilities. All editing of Speaker Data takes place in **EASE Speaker Base** and in **EASE Project Data.**

EASE Balloon Main Window

Key Conventions

F1	**Help**
F9	**Options**
F10	**Statusbar** settings
F11	Zoom In
F12	Zoom Out
D	Activates the Drag Function Mouse mode
P	Activates the Pick Function Mouse mode
x	x-View
y	y-View
z	z-View
3	3D-View
Home	Full View
Left Arrow	Moves the horizontal rotation scrollbar to the left
Right Arrow	Moves the horizontal rotation scrollbar to the right
Up Arrow	Moves the vertical rotation scrollbar upwards
Down Arrow	Moves the vertical rotation scrollbar downwards
PgUp	Zoom In
PgDn	Zoom Out

Ctrl+

O	**Load** EASE Balloon Mapping file

PgUp	**Frequency** +1/3 Octave
PgDn	**Frequency** –1/3 Octave

Shift+

C	Activates Fixed Center Mouse Mode

Mouse Conventions

RMB on background:	Window Color, Options Menu

Mouse Wheel

Mouse wheel spinning allows zooming in and out.

Statusbar Conventions

Mouse Mode	This is the operational mode of the mouse. This can be **Pick, Peek, Drag, Zoom In, Zoom Out** and **Center**.
Freq	This is the **Frequency** of the current display
Hor	This is the **Horizontal** angle of the directional balloon relative to the window. 0 degrees is in the –Y direction.
Ver	This is the **Vertical** angle of the directional balloon relative to the window. 0 degrees is horizontal.
Cursor	This is the **Cursor** position.
Value	This is the balloon value while using **Speaker View** and Mouse Mode **Peek**.

File Menu

This menu opens files, accesses **Print** functions and sets **Draw Balloon Options**.

Load EASE Balloon Mapping (standalone mode only)
Ctrl + O

You can load an EASE Balloon Mapping file (*.ebm) into the speaker balloon to show the 3D directivity balloon data.

Acquire EASE Balloon Mapping (child mode only)
Ctrl + O

You can update a recalculated EASE Balloon Mapping file (*.ebm) to show the new 3D directivity balloon data.

Save OpenGL File

This **Saves** an **OpenGL (.EGL) File** for the current display. An **OpenGL** file can be **Viewed** using **EASE View**, a standalone viewer that can be provided to clients. **EASE View** can be accessed from the menu **File | EASE Viewer** in EASE Main. To use this command:

3. Left click **Save OpenGL File** to open a **Save File** window.

4. Choose a folder for the **OpenGL** file, enter a file name, and Left click on **Save.**

OpenGL files are convenient for saving OpenGL views of the room or any maps calculated within the room with the capability of viewing them later from any point of view. These OpenGL files can be demonstrated e.g. for architects only just with the help of a demo version of EASE (includes already the EASE Viewer).

Send Picture To

This allows the current active picture to be sent to the Clipboard, a File, or **EASE Page Designer**.

Clipboard

This copies the current picture to the **Windows Clipboard.**

File Location

This saves the picture to a file. Supported formats are:

Windows Bitmap……………………………*.BMP

JPEG…………………………………………*.JPG

CompuServe GIF…………………………….*.GIF

Portable Network Graphics………………….*.PNG

Tagged File Format…………………………*.TIF

LuRa Tech Wavelet…………………………*.LWF

Zsoft Paintbrush……………………………..*.PCX

Windows Icon……………………………….*.ICO

Enhanced Windows Metafile……………….*.EMF

Truevision Targa…………………………….*.TGA.

EASE Page Designer

This opens the current picture in **EASE Page Designer,** allowing text annotations, multiple picture layouts, and editing of the page layout format before printing or use in printed reports and presentations.

Print

This prints the current window without the window frame, e.g. without the command buttons and scroll bars.

Options

This opens the **Fehler! Ungültiger Eigenverweis auf Textmarke.** to set parameters for **Draw Balloon**.

Shortcut: F9

Modify Toolbar

This opens a window for modification and construction of toolbars. Buttons and commands may be added or subtracted as needed.

Legend Colors

This opens the Legend Colors Window to set colors used in color-coded display rendered data.

Fast Open (standalone mode only)

This area of the menu stores the paths of the last opened **Speaker Models**. Left click opens the selected **Speaker Model** directly.

Exit

Left click exits EASE **Draw Balloo**n.

View Menu

This menu chooses between different views of **Directivity Balloon** data.

3D Perspective

This command has four preset angles, e.g. (60 deg X –30 deg). This displays the Balloon isometrically in external view. In **Speaker View** the viewpoint is the **Point of Origin (Insert Point of the speaker).**

Side View (x)

Left click displays the **Directivity Balloon** in the YZ-Domain (X-View) in **External View**. In **Speaker View** the viewpoint is the **Point of Origin** looking along the +X-axis.

End View (y)

Left click displays the **Directivity Balloon** looking along the y-axis (the aiming axis). When looking from outside the **Balloon**, this a "head on" view (i.e., looking straight at the **Speaker Model** from the aim point). **Speaker View** looks from the **Point of Origin** to the aim point.

Plan View (z)

Left click displays the **Directivity Balloon** looking along the z axis. From outside the **Balloon**, this looks down on the **Speaker Model**. **Speaker View** looks straight up from the **Point of Origin**.

Redraw

Left click **Redraws** the display.

Full View

When viewing from outside the **Balloon**, left click zooms to fill the window with the globe. In **Speaker View**, left click zooms to the default size.

Zoom In

Left click, PgUp, or F11 increases the zoom percentage in **External View**. In **Speaker View** the scope angle decreases.

Zoom Out

Left click, PgDn, or F12 decreases the zoom percentage in **External View**. In **Speaker View** the scope angle increases.

Frequency Band

Left click to select the 1/3 octave **Directivity Balloon** data for display.

Isoline Plot

Left click selects **Isoline** mapping and disables **Patch Grid**.

Patch Grid

Left click selects **Patch Grid** mapping and disables **Isoline Plot**.

Painted

Left click toggles the **Painting** of the mapping display with colors indicating value.

Labeled

Left click toggles the labeling function of the map.

Balloon Menu

This menu selects various views of **Speaker** or **Cluster** directional data.

Draw Balloon

Left click renders the **Directional Response** as a monochromatic 3-D balloon built from parallels and meridians.

Paint Balloon

Left click renders the **Directional Response** as a 3-D balloon with colors assigned by an **Attenuation** or **Phase** scale defined in the **File | Legend Colors** Window.

Paint Globe

Left click renders directional **Attenuation** or **Phase** data onto a sphere with colors assigned by an **Attenuation** or **Phase** scale defined in the **File | Legend Colors** Window.

Speaker View

Left click renders directional data from the viewpoint of the **Reference Point** of the **Speaker Model,** and painted with colors assigned by an **Attenuation** or **Phase** scale defined in the **File | Legend Colors** Window. The default view is looking toward the zero degree horizontal and vertical point (i.e., toward the aim point).

Balloon Mapping

Left click displays directional frequency dependant data as a rendered rectangular 3-D map with colors assigned by an **Attenuation** or **Phase** scale defined in the **File | Legend Colors** Window. Either **Patches** or **Isolines** may be displayed.

Hor. Attenuation

Left click renders the horizontal polar data as an attenuation map in 3-D by an **Attenuation** or **Phase** scale defined in the **File | Legend Colors** Window. Either **Patches** or **Isolines** may be displayed. The X axis is the angle in a 180 degree section from 90 to –90 degrees (Can be changed from 180 to –180 degrees in Options/Mapping/Draw Meridians/Show Full Parallel). The Y-axis is the Frequency and the Z is the attenuation level.

Ver. Attenuation

Left click renders the vertical polar data as an attenuation map in 3-D with colors assigned by an **Attenuation** or **Phase** scale defined in the **File | Legend Colors** Window. Either **Patches** or **Isolines** may be displayed. The X axis is the angle in a 180 degree section from 90 to –90 degrees (Can be changed from 180 to –180 degrees in Options/Mapping/Draw Meridians/Show Full Parallel). The Y-axis is the Frequency and the Z is the attenuation level.

Draw Parallels

Left click shows the balloon parallels on the surface of a rendered map versus angle (see Mapping Tab**Ver. Angle**).

Draw Meridians

Left click shows the balloon **Meridians** on the surface of the rendered map versus angle (see Mapping Tab). **Ver. Attenuation** (see above) is a special case for **Hor. Angle** = 90 degree and **Hor. Attenuation** (see above) is the special case for **Hor. Angle** = 0 degree.

x – Plane Map (DLL/GLL Only)

Shows longitudinal direct sound propagation in the vertical domain along a virtual plane.

y – Plane Map (DLL/GLL Only)

Shows transversal direct sound propagation in the vertical domain along a virtual plane.

z – Plane Map (DLL/GLL Only)

Shows longitudinal direct sound propagation in the horizontal domain along a virtual plane.

Mapping Menu

Attenuation Data

A check mark selects the display of **Attenuation Data.**

Phase Data (not with DLL/GLL Data)

A check mark selects the display of **Phase Response Data**.

Utilities Menu

Show Legend

Left click opens a separate **Legend Window** to show the color scale used for the mapping calculations and set in File / Legend Colors.

Insert Legend

Left click inserts the color scale used for mapping calculations (and set in File / Legend Colors) into the drawing for printing and presentations.

Insert Parameters

This inserts text annotations identifying the displayed data in the upper left corner of the picture for printing and presentations.

Spin

This starts the **Spin** function. The rendered balloon is rotated at a rate set on the **Options** menu.

Mouse Menu

This menu sets the functional mode of the **Mouse**.

Pick

A check mark enables the **Pick** mode, so that a left click will select a response curve or other displayed item.

Peek

A check mark enables viewing of the computed values at a picked spot while using **Speaker View**. The current value is displayed in the statusbar panel labeled **Value**.

Center

A check mark enables **Center** mode, so that a left click at a point pans the display to center that point in the window.

Drag

A check will enables **Drag** mode, so that left mouse button can drag the graph around the window. RMB aborts the action.

Zoom In

A check enables **Zoom In** mode. To **Zoom In**, left click on where one corner of the new zoom window should be and hold the LMB while dragging to the opposite corner of the new window. When the LMB is released the zoom will activate.

Zoom Out

A check enables **Zoom Out** mode. To **Zoom Out**, left click on the part of the screen where one corner of the new zoom window should be and hold the LMB while dragging to the point on the screen where the current window should fit into. When the LMB is released the zoom will activate.

Share Menu

This function allows different windows to automatically **Share** selected setup parameters. In general, those parameters that can be displayed in the status bar for a window will be **Shared** if set to do so.

Frequency

When checked, **Frequency** is a common viewing parameter.

Horizontal Angle

When checked, the **Horizontal Angle** is a common viewing parameter.

Vertical Angle

When checked, the **Vertical Angle** is a common viewing parameter.

Window Menu

This menu sets the screen layout for **Draw Balloon**.

Screen Quarter

This allows placement of the active window into any of 5 positions.

Center

This places the open window in the center of the screen.

Upper Left

This places the open window in the upper left corner of the screen.

Upper Right

This places the open window in the upper right corner of the screen.

Lower Left

This places the open window in the lower left corner of the screen.

Lower Right

This places the open window in the lower right corner of the screen.

Cascade Windows

This makes all open windows appear in a stacked format.

Help Menu

This menu allows access to all forms of help.

Help Topics

This offers a list of commonly asked help subjects. If you need an answer as to what a particular command does go to the help files.

About

This displays information about your EASE program.

About OpenGL

Information about OpenGL.

Memory Used

This dynamically displays the computer memory actually used.

Options Window

This sets all **Options** for **Render Balloon**.

Apply

Left click **Applies** changes and keeps **Options** window open.

OK

Left click **Applies** changes and closes **Options** window.

Cancel

Left click discards changes and closes **Options** window.

General Tab

The Tab sets Options for **Background Colors**, and for **Zooming** and **Spinning** the **Balloon** display.

Zoom Scope

This sets the **Zoom Range** in percent of full size.

Factor [%] Windows

These numbers set the **Zoom Range** as a percentage of full size.

Spinning

These parameters control the **Spinning** of the **Balloon** display.

Time Step [ms]

This sets how long the display stops at each step when **Spinning**.

Angle [deg]

This sets the **Angle** of balloon rotation for each step when **Spinning**.

Colors

This sets basic display **Colors**.

Background / …

The color in the box shows the background color for graphics displays. Left click on the color box or on the [**…**] button opens a color palette to choose a different color.

View Tab

This Tab sets basic display **Options** in **EASE Speaker Base**.
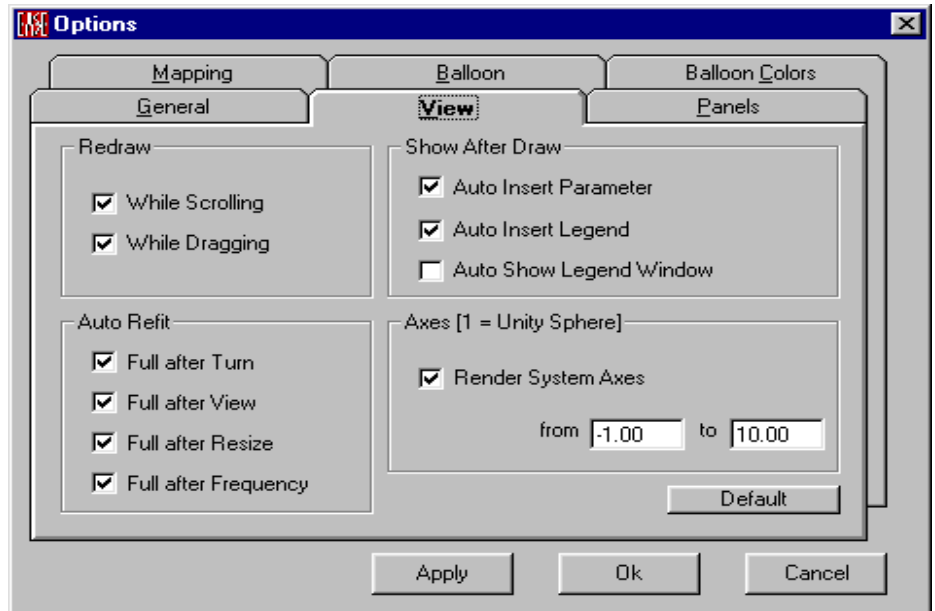
Redraw

While Scrolling

If checked, windows will be redrawn dynamically **While Scrolling**.

While Dragging

If checked, windows will be redrawn dynamically **While Dragging**.

Show after Draw

Displays information or legends.

Auto Insert Parameter

If checked, a legend will be inserted in the upper left corner annotating the data in the display.

Auto Insert Legend

If checked, the **Color Scale Legend** will be inserted in the window.

Auto Show Legend Window

If checked, the **Color Scale Legend** will open in a separate window.

Auto Refit

Sets the conditions for the view to be automatically resized.

Full after Turn

If checked, the view will be reset to **Full** size after a **Turn**.

Full after View

If checked, the view will be reset to **Full** size after a change of **View**.

Full after Resize

If checked, the view will be reset to **Full** size after a **Resize**.

Full after Frequency

If checked, the view will be reset to **Full** size after a change in **Frequency**.

Axes [1 = Unity Sphere]

Establishes conditions for the rendering of **System Axes**.

Render System Axes

If checked, the **System Axes** will be displayed in **Draw Balloon** graphics displays.

From / To Window

The dimensions entered here set the length of the rendered **System Axes**.

Default

Left click will reset **View** parameters to their default settings.

Panels Tab

This tab selects parameters displayed on the **Status Bar** in **Render Balloon**.
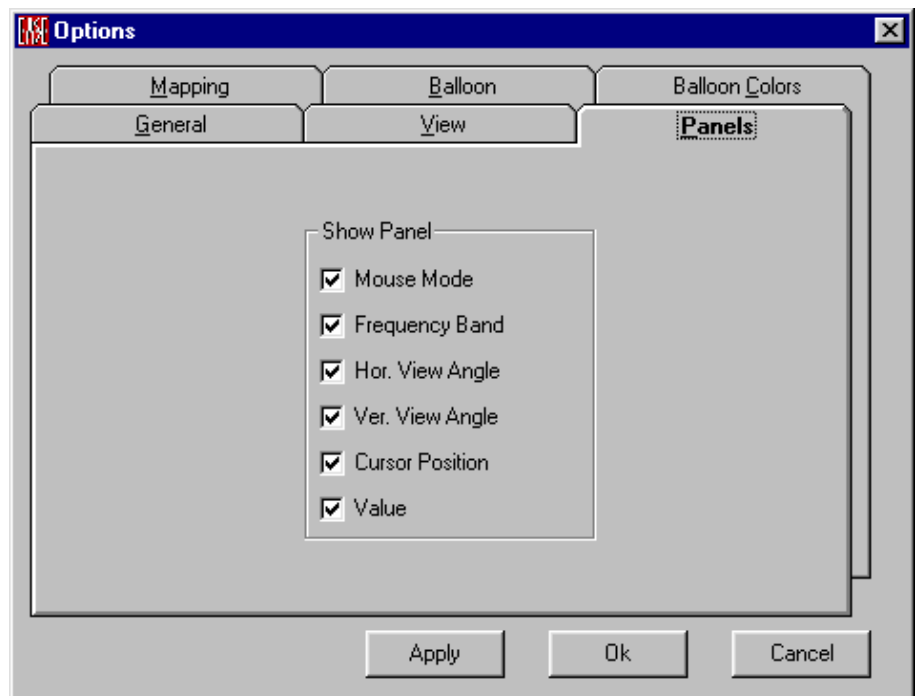
Mouse Mode

If checked, **Mouse Mode** will be shown on the **Status Bar**.

Frequency Band

If checked, **Frequency Band** of the current data will be shown on the Status Bar.

Hor. View Angle

If checked, **Horizontal Viewing Angle** will the shown on the Status Bar.

Ver. View Angle

If checked, **Vertical Viewing Angle** will the shown on the Status Bar.

Cursor Position

If checked, **Cursor Position** will be shown on the Status Bar.

Value

If checked, the calculated **Value** at the **Cursor Position** will be shown on the Status Bar.

Balloon Colors Tab
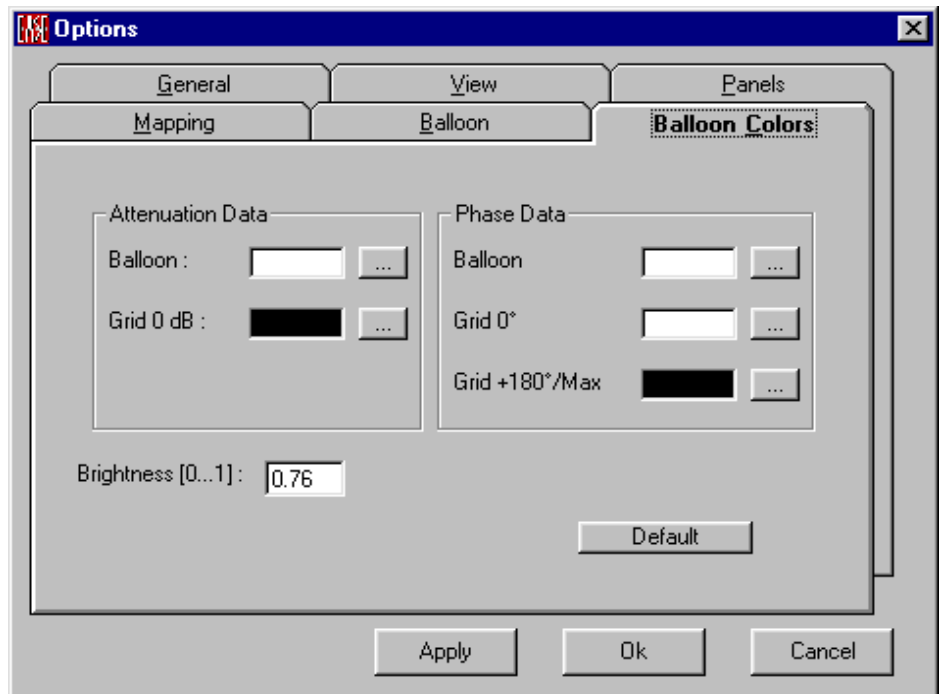
This Tab sets colors for display of **Balloon Data** in **Speaker Base**.

Attenuation Data

The color box shows the color assigned to **Balloon Attenuation Data**.

Balloon / …

The color box shows the color assigned to **Balloon Attenuation Data**. Left click the color box or the [. . .] button to change the color assignment.

Grid 0 dB / …

The color box shows the color assigned to the **Balloon's Grid**. Left click the color box or the [. . .] button to change the color assignment.

Phase Data

These settings control colors for the **Phase Balloon** display.

Balloon / …

The color box shows the color assigned to **Phase Balloon Data.** Left click the color box or the [. . .] button to change the color assignment.

Grid 0º / …

The color box shows the color assigned to the **Phase Balloon 0° Grid.** Left click the color box or the [. . .] button to change the color assignment.

Grid + 180º/Max/ …

The color box shows the color assigned to the **Phase Balloon 180° or max. Degree Grid**. Left click the color box or the [. . .] button to change the color assignment.

Brightness [0…1]

A number from 0 to 1 sets the **Brightness** of the rendered colors.

Default

Left click to reset colors to their defaults.

Balloon Tab

This tab sets **Balloon** and globe sizes and controls the **Phase Balloon.**
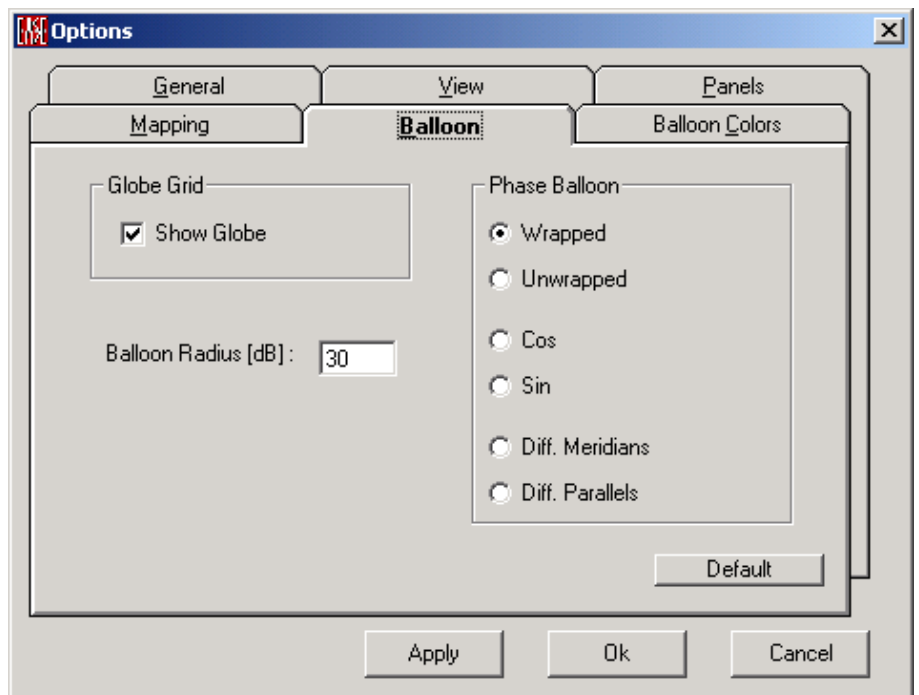
Balloon Radius [dB]

This sets the amplitude scale for the **Balloon**.

Globe Grid

Show Globe

If checked, a **Grid** will be shown on the **Globe**.

Phase Balloon

These settings control how the **Phase Balloon** will be displayed.

Wrapped

If Checked, the **Phase Balloon** will show **Phase Wrapping** between +180 degrees and -180 degrees.

Unwrapped

If Checked, the Phase Balloon will show Phase Unwrapped. The origin is the max. negative phase number and outside are the positive ones.

Cos

Here the phase will be cosine weighted to smooth jumps.

Sin

Here the phase will be sine weighted to smooth jumps.

Diff. Meridians

Here the phase will have a weighted derivative behavior along the meridians to smooth jumps.

Diff. Parallels

Here the phase will have a weighted derivative behavior along the parallels to smooth jumps.

Default

Left click returns all **Balloon** settings to their **Defaults**.

Mapping Tab

This tab allows settings of the mapping display.
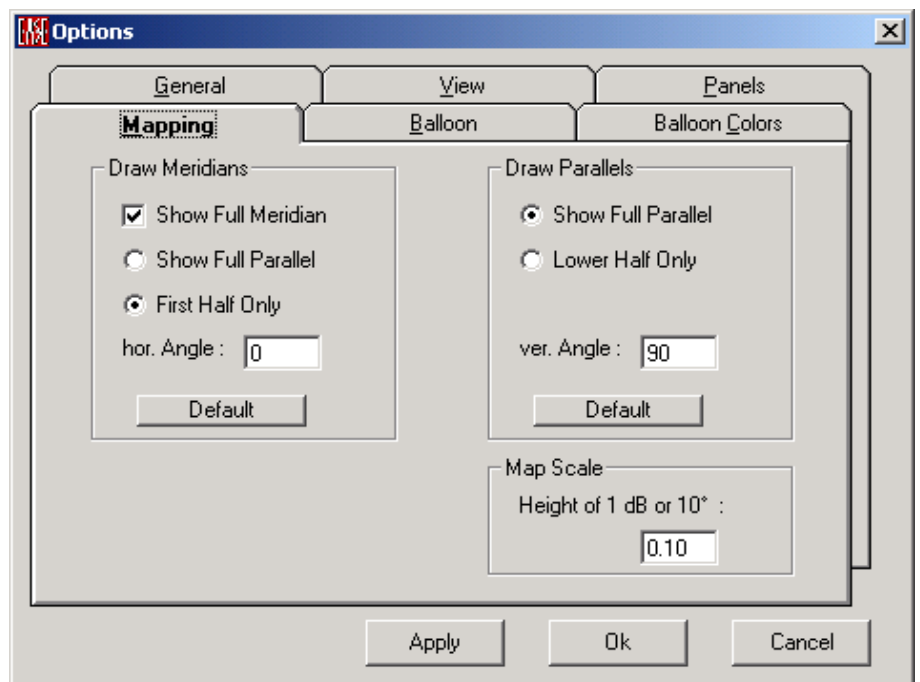
Draw Meridians

Show Full Meridian

If checked, **Balloon Meridians** projected onto Cartesian coordinates will show **Full Meridian** data (-180° to +180° or -90° to +90°). If not checked, graphs show only 0° to +180° or 0° to +90°.

Show Full Parallels

If checked, **Balloon Meridians** projected onto Cartesian coordinates will show **Full Parallel** data (-180° to +180° or 0° to +180°). If not checked, graphs show only -90° to +90° or 0° to +90°.

First Half Only

If checked, **Balloon Meridians** projected onto Cartesian coordinates will show only the first 90° of **Parallels** data (-90° to +90° or 0° to +90°). If not checked, these graphs show -180° to +180° or 0° to +180°.

Hor. Angle

This sets the angle for a meridian to draw an attenuation map.

Default

This returns **Draw Meridian Setting**s to their defaults.

Draw Parallels

Show Full Parallels

If checked, Balloon Parallels projected onto Cartesian Coordinates will show Full Parallel data (-180° to +180° or -90° to +90°). If not checked, graphs show only 0° to +180° or 0° to +90°.

Lower Half Only

This sets the limit for meridians from -90 to +90 degrees.

Ver. Angle

This sets the angle for a parallel to draw an attenuation map.

Default

This returns **Draw Parallels Settings** to their defaults.

Map Scale

Height of 1dB or 10°

This sets the **Vertical Scale** for **Projected Balloon** displays.

Chapter XII : Ease Material Base

EASE Material Base

This module views and edits **Absorption** and **Scattering** data for **Wall Materials**.

See also : Wall Material Main Window

Material Base Main Window

Key Conventions

F1	Help
Ctrl+N	New Wall Material
Ctrl+O	Open Wall Material
Ctrl+S	Save Wall Material
Ctrl+A	Save Wall Material As

Statusbar Conventions

Freq   This is the **Frequency** at the cursor.

Value   This is the **Absorption** (**Scattering**) coefficient at the cursor.

File Menu

This menu accesses file management and **Printing** functions.

New Wall Material

This creates a new Wall Material file.

Shortcut: Ctrl+N

To use this command:

1. Left Click on **New Wall Material**.
2. Enter a name for the new **Wall Material** and left click **OK.**

Open Wall Material

This views and edits EASE 3.0, 4.x Wall Material Files.

Shortcut: Ctrl+O

To use this command:

1. Left click on **Open Wall Material** to open an **Open File** Window.

2. Use **Look In** to find the folder, Left click on the **Wall Material File**, and Left click on **Open.**

Save Wall Material

This saves the current **Wall Material**, including its **Absorption** and **Scattering** data, to the existing **Wall Material (.MAT) File**. In child mode **Material Base** will reload.

Shortcut: Ctrl+S

Save Wall Material As

This saves the current **Wall Material** to a different **Wall Material (.MAT) File**. This allows different versions of the same **Wall Material**.

Shortcut: Ctrl+A

To use the command:

1. Left click **Save Wall Material As** for a Save File Window.

2. Choose a folder, enter the new filename, and Left click on **Save**.

Import ASCII

This **Imports Wall Material** data from a "comma and quotes"-delimited **ASCII** file (such as Excel .XWM). A formatted example file is in the \EASE 4.4\Easepath\Examples_ASCII\Materials folder.

To use this command:

3. Left click on **Import ASCII** for an **Open File** window.

4. Use **Look In** to find the folder, left click on the **Import** (.**XWM**) **File** and left click on **Open**.

Convert EASE 2.1 Catalog

This imports an EASE 2.1. **Material (CATALOG.WAL) File.** This can be a manufacturers file or a project catalog file. In EASE 2.1, a single **CATALOG.WAL** file may contain many **Wall Materials**. In EASE 3.0, 4.x, each **Wall Material** has its own file.

 To use this command:

1. Left click on **Convert EASE 2.1 Catalog** to open an **Open File** Window.

2. Browse to the desired folder, left click on the **(CATALOG.WAL)** file, and left click **Open**.

The Import Window opens.
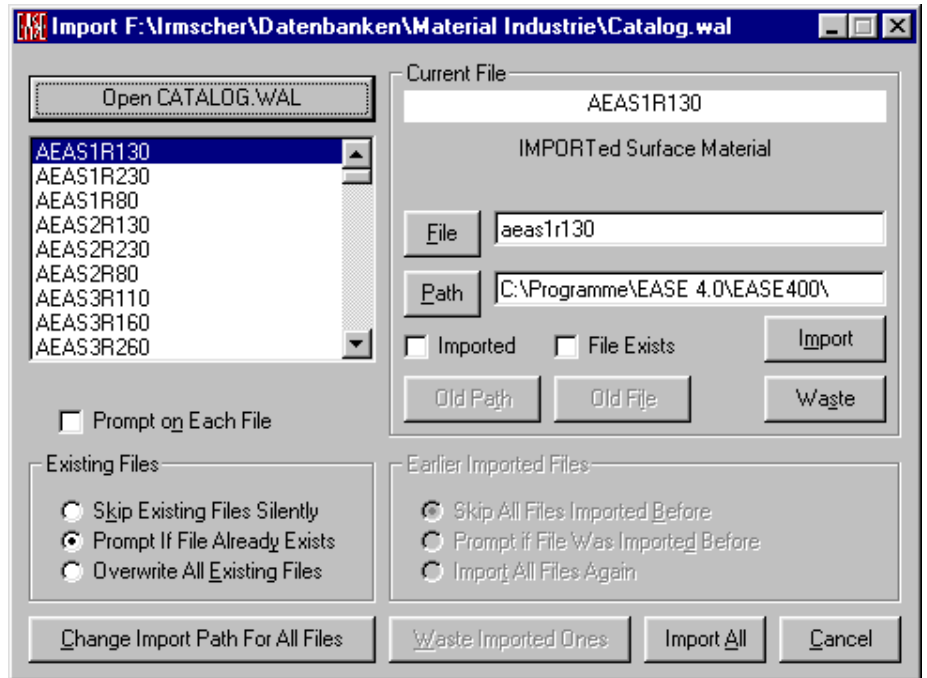
3. The left panel lists the **Wall Materials** in the selected file, Left click selects one for Import, the upper right **Current File** window lists the material, and a brief description of the **Wall Material** appears below the window.

4. The next data slot shows a default name for a new file for the converted **Wall Material** data. Accept the default, or left click **File** and/or **Path** to browse for a file to overwrite, or type a new filename in the **File** Window.

5. The **Path** data slot shows where the file will be saved. Accept the default, or left click **Path** to browse for a different path, or type a new **Path** in the window.

6. If **File Exists** has a check mark, a **Wall Material (.MAT) File** with the chosen name exists in the selected folder. Left click **Waste** to skip (not import) the selected file or left click **Import** to write (overwrite) the converted data to the selected **Filename** and directory.

7. If **Imported** or **File Exists** are checked, Left click on **Old Path** will **Import** the current **Wall Material** to the **Path** where its EASE 2.1 data is located.

8. If **Imported** or **File Exists** are checked, Left click on **Old File** will **Import** the current **Wall Material** to the **Path** where its EASE 2.1 data is located and use the **Wall Material** as a filename.

9. **Existing Files** sets criteria for how to treat existing files in the chosen save folder. **Skip Existing Files Silently** does not convert and does not ask. **Prompt If File Already Exists** asks before converting. **Overwrite All Existing Files** overwrites without asking.

10. **Earlier Imported Files** sets criteria for overwriting previously imported files. **Skip All Files Imported Before** does not convert and does not ask. **Prompt if File Was Imported Before** asks before converting. **Import All Files Again** overwrites without asking.

---

11. **Path** sets the save path for only one **Wall Material** at a time. **Change Import Path For All Files** sets a **Save Path** for all **Imported Files**.

12. **Waste Imported Ones** removes from the from the import list all Wall Materials that already exist in current **Save Path**.

13. **Import All** converts and saves all **Wall Materials** from CATALOG.WAL according to the settings in this window.

14. **Cancel** stops all operations and closes the window.

15. To import another catalog, click on **Open CATALOG.WAL** and repeat the steps above.

Send Picture To

This sends the current picture to the Clipboard, a File, or **EASE Page Designer**.

Clipboard

This copies the current picture to the **Windows Clipboard.**

File Location

This saves the picture to a file. Supported formats are:

Windows Bitmap……………………………*.BMP

JPEG…………………………………………*.JPG

CompuServe GIF…………………………….*.GIF

Portable Network Graphics………………….*.PNG

Tagged File Format………………………….*.TIF

LuRa Tech Wavelet…………………………*.LWF

Zsoft Paintbrush……………………………..*.PCX

Windows Icon……………………………….*.ICO

Enhanced Windows Metafile………………*.EMF

Truevision Targa……………………………*.TGA.

EASE Page Designer

This opens the current picture in **EASE Page Designer,** allowing text annotations, multiple picture layouts, and editing of the page layout format before printing or use in printed reports and presentations.

Print

This prints the current window without the window frame, e.g. without the command buttons and scroll bars

Exit

This exits **Materials Base**.

Edit Menu

This menu allows editing and adding to the **Wall Material** database.

Material Data

This views and edits non-numeric data for the selected **Wall Material.**

Coefficients

This views and edits absorption and scattering (according ISO standard 17497) data for the **Wall Material**.

Interpolate Absorption

This converts octave band **Absorption** data to 1/3 octave band data.

Interpolate Scattering

This converts octave band **Scattering** data to 1/3 octave band data.

Calculate Scattering

Allows to estimate scattering coefficients.

For further infos Calculate Scattering Window.

View Menu

This menu displays the graph of **Absorption** or **Scattering**.

Absorption

This graphs **Absorption** in one-third octave bands.

Scattering

This graphs **Scattering** in one-third octave bands.

Window Menu

This menu selects preset window configurations.

Screen Quarter

This allows placement of the active window into any of 5 positions.

Center

This places the open window in the center of the screen.

Upper Left

This places the open window in the upper left corner of the screen.

Upper Right

This places the open window in the upper right corner of the screen.

Lower Left

This places the open window in the lower left corner of the screen.

Lower Right

This places the open window in the lower right corner of the screen.

Cascade Windows

This makes all open windows appear in a stacked format.

Help Menu

This menu allows access to all forms of help.

Help Topics

This offers a list of commonly asked help subjects. We have made a concerted effort to develop the Help files and the manual together. If you need an answer to what a particular command does go to the help files. You will likely find your answer there.

About

This displays information about your EASE program.

Memory Used

This tests and dynamically displays the computer memory actually used.

Wall Material Main Window

This window views and edits data for the selected **Wall Material**.

Wall Material Tab
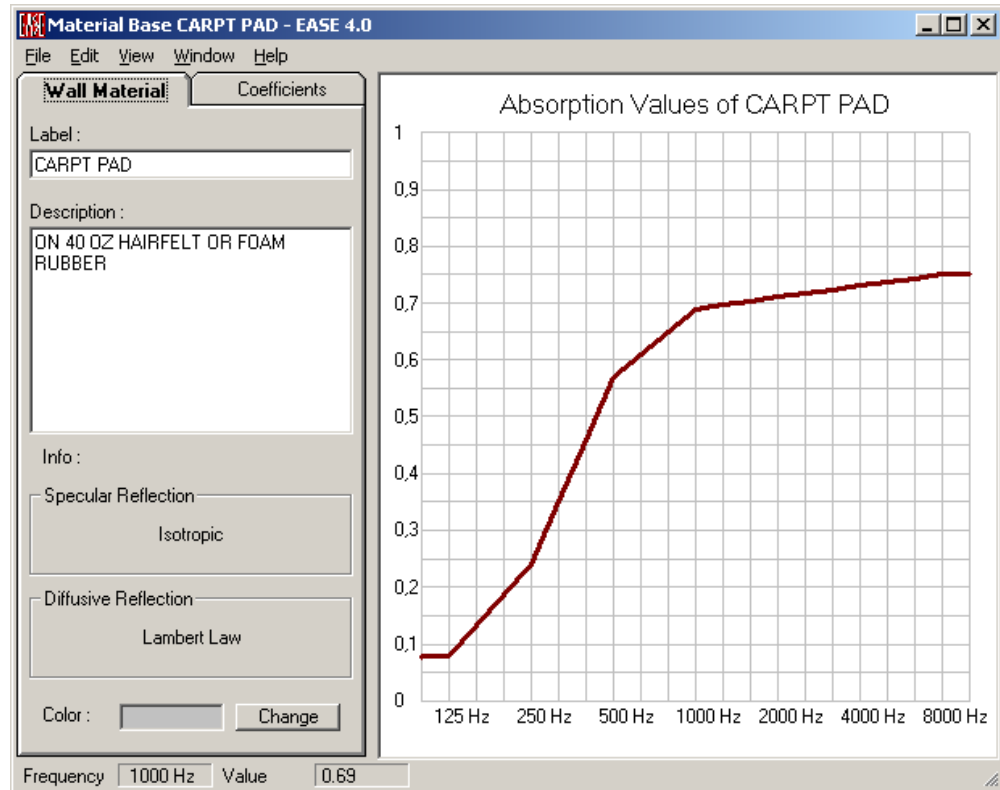
Label Window

This is the name if the **Wall Material**.

Description Window

Text in this window will appear as a description of the **Wall Material**.

Info

Specular Reflection

EASE uses Isotropic behavior to calculate specular reflections, i.e. with this method calculations assume the angle of reflection will be equal to the angle of incidence.

Diffusive Reflection

Here the AURA module will use **Lambert's Law** to calculate scattering. This law predicts that reflections are scattered in density based on the cosine of the angle.

Color / Change

This is the **Color** assigned to the face. Click on the **Color** to change it.

Frequency Window (In Status Bar)

This is the **Frequency** at the cursor in the graph at right.

Value Window (In Status Bar)

This is the **Absorption** or **Scattering** at the cursor in the graph at right.

Value Graph

The graph at right shows the resulting absorption and scattering values, you can change them with dragging the pushed RMB.

Coefficients Tab

This tab allows direct entry of **Absorption** and **Scattering** coefficients.
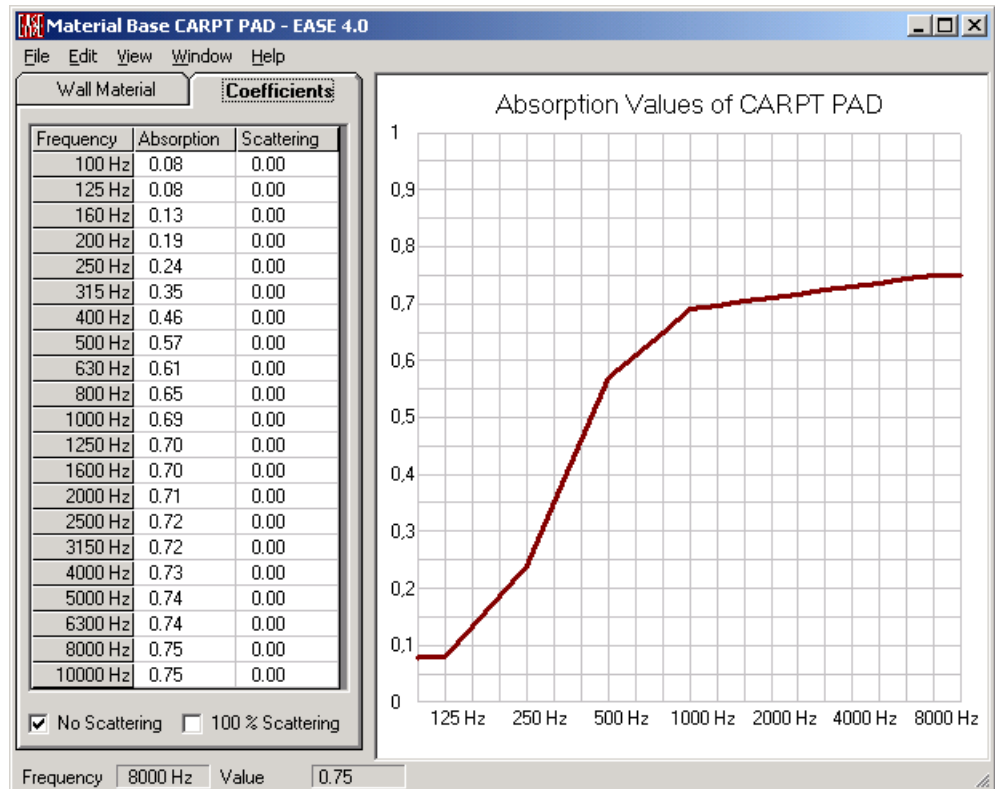
Frequency Column

These are one-third octave frequency bands.

Absorption Column

These are average **Absorption Coefficients** by one-third octave.

Scattering Column

These are average **Scattering Coefficients** by one-third octave.

No Scattering

If checked, this **Wall Material** will be omitted from **Scattering** calculations.

---

100 % Scattering

If checked, calculations will assume this **Wall Material** is 100% **Diffusive**.

Frequency Window

This is the **Frequency** at the cursor's location in the graph at right.

Value Window

This is the **Absorption** or **Scattering** at the cursor's location in the graph at right.

Value Graph

The graph at right shows the resulting absorption and scattering values. You can change them by dragging with the RMB, the coefficients are changed accordingly.

Calculate Scattering Window

In most of the cases Scattering coefficients are not material-specific but they depend strongly on the arrangement and the dimension of the structure and geometry of the walls. In contrast to absorption coefficients normally these coefficients are seldom found in text books, so in some cases rules of thumb have to be used too.

This window allows estimating the scattering coefficients of known wall structures and assigning them to wall materials in the database.

It is recommended to give these new wall materials new names with reference to the specific application inside the actual model.
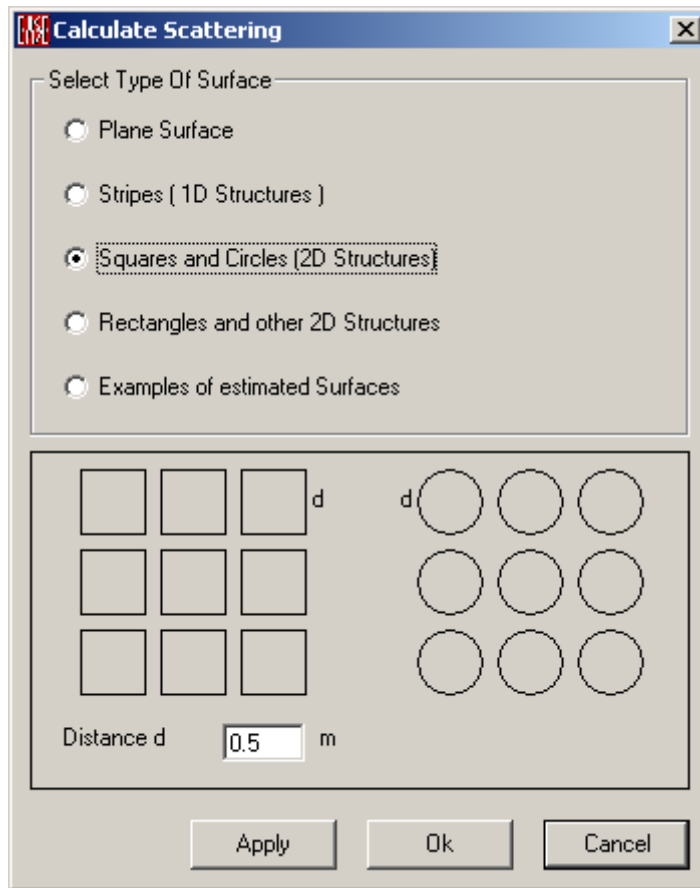
Chapter XIII: Ease Import / Export

EASE Import / Export

EASE Import/Export imports **EASE 2.1, CADP2**, **ASCII** files from both **EASE 2.1** and **EASE 3.0** or later, **Trimble SketchUp (SKP), and AutoCAD Drawing Interchange File (DXF)** files for use in **EASE 4.0** or later. It also allows export of **EASE 4.x** files as **EASE 3.0**, **EASE 4.x ASCII, AutoCAD Drawing Interchange File (DXF)**, and **Trimble SketchUp (SKP)** files. **Import/Export** can process checked or unchecked **EASE Project Data, Wall Materials** and **Speaker Models**.

Pack Project saves all **EASE Project Data** to a **.ZIP** or **.PPJ** file. A project must <u>always</u> be packed before moving it to another computer or even a different directory on the same computer. **Unpack Project** completes the move at the new location.

Import / Export Main Window

Key Conventions

F1	Help
F5	Check Data
X	x-View
Y	y-View
Z	z-View
3	3D-View
Ctrl+N	New Project (standalone mode only)
Ctrl+O	Open Project or Acquire Project Data (standalone mode only)
Ctrl+S	Save Project or Apply Project Data (standalone mode only)
Ctrl+A	Save Project As (standalone mode only)

File Menu

This menu opens and saves EASE 4.x files without conversion. It also **Packs** and **Unpacks** EASE data to and from the .PPJ, .ZIP and former (EASE 3.0 format) .SHP formats.

New Project (Standalone mode only)

This opens a new EASE project name to store project data.

Shortcut: Ctrl+N

To use this command:

1. Left Click **New Project** for a **New Project** Window.

2. Enter the new **Project Name** and Left click **OK**.

Open Project (Standalone mode only)

This opens EASE 4.0 or later **Project** files for export to **EASE 3.0, ASCII, SketchUp** or as a **DXF** file.

Shortcut: Ctrl+O

To use this command:

1. Left click on **Open Project** to display an **Open File** window.

2. Browse to the folder for the **Main Project (.FRD)** file, select the file, and Left click **Open.**

Acquire Project Data (child mode only)

This updates data from the parent window and draws a wire frame model of the Project.

Install Packed Project

A **Packed Project** is a **.PPJ** or **.ZIP** or the older **.SHP** file holding all data for an EASE project. **Install Packed Project** extracts that data and saves it to a selected folder and sub-folders. *Note: The .ZIP file is simply a compressed version of the .PPJ file.* To use this command:

1. Left click **Install Packed Project** to display an **Open File** window.

2. Use **Look In** to find the folder, Left click the project file name, and Left click **Open**.

3. The **Install *.ppj** window opens. Choose paths for the data and left click **OK**.

Save Project (Standalone mode only)

This saves the current project to its current EASE path and main project (.FRD) filename. The (.FRD) file includes pointers to all project data (the **Room Model, Loudspeakers, Wall Materials, IR Radiators**, and **Lamps**).

Shortcut: Ctrl+S

Save Project As (Standalone mode only)

This saves the current EASE project to a different project (**.FRD**) file. This allows saving different versions of the same project, (different speakers, different room treatments) without having to rebuild the room each time.

Shortcut: Ctrl+A

To use the command:

1. Left click **Save Project As** to display a **Save File** window.

2. Choose a folder for the **Project** files, enter a project (.FRD) file name, and Left click on **Save.**

Apply Project Data (child mode only)

This command sends the data to the parent EASE Main window.

Pack Project

Pack Project saves all **EASE Project Data** to a **.PPJ** file. A project must always be packed before moving it to another computer or even a different directory on the same computer. *Note: EASE can also compress the .PPJ file using the .ZIP compression standard.* To use this command:

1. Left click **Pack Project** to display a **Save File** window.

2. Choose a folder for the **Packed** file, enter a file name, and Left click on **Save.**

3. A Create Packed File window opens.

4. A check mark next to Minimize All Base Files will omit unused Speaker Models and Wall Materials from the Packed (.PPJ) File.

5. A check mark next to Include Cluster Components will Pack Speaker Model data for Clusters.

6. A check mark next to **Compress Packed File** will place the Packed Project (.PPJ) file into a ZIP file.

7. Left click **OK**.

Note: Together with the **.PPJ** or **.ZIP** file EASE creates a **.LST** file. This text file contains information about the packed project file. It is merely intended as reference for the user and is NOT required at all for any later use of the packed project.

Localize Project

This copies all database files of the project you select (speaker models, wall materials, IR emitters, light sources etc.) into standard subdirectories of the project's target folder, and modifies the project's internal pointers correspondingly. The option is useful for 'cleaning up' if the project refers to base files scattered over various different folders on the computer, but it is not required for the project in any way.

To use this command:

1. Left click Localize Project to open a Localize Project window.

2. Browse to choose an existing folder for **Project Files** and Left click OK, or type a new folder name in the top data window.

3. If a new folder is requested, you will be asked to confirm it.

Install Packed Base

This unpacks and installs **Packed** EASE **Databases**.

Speaker Models

This installs a **Packed Speaker Model (.PHN) or older (.SHS)** file.

Wall Materials

This installs a **Packed Wall Materials (.PWM) or older (.SHM)** file.

Light Sources

This installs a **Packed Light Source (.PBL)** file.

Textures

This installs a **Packed Textures (.PTP)** file.

IR Modulators

This installs a **Packed IR Modulator (.PMO)** file.

IR Radiators

This installs a **Packed IR Radiator (.PRA)** file.

Pack Project Base

This **Packs** EASE **Databases**.

Speaker Models

This **Packs Project Speaker Models** for the current project to a projectname**.PHN** file in the project directory.

Wall Materials

This **Packs Wall Materials** for the current project to a projectname**.PWM** file in the project directory.

Light Sources

This **Packs Light Sources** for the current project to a projectname**.PBL** file in the project directory.

Textures

This **Packs Textures** for the current project to a projectname**.PTP** file in the project directory.

IR Modulators

This **Packs IR Modulators** for the current project to a projectname**.PMO** file in the project directory.

IR Radiators

This **Packs IR Radiators** for the current project to a projectname**.PRA** file in the project directory.

Exit

This exits **EASE Import/Export**.

Edit Menu

This menu allows editing of EASE Data.

Rescale Project

This opens the **Rescale Project** window to multiply all project dimensions by a constant factor.
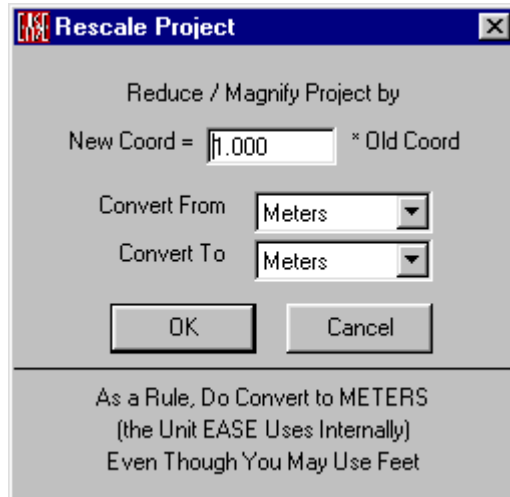
To use this command:

1. In the **New Coordinate** box, enter the desired multiplier.

2. Select the units of the old data in the **Convert From** box.

3. Select the units of the new data in the **Convert To** box.

4. Left click **OK** to **Apply** the changes and close the **Rescale** window, or Left click **Cancel** to abort the conversion and close the **Rescale** window.

Rotate Project

This sub-menu rotates the reference axes of the project.

By 90 Degrees

This rotates the axes by 90 degrees (in asymmetric projects).

By 180 Degrees

This reverses the axes by 180 degrees (in symmetrical and asymmetric projects).

By 270 Degrees

This rotates the axes by 270 degrees (in asymmetric projects).

By Free Angle

This rotates the axes by a user-selected angle in degrees (in asymmetric projects).

Check Project Data

This checks the mathematical integrity of **EASE Room Data.** It looks for **Faces** that are not planes, **Vertices** not included in a plane, orientation of **Faces** into the room, and other important parameters. When the room is closed, the program will also check for the inclusion of all **Vertices** in all adjoining **Faces**. **Room Data** cannot be used for calculations until it has successfully passed **Check Data.**

Short Cut: F5

Project Base Inventory

This checks current status of all **Speakers**, **Wall Materials, Light Sources, Textures**, and **IR Devices** in the project. Results are displayed in a simple text editor/viewer, and can be saved as an Inventory.INV file.

Imported Speaker Inventory

This lists both the IMPORT21.LSP and CADP2DEV.LSP databases in alphabetical order by **Speaker Model**. When EASE 2.1 **Speaker Models** are imported **Globally** or when CADP2 devices are imported, they are added to IMPORT21.LSP or CADP2DEV.LSP (the "master" listings of all **Globally Imported Speaker Models)**. Models registered here will not be imported again with further projects. This is the only purpose of these "import books"; if you do not plan to globally import any further projects from EASE 2.x or CADP2, you will not need them anymore. Note: When imported **Speaker Models** shipped with EASE 4.0 or later are installed, they will be registered in IMPORT21.LSP or CADP2DEV.LSP during installation.

Imported Material Inventory

This lists both the IMPORT21.WAL and CADP2ABS.WAL databases in alphabetical order by **Wall Material**, including the path. When EASE 2.1 **Wall Materials** are imported **Globally** or when CADP2 absorbers are imported, they are added to IMPORT21.WAL or CADP2ABS.WAL (the "master" listings of all **Globally Imported Wall Materials).** Materials registered here will not be imported again with further projects. This is the only purpose of these "import books"; if you do not plan to globally import any further projects from EASE 2.x or CADP2, you will not need them anymore. Note: When imported **Wall Materials** shipped with EASE 4.0 or later are installed, they will be registered in IMPORT21.WAL or CADP2ABS.WAL during installation.

Edit File IMPORT21.LSP

This window edits this master list of **Imported Speaker Models**.
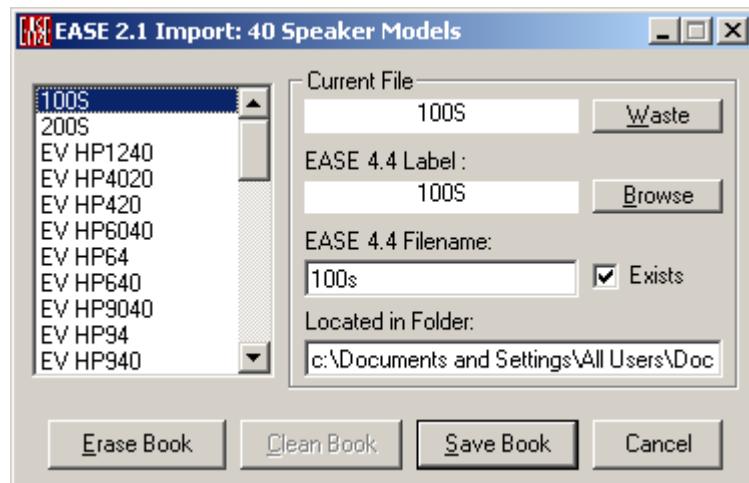
The left data window lists all Globally Imported Speaker Models alphabetically.

Current File

This file is selected in the list window.

Waste

This deletes the **Current File** from the **Import Book** (IMPORT21.LSP).

EASE 4.4 Label:

This is the name of the **Speaker Model** in **EASE 4.4**.

Browse

This opens a File browse window to find a **Speaker Model** file to assign to this label.

EASE 4.4 Filename

This is the **EASE 4.4** Filename for the **Speaker Model**.

Exists

This box is checked to indicate that the **Speaker Model** file has been located.

Located in Folder:

This is the path to the **EASE 4.4 Speaker Model** file.

Erase Book:

This deletes all entries from IMPORT21.LSP.

Clean Book:

When data files are missing, this deletes their entries from IMPORT21.LSP.

Save Book:

This saves the edited IMPORT21.LSP file.

Cancel

This abandons all edits and closes the edit window.

Edit File IMPORT21.WAL

This window edits this master list of **Imported Wall Materials**.
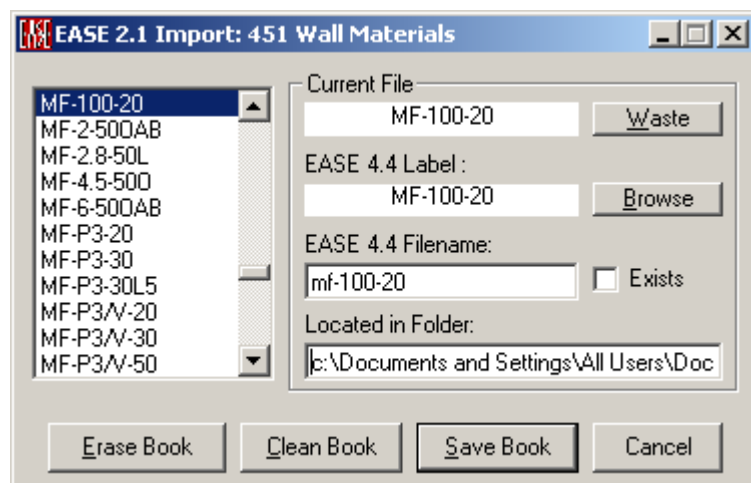
The left data window lists all **Globally Imported Wall Materials** alphabetically.

Current File

This file is selected in the list window.

Waste

This deletes the **Current File** from the **Import Book** (IMPORT21.WAL).

EASE 4.4 Label:

This is the name of the **Wall Material** in **EASE 4.4**.

Browse

This opens a File browse window to find a **Wall Material** file to assign to this label.

EASE 4.4 Filename

This is the **EASE 4.4** Filename for the **Wall Material**.

Exists

This box is checked to indicate that the **Wall Material** file has been located.

Located in Folder:

This is the path to the **EASE 4.4 Wall Material** file.

Erase Book:

This deletes all entries from IMPORT21.WAL.

Clean Book:

When data files are missing, this deletes their entries from IMPORT21.WAL.

Save Book:

This saves the edited IMPORT21.WAL file.

Cancel

This abandons all edits and closes the edit window.

Edit File CADP2DEV.LSP

This window edits this master list of **Globally Imported CADP2 Speaker Models**.
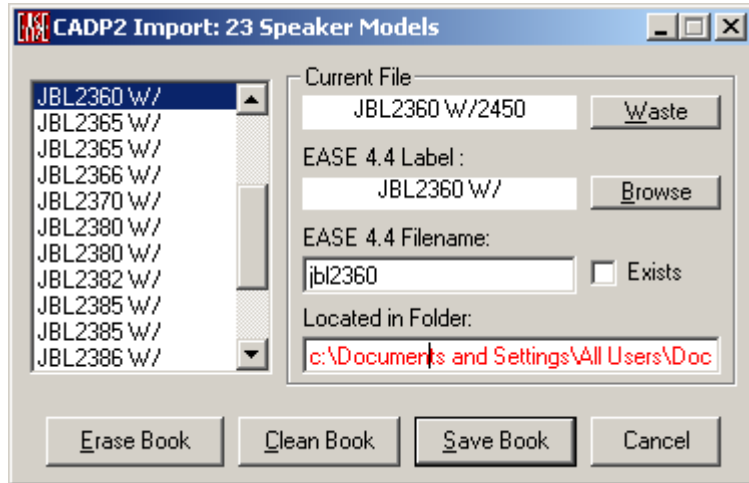
The left data window lists all **Globally Imported CADP2 Speaker Models** alphabetically.

Current File

This file is selected in the list window.

Waste

This deletes the **Current File** from the **Import Book** (CADP2DEV.LSP).

EASE 4.4 Label:

This is the name of the **CADP2 Speaker Model** in **EASE 4.4**.

Browse

This opens a File browse window to find a **Speaker Model** file to assign to this label.

EASE 4.4 Filename

This is the **EASE 4.4** Filename for the **CADP2 Speaker Model**.

Exists

This box is checked to indicate that the **Speaker Model** file has been located.

Located in Folder:

This is the path to the **EASE 4.4 Speaker Model** file.

Erase Book:

This deletes all entries from CADP2DEV.LSP.

Clean Book:

When data files are missing, this deletes their entries from CADP2DEV.LSP.

Save Book:

This saves the edited CADP2DEV.LSP file.

Cancel

This abandons all edits and closes the edit window.

Edit File CADP2ABS.WAL

This window edits this master list of **Imported CADP2 Wall Materials**.
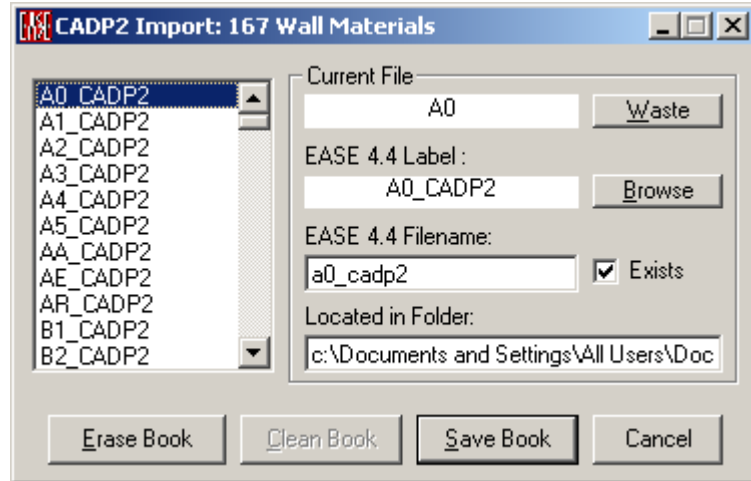
The left data window lists all **Globally Imported CADP2 Wall Materials** alphabetically.

Current File

This file is selected in the list window.

Waste

This deletes the **Current File** from the **Import Book** (CADP2ABS.WAL).

EASE 4.4 Label:

This is the name of the **CADP2 Wall Material** in **EASE 4.4**.

Browse

This opens a File browse window to find a **Wall Material** file to assign to this label.

EASE 4.4 Filename

This is the **EASE 4.4** Filename for the **CADP2 Wall Material**.

Exists

This box is checked to indicate that the **Wall Material** file has been located.

Located in Folder:

This is the path to the **EASE 4.4 Wall Material** file.

Erase Book:

This deletes all entries from CADP2ABS.WAL.

Clean Book:

When data files are missing, this deletes their entries from CADP2ABS.WAL.

Save Book:

This saves the edited CADP2ABS.WAL file.

Cancel

This abandons all edits and closes the edit window.

Check Speaker Base

This **Checks** the currently selected **Speaker Model** database for balloon data, symmetry and authorized status.

Full Speaker Inventory

This lists all **Speaker** data on the hard drive that are available with a check status. EASE keeps track of the locations of all speakers you have ever used in your various projects and provides you with a complete list upon request.

Convert Speakers to 4.0

This **Converts Speaker Model** data from 3.0 format (magnitude only) to 4.0 format (magnitude and phase, long names, long texts).

Full Material Inventory

This lists all **Wall Material** data on the hard drive that are available with a check status. EASE keeps track of the locations of all materials you have ever used in your various projects and provides you with a complete list upon request.

Convert Materials to 4.0

This **Converts Wall Material** data from 3.0 format (Absorption only) to 4.0 format (Absorption and Scattering).

Full Light Source Inventory

This lists all **Light Source** data on the hard drive that are available with a check status. EASE keeps track of the locations of all **Light Sources** you have ever used in your various projects and provides you with a complete list upon request.

Full Texture Inventory

This lists all **Texture** data on the hard drive that are available with a check status. EASE keeps track of the locations of all **Textures** you have ever used in your various projects and provides you with a complete list upon request.

Full IR Modulator Inventory

This lists all **IR Modulator** data on the hard drive that are available with a check status. EASE keeps track of the locations of all **IR Modulators** you have ever used in your various projects and provides you with a complete list upon request.

Full IR Radiator Inventory

This lists all **IR Radiator** data on the hard drive that are available with a check status. EASE keeps track of the locations of all **IR Radiators** you have ever used in your various projects and provides you with a complete list upon request.

View Menu

This menu selects between Isometric and Perspective views of the wire frame project model, and lists project **Speaker Models, Wall Materials, Light Sources, Textures,** and **IR Devices**.

3D Perspective

This command has four preset angles, e.g. (60 deg X –30 deg). This displays the object isometrically.

Shortcut: **3**

Side View (x)

This displays the object in the YZ-Domain. This is otherwise known as the X-View.

Shortcut: **x**

End View (y)

This displays the object in the XZ-Domain. This is otherwise known as the Y-View.

Shortcut: **y**

Plan View (z)

This displays the object in the XY-Domain. This is otherwise known as the Z-View.

Shortcut: **z**

Speaker Model List

This lists **Speaker Models** currently loaded into EASE ImEx.

Wall Materials List

This lists **Wall Materials** currently loaded into EASE ImEx.

Light Source List

This lists **Light Sources** currently loaded into EASE ImEx.

Texture List

This lists **Textures** currently loaded into EASE ImEx.

IR Modulator List

This lists **IR Modulators** currently loaded into EASE ImEx.

IR Radiator List

This lists **IR Radiators** currently loaded into EASE ImEx.

Tools Menu

This menu holds **Import, Export**, and **File Conversion Tools**.

Import EASE 2.1

This submenu imports EASE 2.x **Project** and **Database** files.

Project / Global Base

This imports a single EASE 2.x **Project** from an EASE 2.x **Project** folder into a user defined EASE **Project** folder. The associated CATALOG.LSP and CATALOG.WAL files are imported into the EASE **Global Loudspeaker** and **Global Material Databases**. Note: The **Global Database** is maintained as a master file of all available **Speaker Models** and **Wall Materials**, and is available for all **Projects**. **Speaker Models** and **Wall Materials** that have already been Imported will not be imported again. Instead, EASE will find their data in the Global Database by referring to IMPORT21.LSP and IMPORT21.WAL. This method of import is suitable when the user wants the imported project to use the latest **Speaker Model Data** and does not need to segregate imported EASE 2.1 Databases from newer EASE 3.0 and 4.0 or later Databases.

To use this command:

1. Left click Import EASE 2.1 Project, then Project / Global Base. An **Open File** window opens.

2. Browse to the EASE 2.1 project folder, choose a **Room (.ROO)** file to import, and Left click **OK**.

3. After EASE draws the room click **Yes** in the **Check Data** message box to open a **Save File** dialog.

4. Browse to select a folder, accept the filename or enter a different one, and Left click **Save**.

Project / Local Base

This imports a single **EASE 2.x Project** from an EASE 2.x **Project** folder into a user assigned EASE **Project** folder. The associated CATALOG.LSP and CATALOG.WAL files are converted to **EASE 4.4 Speaker Model** and **Wall Material Databases** within the user defined folder or sub-directories of that folder. These **Speaker Models** and **Wall Materials** will not be available for use in other projects. Note: This method of import keeps **Speaker Models** and **Wall Materials** completely separated by project.

To use this command:

1. Left click Import EASE 2.1 Project, then Project / Local Base. An **Open File** window opens.

2. Browse to the EASE 2.1 project folder, choose a **Room (.ROO)** file to import, and Left click **OK** to open a **Save File** dialog.

3. Browse to select a folder, accept the filename or enter a different one, and Left click **Save**.

4. The **EASE 2.1 Speaker Model files** will be imported using the **Import EASE 2.x Speaker File** window and the **EASE 2.1 Wall Material** files will be imported using the **Import EASE 2.x Material File** window.

5. After EASE draws the room then click **Yes** in the **Check Data** message box to complete the import process.

Project Group / Local Base

This imports multiple EASE 2.x projects from an EASE 2.x **Project** folder into a user assigned EASE **Project** folder. The associated CATALOG.LSP and CATALOG.WAL files are converted to **EASE 4.4 Speaker Model** and **Wall Material Databases** and saved to the same user-defined folder or sub-directories of that folder. These **Speaker Models** and **Wall Materials** will not be available for use in other projects. Note: This method of import would be appropriate for converting a group of EASE 2.x projects that share common **Speaker Model** and **Wall Material Databases,** when the user wants to keep the EASE 2.1 databases separated from **EASE 3.0** and **4.0** or later projects.

To use this command:

1. Left click Import EASE 2.1, then Project Group / Local Base. An EASE 2.1 Project Group window opens.

2. Browse to the EASE 2.1 project folder, choose one or more **Room (.ROO)** file(s) to import, and Left click **OK**.

3. If **EASE 2.1 Speaker Model** files need to be imported, the **Import EASE 2.x Speaker File** window will open.

4. If **EASE 2.1 Wall Material** files need to be imported, the **Import EASE 2.x Material File** window will open.

5. Follow the prompts to **Check Data** to complete the import process.

Speaker File

This **Converts** and **Imports** selected **Speaker Models** from a single CATALOG.LSP file into EASE. Note: All **Imported Speakers** are marked "**Not Authorized.**"

To use this command:

1. Left click **Import EASE 2.1,** then **Speaker File** to display an **Open File** window.

2. Browse to the EASE 2.1 speaker folder, choose a **Catalog.lsp** file to import, and Left click **Open** to display an **Import EASE 2.x Speaker File** window.

Speaker Folder

This imports all CATALOG.LSP from all subfolders of the selected source folder into an analogous tree of subfolders of the selected destination folder. This way you can import all EASE 2.1 speakers at once in a single step. However, most of the involved imports will be done by EASE defaults without user interference, which may lead to unexpected or even erratic results. This option should be used with great caution. Note: All imported speakers are marked "**Not Authorized.**"

To use this command:

1. Left click **Import EASE 2.1,** then **Speaker Folder**. After clicking **OK** in the warning message box an **EASE 2.1 Source Folder** window opens.

2. Browse to the EASE 2.1 speaker folder, and Left click **OK** to open an **EASE 2.1 Destination Folder** window.

3. Browse to the location where you want to save the EASE 4.4 speakers, and Left click **OK**.

4. An **Import EASE 2.x Speaker File** window will open for each of the folders and sub-folders in the path that was selected.

Material File

This **Converts** and **Imports** selected **Wall Materials** from a single CATALOG.WAL file into EASE.

To use this command:

1. Left click Import EASE 2.1, then **Material File** to display an **Open File** window.

2. Browse to the EASE 2.1 surface folder, choose a **Catalog.wal** file to import, and Left click **Open** to display an **Import EASE 2.x Material File** window.

Material Folder

This allows import of all CATALOG.WAL files from all subfolders of the selected source folder into an analogous tree of subfolders of the selected destination folder. This way you can import all EASE 2.1 materials at once in a single step. However, most of the involved imports will be done by EASE defaults without user interference, which may lead to unexpected or even erratic results. This option should be used with great caution.

To use this command:

1. Left click **Import EASE 2.1,** then **Material Folder**. After clicking **OK** in the warning message box an **EASE 2.1 Source Folder** window opens.

2. Browse to the EASE 2.1 surface folder, and Left click **OK** to open an **EASE 2.1 Destination Folder** window.

3. Browse to the location where you want to save the EASE 4.4 materials, and Left click **OK**.

4. An **Import EASE 2.x Material File** window will open for each of the folders and sub-folders in the path that was selected.

Export EASE 3.0 Project

This saves the current EASE **Project** (if one is loaded) in packed EASE 3.0 format so that it can be unpacked and installed by EASE 3.0. To use this command:

1. Left click Export EASE 3.0 Project. An Open File window opens.

2. Browse to select a folder, accept the filename or enter a different one, and Left click **Save**.

Note: Various EASE 4.x features like long file names (>11 characters) cannot be exported. Before export make sure no long file names are used. No EASE 4.x basefiles (speakers, materials, light sources, etc.) will be exported together with the actual project. Speakers and materials used in the exported project must exist in EASE 3.0 format on the destination computer. When installing the packed

project in the EASE 3.0 environment, be sure to enable the base file [x] Find option so that EASE can attempt to reassign the unresolved references. You cannot read in EASE 3.0 speakers and wall materials in EASE 4.0 or later format. Use the labels to substitute the corresponding base values with 3.0 ones. Do not expect a perfectly smooth downward conversion, instead, be prepared for some additional edition and correction required when the project is received in EASE 3.0.

Import CADP2

The modules on this sub menu convert CADP2 projects and databases into EASE 4.0 or later files.

Job File

This imports CADP2 **Job Data** for use in EASE 4.0 or later. *Note: CADP2 Devices and Absorbers should be Imported first, then CADP2 Arrays, then the CADP2 Job File*. To use this command:

1. Left click **Import CADP2,** then **Job File**. An **Open File** window opens.

2. Browse to the CADP2 job folder, choose a file to import, and Left click **Open**.

3. If **CADP2 Devices, Absorbers**, and **Arrays** used in the selected **Job File** have already been imported, EASE will draw the room and open a **Save File** dialog. Choose a filename and Left click OK.

4. If any **CADP2 Devices, Absorbers**, or **Arrays** used in the selected Job File have not been imported, the **CADP2 Import Check** window will open.

Array File

This imports CADP2 speaker array data for use in EASE 4.0 or later. Note: CADP2 Devices and Absorbers should be Imported first, then CADP2 Arrays, then the CADP2 Job File. To use this command:

1. Left click **Import CADP2,** then **Array File**. An **Open File** window opens.

2. Browse to the CADP2 job folder, choose an **Array** file to import, and Left click **Open**.

3. If **CADP2 Devices** used in the selected **Array File** have already been imported, the **Import CADP2 Array Window** will open.

4. If any **CADP2 Devices** used in the selected **Array** File have not been imported, the **CADP2 Import Check** window will open.

Devices

This imports CADP2 speaker data for use in EASE 4.0 or later. Note: CADP2 Devices and Absorbers should be Imported first, then CADP2 Arrays, then the CADP2 Job File. To use this command:

1. Left click Import CADP2, then Device File. A Select CADP2 Device Path window opens.

2. Browse to the CADP2 **Device** folder, and Left click **Ok**. The **Import CADP2 Devices** window will appear.

Absorbers

This imports CADP2 Wall Material data for use in EASE 4.0 or later. Note: CADP2 Devices and Absorbers should be Imported first, then CADP2 Arrays, then the CADP2 Job File. To use this command:

1. Left click **Import CADP2,** then **Absorber File**. An **Open File** window opens.

2. Browse to the CADP2 **Data** folder, choose an **Absorber** file to import, and Left click **Open**. The **Import CADP2 Absorber** window will appear.

Import ASCII

The items on this sub-menu import **"Comma And Quotes Delimited"** ASCII files created by spreadsheet programs to describe **Speaker Models, Wall Materials, IR Emitters**, and **Lamps**, as well as **Room Data** (**Edges, Faces, Audience Areas,** and **Listener Seats**). The appropriate formats for the data are different for each **Item**.

Speaker Models

This sets the input filter to the **Speaker Models Comma And Quotes**-**Delimited** format and converts it to EASE 4.0 or later data. A sample file is in …EASE 4.4\Easepath\Examples_ASCII\Speakers\. To use this command:

1. Left Click on **Import ASCII**, then **Speaker Models**.

2. Use the **Open File** window to Browse to the folder and select the ASCII file. The file should have a file extension of **XHN**.

3. The **Save Speaker Models** window opens.

Wall Materials

This sets the input filter to the **Wall Materials Comma And Quotes-Delimited** format and converts it to EASE 4.0 or later data. A sample file is in … EASE 4.4\Easepath\Examples_ASCII\Materials\. To use this command:

1. Left Click on **Import ASCII**, then **Wall Materials**.

2. Use the **Open File** window to Browse to the folder and select the ASCII file. The file should have a file extension of **XWM**.

3. The **Save Wall Materials** window opens.

Edges

This sets the input filter to the **Comma And Quotes**-**Delimited** format for EASE 3.0 or 4.0 or later **Edges** and converts it to EASE 4.0 or later data. A sample file is in … EASE 4.4\Easepath\Examples_ASCII\Edges\. To use this command:

1. Make sure a project is open to receive the **Imported Edges**. If not, open a project or create a new one.

2. Left Click on **Import ASCII**, then **Edges**.

3. Use the **Open File** window to Browse to the folder and select the ASCII file. The file should have a file extension of **XED**.

4. The **EASE Import/Export Viewing** window will show the imported **Edge(s)**.

Faces

This sets the input filter to the **Comma And Quotes**-**Delimited** format for EASE 3.0 or 4.0 or later **Faces** and converts it to EASE 4.0 or later data. A

sample file is in … EASE 4.4\Easepath\Examples_ASCII\Faces\. To use this command:

1. Make sure a project is open to receive the **Imported Faces**. If not, open a project or create a new one.

2. Left Click on **Import ASCII**, then **Faces**.

3. Use the **Open File** window to Browse to the folder and select the ASCII file. The file should have a file extension of **XFC**.

4. The **EASE Import/Export Viewing** window will show the imported **Face(s)**.

Loudspeakers

This sets the input filter to the **Comma And Quotes**-**Delimited** format for EASE 3.0 or 4.0 or later **Loudspeakers** and converts it to EASE 4.0 or later data. A sample file is in … EASE 4.4\Easepath\Examples_ASCII\Speakers\. To use this command:

1. Make sure a project is open to receive the **Imported Loudspeakers**. If not, open a project or create a new one.

2. Left Click on **Import ASCII**, then **Loudspeakers**.

3. Use the **Open File** window to Browse to the folder and select the ASCII file. The file should have a file extension of **XLD**.

4. The **EASE Import/Export Viewing** window will show the imported **Loudspeaker(s)**.

Audience Areas

This sets the input filter to the **Comma And Quotes**-**Delimited** format for EASE 3.0 or 4.0 or later **Audience Areas** and converts it to EASE 4.0 or later data. A sample file is in … EASE 4.4\Easepath\Examples_ASCII\Areas\. To use this command:

1. Make sure a project is open to receive the **Imported Audience Areas**. If not, open a project or create a new one.

2. Left Click on **Import ASCII**, then **Audience Areas**.

3. Use the **Open File** window to Browse to the folder and select the ASCII file. The file should have a file extension of **XAR**.

4. The **EASE Import/Export Viewing** window will show the imported **Audience Area(s)**.

Listener Seats

This sets the input filter to the **Comma And Quotes**-**Delimited** format for EASE 3.0 or 4.0 or later **Listener Seats** and converts it to EASE 4.0 or later data. A sample file is in … EASE 4.4\Easepath\Examples_ASCII\Seats\. To use this command:

1. Make sure a project is open to receive the **Imported Listener Seats**. If not, open a project or create a new one.

2. Left Click on **Import ASCII**, then **Listener Seats**.

3. Use the **Open File** window to Browse to the folder and select the ASCII file. The file should have a file extension of **XST**.

4. The **EASE Import/Export Viewing** window will show the imported **Listener Seat(s)**.

Lamps

This sets the input filter to the **Comma And Quotes-Delimited** format for EASE 4.0 or later **Lamps** and converts it to EASE 4.0 or later data. A sample file is in … EASE 4.4\Easepath\Examples_ASCII\Lamps\. To use this command:

1. Make sure a project is open to receive the **Imported Lamps**. If not, open a project or create a new one.

2. Left Click on **Import ASCII**, then **Lamps**.

3. Use the **Open File** window to Browse to the folder and select the ASCII file. The file should have a file extension of **XLM**.

4. The **EASE Import/Export Viewing** window will show the imported **Lamp(s)**.

IR Emitters

This sets the input filter to the **Comma And Quotes-Delimited** format for EASE 4.0 or later **IR Emitters** and converts it to EASE 4.0 or later data. A sample file is in … EASE 4.4\Easepath\Examples_ASCII\IR\. To use this command:

1. Make sure a project is open to receive the **Imported IR Emitters**. If not, open a project or create a new one.

2. Left Click on **Import ASCII**, then **IR Emitters**.

3. Use the **Open File** window to Browse to the folder and select the ASCII file. The file should have a file extension of **XDI**.

4. The **EASE Import/Export Viewing** window will show the imported **IR Emitter(s)**.

Import ASCII (EASE 2.1)

The items on this sub-menu import ASCII formatted EASE 2.1 files. The appropriate formats for the data are different for each item.

Speaker Models

This sets the input filter to the EASE 2.x **Comma And Quotes-Delimited** format for **Speaker Models** and converts it to EASE 4.0 or later data. To use this command:

1. Left Click on **Import ASCII**, then **Speaker Models**.

2. Use the **Open File** window to Browse to the folder and select the ASCII files. The files can have **IMP**, **EXP**, **ASC** or other extensions.

3. The **Save Speaker Models** window opens.

Wall Materials

This sets the input filter to the EASE 2.x **Comma And Quotes-Delimited** format for **Wall Materials** and converts it to EASE 4.0 or later data. To use this command:

1. Left Click on **Import ASCII**, then **Wall Materials**.

2. Use the **Open File** window to Browse to the folder and select the ASCII files. The files can have **IMP**, **EXP**, **ASC** or other extensions.

3. The **Save Wall Materials** window opens.

Edges

This sets the input filter to the EASE 2.x **Comma And Quotes**-**Delimited** format for **Edges** and converts it to EASE 4.0 or later data. To use this command:

1. Left Click on **Import ASCII**, then **Edges**.

2. Use the **Open File** window to Browse to the folder and select the ASCII files. The files can have **IMP**, **EXP**, **ASC** or other extensions.

3. The **EASE Import/Export Viewing** window will show the imported **Edge(s)**.

Faces

This sets the input filter to the EASE 2.x **Comma And Quotes**-**Delimited** format for **Faces** and converts it to EASE 4.0 or later data. To use this command:

1. Left Click on Import ASCII, then Faces.

2. Use the **Open File** window to Browse to the folder and select the ASCII files. The files can have **IMP**, **EXP**, **ASC** or other extensions.

3. The **EASE Import/Export Viewing** window will show the imported **Face(s)**.

Loudspeakers

This sets the input filter to the EASE 2.x **Comma And Quotes**-**Delimited** format for **Loudspeakers** and converts it to EASE 4.0 or later data. To use this command:

1. Left Click on Import ASCII, then Loudspeakers.

2. Use the **Open File** window to Browse to the folder and select the ASCII files. The files can have **IMP**, **EXP**, **ASC** or other extensions.

3. The **EASE Import/Export Viewing** window will show the imported **Loudspeaker(s)**.

Audience Areas

This sets the input filter to the EASE 2.x **Comma And Quotes**-**Delimited** format for **Audience Areas** and converts it to EASE 4.0 or later data. To use this command:

1. Left Click on Import ASCII, then Audience Areas.

2. Use the **Open File** window to Browse to the folder and select the ASCII files. The files can have **IMP**, **EXP**, **ASC** or other extensions.

3. The **EASE Import/Export Viewing** window will show the imported **Audience Area(s)**.

Listener Seats

This sets the input filter to the EASE 2.x **Comma And Quotes**-**Delimited** format for **Listener Seats** and converts it to EASE 4.0 or later data. To use this command:

1. Left Click on Import ASCII, then Listener Seats.

2. Use the **Open File** window to Browse to the folder and select the ASCII files. The files can have **IMP**, **EXP**, **ASC** or other extensions.

3. The **EASE Import/Export Viewing** window will show the imported **Listener Seat(s)**.

Export ASCII

This menu allows export of EASE 4.0 or later data in **Comma And Quotes-Delimited** ASCII format for use in other programs such as Word or Excel. The appropriate formats for the data are different for each item.

Edges

This converts selected EASE **Edge** data for the current project to the **Comma And Quotes-Delimited** ASCII format for **Edge** data. The default filetype is an **XED** extension. To use this command:

1. Left Click on **Export ASCII**, then **Edges**.

2. The **Select Edge(s)** window will open. Select the **Edges** to be exported, left click **OK.**

3. The **Save File** window will open. Browse to select a Folder for the **Exported Edges**, accept the default filename or type a new one, and Left click on **Save**.

Faces

This converts selected EASE **Face** data for the current project to the **Comma And Quotes-Delimited** ASCII format for **Face** data. The default filetype is an **XFC** extension. To use this command:

1. Left Click on **Export ASCII**, then **Faces**.

2. The **Select Face(s)** window will open. Select the **Faces** to be exported, left click **OK.**

3. The **Save File** window will open. Browse to select a Folder for the **Exported Faces**, accept the default filename or type a new one, and Left click on **Save**.

Loudspeakers

This converts selected EASE **Loudspeaker** data for the current project to the **Comma And Quotes-Delimited** ASCII format for **Loudspeaker** data. The default filetype is an **XLD** extension. To use this command:

1. Left Click on **Export ASCII**, then **Loudspeakers**.

2. The **Select Lspk(s)** window will open. Select the **Loudspeakers** to be exported, left click **OK.**

3. The **Save File** window will open. Browse to select a Folder for the **Exported Loudspeakers**, accept the default filename or type a new one, and Left click on **Save**.

Audience Areas

This converts selected EASE **Audience Area** data for the current project to the **Comma And Quotes-Delimited** ASCII format for **Audience Area** data. The default filetype is an **XAR** extension. To use this command:

1. Left Click on **Export ASCII**, then **Audience Areas**.

2. The **Select Area(s)** window will open. Select the **Audience Areas** to be exported, left click **OK.**

3. The **Save File** window will open. Browse to select a Folder for the **Exported Audience Areas**, accept the default filename or type a new one, and Left click on **Save**.

Listener Seats

This converts selected EASE **Listener Seat** data for the current project to the **Comma And Quotes-Delimited** ASCII format for **Listener Seat** data. The default filetype is an **XST** extension. To use this command:

1. Left Click on **Export ASCII**, then **Listener Seats**.

2. The **Select Seat(s)** window will open. Select the **Listener Seats** to be exported, left click **OK.**

3. The **Save File** window will open. Browse to select a Folder for the **Exported Listener Seats**, accept the default filename or type a new one, and Left click on **Save**.

Lamps

This converts selected EASE **Lamp** data for the current project to the **Comma And Quotes-Delimited** ASCII format for **Lamp** data. The default filetype is an **XLM** extension. To use this command:

1. Left Click on **Export ASCII**, then **Lamps**.

2. The **Select Lamp(s)** window will open. Select the **Lamps** to be exported, left click **OK.**

3. The **Save File** window will open. Browse to select a Folder for the **Exported Lamps**, accept the default filename or type a new one, and Left click on **Save**.

IR Emitters

This converts selected EASE **IR Emitter** data for the current project to the **Comma And Quotes-Delimited** ASCII format for **IR Emitter** data. The default filetype is an **XDI** extension. To use this command:

1. Left Click on **Export ASCII**, then **IR Emitters**.

2. The **Select IR Emitter(s)** window will open. Select the **IR Emitters** to be exported, left click **OK.**

3. The **Save File** window will open. Browse to select a Folder for the **Exported IR Emitters**, accept the default filename or type a new one, and Left click on **Save**.

Import DXF / SKP

This command allows import of a project in the AutoDesk DXF 2000 format or Trimble SketchUp 6 or 7 format for use in EASE 4.0 or later. To use this command:

1. Left Click on **Import DXF / SKP**.

2. If a project is currently open, a pop up window will ask **"Waste Data of [project name]?"**.

3. Click the **Yes** button to close the current project and continue with the DXF/SKP import. Click **Cancel** to stay with the current project and quit the DXF/SKP import.

4. If you clicked Yes a file selection window opens. Browse to find the DXF/SKP data and left click. This opens the **Import DXF** window for DXF files and the **Import SKP** window for SKP files.

See Import DXF Window or Import SKP Window

Export DXF

This command exports EASE Room Data in the AutoDesk DXF 2000 format for use in other CAD programs. To use this command:

1. Left Click on **Export DXF**.

2. This opens the **Export DXF** window.

See Export DXF Window

Export SKP

This command exports EASE Room Data in the Trimble SketchUp 6 format for use in other CAD programs. To use this command:

1. Left Click on **Export SKP**.

2. This opens the **Export SKP** window.

See Export SKP Window

Window Menu

This menu allows access to different commands that affect the open window.

Screen Quarter

This allows placement of the active window into any of 5 positions.

Center

This places the open window in the center of the screen.

Upper Left

This places the open window in the upper left corner of the screen.

Upper Right

This places the open window in the upper right corner of the screen.

Lower Left

This places the open window in the lower left corner of the screen.

Lower Right

This places the open window in the lower right corner of the screen.

Cascade Windows

This makes all open windows appear in a stacked format.

Keep Picture

This saves the current window view to a BitMap File.

Help Menu

This menu allows access to all forms of help.

Help Topics

This offers a list of commonly asked help subjects. We have made a concerted effort to develop the Help files and the manual together. If you need an answer as to what a particular command does go to the help files. You will likely find your answer there.

About

This displays information about your EASE program.

Memory Used

This submenu displays the computer memory actually used.

Import EASE 2.x Speaker File Window

See also Import EASE 2.x Material File Window
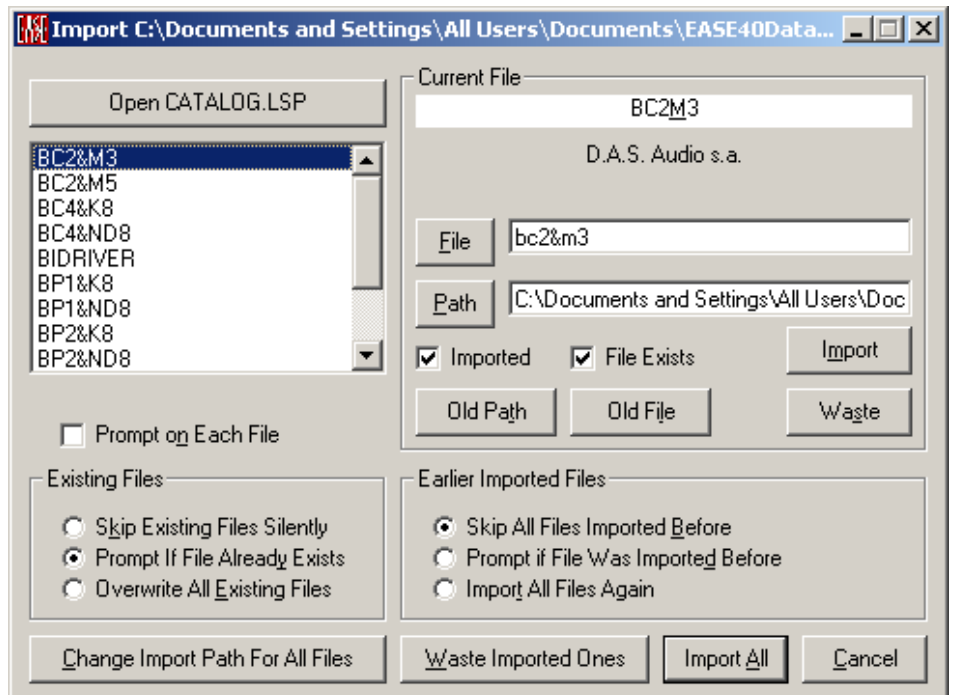
Open CATALOG.LSP

This displays an **Open File** window. Browse to find the desired **CATALOG.LSP** file, Left click to select it, and Left click **Open**.

Speaker Model List Window

This window lists the **Speaker Models** in the selected CATALOG.LSP. When the window opens, the first file will be highlighted, and will be listed as the **Current File**.

Current File

This is the file selected in the Speaker Model List Window. The **Manufacturer's Name** will be listed below the window.

File

This Filename will be used for EASE 4.4 **Speaker Model** data. Left click **File** to use the EASE 2.1 **Speaker Model**, or type a new name in the data window.

Path

This Path will be used for EASE 4.4 **Speaker Model** data. Accept the path shown, left click on **Path** to browse for a new path, or type a new path. Note: This changes the **Path** only for the current selected **Speaker Model**. To change the **Path** for all **Speaker Models**, use **Change Import Path For All Files**.

Imported

A check mark indicates an **Imported Speaker Model** with that name exists already as imported in the **Import Speaker List**.

File Exists

A check mark for **File Exists** indicates a **Speaker Model** with that name is already in the selected subfolder.

Import

Left click on **Import** immediately saves the selected **Speaker Model** to the file name and path.

Old Path

If **Imported** is checked, left click on **Old Path** will restore the path name in the **Path** field above to the one noted in the import book, that is, the path used when the current speaker was imported previously. Only useful if you have modified the **Path** field before. This option is only available if an import book exists.

Old File

If **Imported** is checked, Left click on **Old File** will restore the file name in the **File** field above to the one noted in the import book, that is, the file name used when the current speaker was imported previously. Only useful if you have modified the **File** field before. This option is only available if an import book exists.

Waste

Left click to remove the selected **Speaker Model** from the import list.

Prompt on Each File

If checked, EASE will ask before Importing Each File.

Existing Files

This selects the criteria for replacing existing EASE 4.4 **Speaker Model** files. **Skip Existing Files Silently** will automatically not overwrite existing files. **Prompt If File Already Exists** will ask before overwriting. **Overwrite All Existing Files** will not ask and will **Overwrite**.

Earlier Imported Files

This selects criteria for overwriting previously imported **Speaker Models**. **Skip All Files Imported Before** will not **Import** a **Speaker Model** already Imported. **Prompt if File Was Imported Before** asks whether to overwrite a previously **Imported Speaker Model. Import All Files Again** converts the selected **Speaker Models** and overwrites existing files**.**

Change Import Path For All Files

This opens a Browse Window to select a save path for all **Speaker Models** being **Imported** now.

Waste Imported Ones

Left click to remove **Speaker Models** from the import list that already exist in the **Global** database.

Import All

Left click to **Import All Speaker Models** in the selected CATALOG.LSP according to the settings of the options.

Cancel

Left click **Cancel** to stop all **Import** operations and close the window.

Import EASE 2.x Material File Window
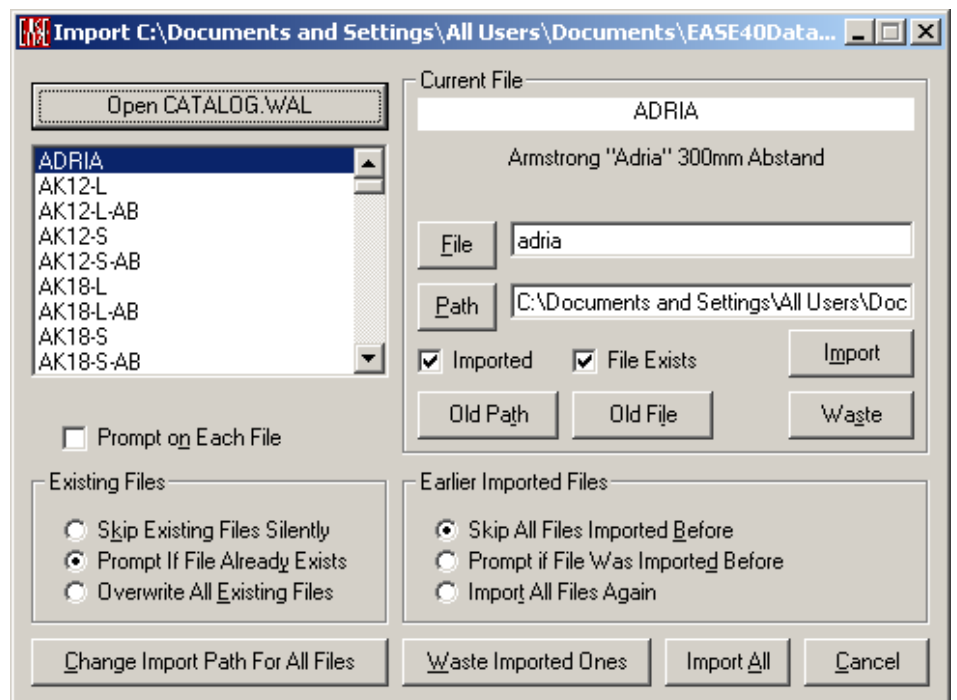
Open CATALOG.WAL

This displays an **Open File** window. Browse to find the desired **CATALOG.WAL** file, Left click to select it, and Left click **Open**.

Wall Material List Window

This window lists the **Wall Materials** in the selected CATALOG.WAL. When the window opens, the first file will be highlighted, and will be listed at the **Current File**.

Current File

This is the file selected in the **Wall Material** List Window. The **Manufacturer's Name** will be listed below the window.

File

This Filename will be used for EASE 4.4 **Wall Material** data. Left click **File** to use the EASE 2.1 **Wall Material** name, or type a new name in the data window.

Path

This Path will be used for EASE 4.4 **Wall Material** data. Accept the path shown, or Left click on **Path** to browse for a new path, or type a new path. Note: This changes the Path only for the current selected **Wall Material**. To change the **Path** for all **Wall Material**s, use **Change Import Path For All Files**.

Imported

A check mark indicates an **Imported Wall Material** with that name exists already as imported in the **Import Material List**

File Exists

A check mark for **File Exists** indicates a **Wall Material** with that name is already in the selected subfolder.

Import

Left click on **Import** immediately saves the selected **Wall Material** to the file name and path.

Old Path

If **Imported** is checked, Left click on **Old Path** will restore the path name in the **Path** field above to the one noted in the import book, that is, the path used when the current material was imported previously. Only useful if you have modified the **Path** field before. This option is only available if an import book exists.

Old File

If **Imported** is checked, Left click on **Old File** will restore the file name in the **File** field above to the one noted in the import book, that is, the file name used when the current material was imported previously. Only useful if you have modified the **File** field before. This option is only available if an import book exists.

Waste

Left click to remove the selected **Wall Material** from the import list.

Prompt on Each File

If checked, EASE will ask before Importing Each File.

Existing Files

This selects the criteria for replacing existing EASE 4.4 **Wall Material** files. **Skip Existing Files Silently** will automatically not overwrite existing files. **Prompt If File Already Exists** will ask before overwriting. **Overwrite All Existing Files** will not ask and will **Overwrite**.

Earlier Imported Files

This selects criteria for overwriting previously imported **Wall Materials**. **Skip All Files Imported Before** will not **Import** a **Wall Material** already imported. **Prompt if File Was Imported Before** asks whether to overwrite a previously **Imported Wall Material**. **Import All Files Again** converts the selected **Wall Materials** and overwrites existing files**.**

Change Import Path For All Files

This opens a Browse Window to select a save path for all **Wall Materials** being **Imported** now.

Waste Imported Ones

Left click to remove **Wall Materials** from the import list that already exist in the **Global** database.

Import All

Left click to **Import All Wall Materials** in the selected CATALOG.WAL according to the settings of the options.

Cancel

Left click **Cancel** to stop all **Import** operations and close the window.

CADP2 Import Check Window

CADP2 Devices, Absorbers, and Arrays used by a **CADP2 Job File,** and **CADP2 Devices** used by a **CADP2 Array** file must be imported before importing the **Array File** and/or **Job File**. If **Device, Absorber, or Array** files are missing, the **CADP2 Import Check** window will open.
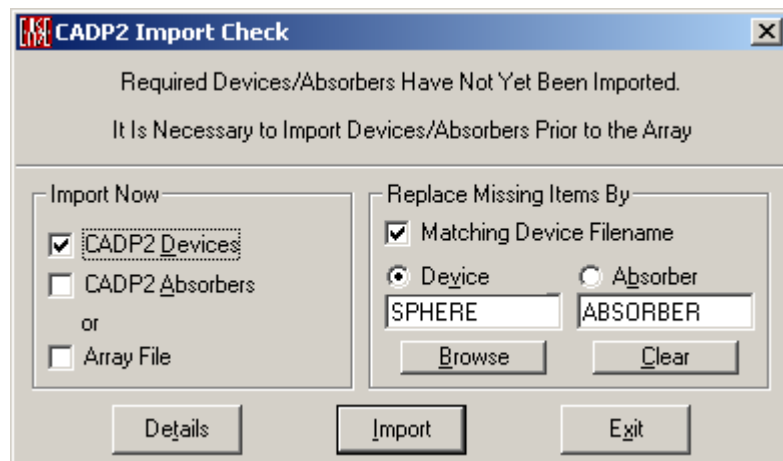
Import Now

CADP2 Devices

If a check mark is here, Left click on **Import** will **Import CADP2 Devices**.

CADP2 Absorbers

If a check mark is here, Left click on **Import** will **Import CADP2 Absorbers**.

Array File (This option is not shown if the **Job File** option is shown)

If a check mark is here, Left click on **Import** will **Import** the selected **Array File**.

Job File (This option is not shown if the **Array File** option is shown)

If a check mark is here, Left click on **Import** will **Import** the selected **Job File**.

Replace Missing Items By

This defines how EASE reacts to missing **Device** or **Absorber** files.

Matching Device Filename

If checked, EASE will substitute an already imported **Speaker Model** having the same filename as the **Device** in the **Job File**.

Device

EASE will substitute the **Speaker Model** listed in the window below for missing CADP2 Devices.

Absorber

EASE will substitute the **Wall Material** listed in the window below for missing CADP2 **Absorbers**.

Browse

This will open a Browse window so that a **Speaker Model** or **Wall Material** can be selected to substitute for any missing CADP2 data.

If **Device** is selected a **Speaker Model** file will be selected. If **Absorber** is selected a **Wall Material** file will be selected.

Clear

If **Device** is selected this enters **SPHERE** in the box to use the default **Speaker Model** for any missing CADP2 data.

If **Absorber** is selected this enters **ABSORBER** in the box to use the default **Wall Material** for any missing CADP2 data.

Details

It tells you the missing Device and Absorber files when importing a job.

Import

This **Imports Devices, Absorbers,** an **Array,** or a **Job File** using the option settings selected.

Exit

This ends import of missing CADP2 data and closes the window.

Import CADP2 Array Window

This window appears if a CADP2 Job being imported contains **Arrays**.
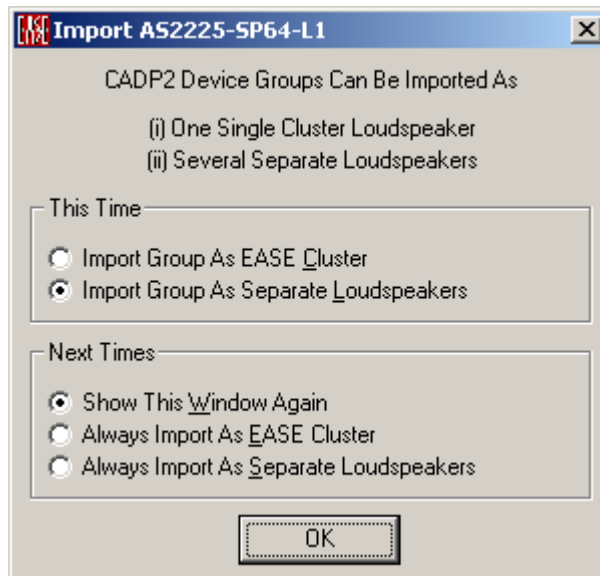
This Time

Tells EASE how to Import the Current **CADP2 Device Group.**

Import Group as EASE Cluster

If selected, this CADP2 Group will be **Imported** as a single EASE **Cluster**.

Import Group as Separate Loudspeakers

If selected, this CADP2 Group will be **Imported** as **Separate Loudspeakers**.

Next Times

This tells EASE how to **Import** additional **CADP2 Device Groups**.

Show This Window Again

If selected, EASE will ask before **Importing** each **CADP2 Device Group**.

Always Import as EASE Cluster

If selected, EASE will **Import all CADP2 Device Groups** as EASE **Clusters** without asking.

Always Import as Separate Loudspeakers

If selected, EASE will **Import all CADP2 Device Groups** as individual **Loudspeakers** without asking.

OK

This Imports the selected **CADP2 Array** and, unless **Show This Window Again** is selected, closes the window.

Import CADP2 Devices Window

See also Import CADP2 Absorber Window
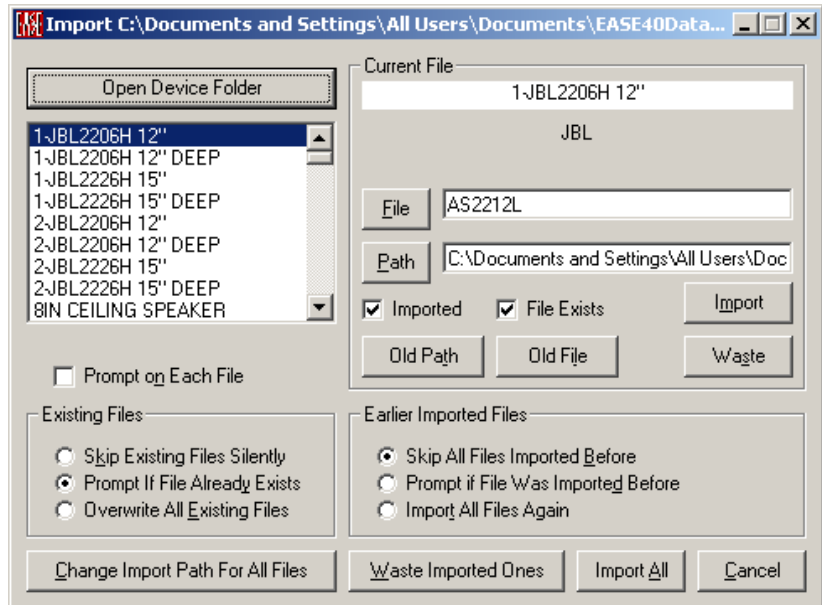
Open Device Folder

Speaker Models are called **Devices** in CADP2, and their data is contained in individual files, one for each **Device**. They may all be in the same folder or in different folders. When a folder holding **CADP2 Device Data** is selected, its **Devices** will be listed in the large window below this button. If the desired **CADP2 Device Folder** is not already open, Left click **Open Device Folder**. This displays an **Open Folder** window. Browse to find the desired **CADP2 Device (.DEV) Folder,** Left click to select it, and Left click **OK**.

CADP2 Device List Window

This window lists the **Devices** in the selected **CADP2 Device Folder**. When the window opens, the first **Device** will be highlighted, and will be listed as the **Current File**.

Current File

This is the file selected in the **CADP2 Device List** Window. The **Manufacturer's Name** will be listed below the window.

File

This Filename will be used for EASE 4.4 **Speaker Model** data. Left click **File** to use the CADP2 Device Name, or type a new name in the data window.

Path

This Path will be used for EASE 4.4 **Speaker Model** data. Accept the path shown, Left click on the **Path** button to browse for a new path, or type a new path. *Note: This changes the Path only for the current selected CADP2 Device. To change the **Path** for all CADP2 Devices, use **Change Import Path For All Files***.

Imported

A check mark indicates that an **Imported Speaker Model** with this name exists already as imported in the **Import Speaker List**

File Exists

A check mark for **File Exists** indicates a **Speaker Model** with that name is already in the selected subfolder.

Import

Left click on **Import** immediately saves the converted **Speaker Model** to the file name and path.

Old Path

If **Imported** is checked, Left click on **Old Path** to restore the path name in the **Path** field above to the one noted in the import book, that is, the path used when the current speaker was imported previously. Only useful if you have modified the **Path** field before. This option is only available if an import book exists.

Old File

If **Imported** is checked, Left click on **Old File** to restore the file name in the **File** field above to the one noted in the import book, that is, the file name used when the current speaker was imported previously. Only useful if you have modified the **File** field before. This option is only available if an import book exists.

Waste

Left click to remove the selected **CADP2 Device** from the import list.

Prompt on Each File

If checked, EASE will ask before importing each file.

Existing Files

This selects the criteria for file replacement. **Skip Existing Files Silently** will automatically not overwrite existing files. **Prompt If File Already Exists** will ask before overwriting. **Overwrite All Existing Files** will not ask and will **Overwrite**.

Earlier Imported Files

This selects criteria for overwriting previously imported **Speaker Models**. **Skip All Files Imported Before** will not **Import** a **Speaker Model** already Imported. **Prompt if File Was Imported Before** asks whether to overwrite a previously **Imported Speaker Model. Import All Files Again** converts the selected **Speaker Models** and overwrites existing files**.**

Change Import Path For All Files

This opens a Browse Window to select a save path for all **Speaker Models** being **Imported** now from CADP2.

Waste Imported Ones

Left click to remove CADP2 Devices from the import list that already exist in the **Global** database.

Import All

Left click to **Import All** CADP2 Devices in the selected CADP2 Device file according to the settings of the options.

Cancel

Left click **Cancel** to stop all **Import** operations and close the window.

Import CADP2 Absorber Window
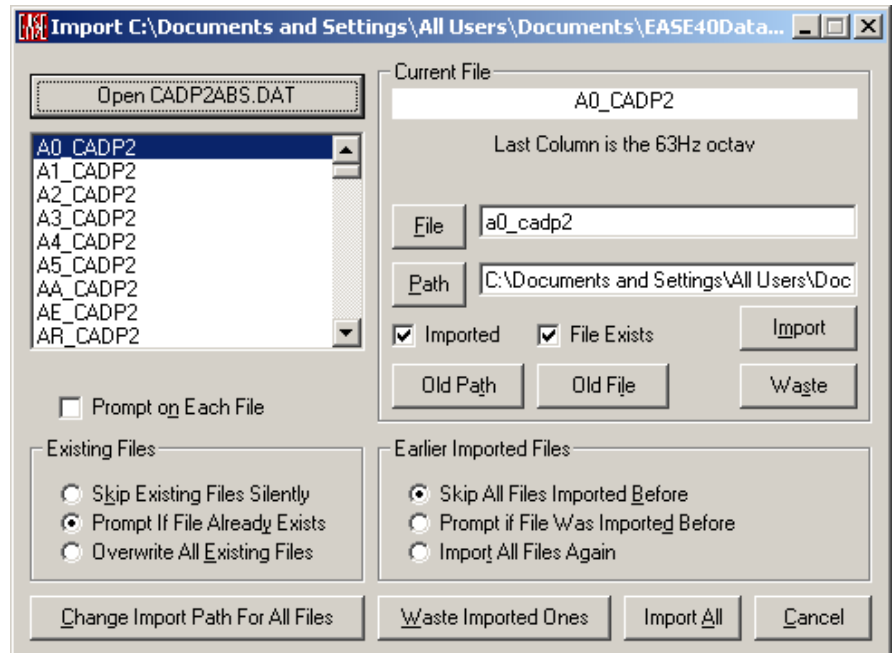
Open CADP2ABS.DAT

CADP2 Absorber data for multiple absorber types is contained in a file named CADP2ABS.DAT. If the desired CADP2 Absorber Data File is not already open (a list of absorbers will be present in the large data window below the button if it is), Left click **Open CADP2ABS.DAT**. This displays an **Open File** Window. Browse to find the desired **CADP2ABS.DAT File,** Left click to select it, and Left click **Open**.

CADP2 Material List Window

This window lists the **Devices** in the selected CADP2 Absorber File. When the window opens, the first Material will be highlighted, and will be listed as the **Current File**.

Current File

This is the file selected in the CADP2 Material List Window. The **Manufacturer's Name** will be listed below the window.

File

This Filename will be used for EASE 4.4 **Wall Material** data. Left click **File** to use the CADP2 Material Name, or type a new name in the data window.

Path

This Path will be used for EASE 4.4 **Wall Material** data. Accept the path shown, Left click on **Path** button to browse for a new path, or type a new path. Note: This changes the Path only for the current selected CADP2 Material. To

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change the **Path** for all CADP2 Materials, use **Change Import Path For All Files**.

Imported

A check mark indicates an **Imported Wall Material** with that name exists already as imported in the **Import Material List.**

File Exists

A check mark for **File Exists** indicates a **Wall Material** with that name is already in the selected subfolder.

Import

Left click on **Import** immediately saves the converted **Wall Material** to the file name and path.

Old Path

If **Imported** is checked, Left click on **Old Path** will restore the path name in the **Path** field above to the one noted in the import book, that is, the path used when the current material was imported previously. Only useful if you have modified the **Path** field before. This option is only available if an import book exists.

Old File

If **Imported** is checked, Left click on **Old File** will restore the file name in the **File** field above to the one noted in the import book, that is, the file name used when the current material was imported previously. Only useful if you have modified the **File** field before. This option is only available if an import book exists.

Waste

Left click to remove the selected **CADP2 Material** from the import list.

Prompt on Each File

If checked, EASE will ask before importing each file.

Existing Files

This selects the criteria for file replacement. **Skip Existing Files Silently** will automatically not overwrite existing files. **Prompt If File Already Exists** will ask before overwriting. **Overwrite All Existing Files** will not ask and will **Overwrite**.

Earlier Imported Files

This selects criteria for overwriting previously imported **Wall Materials**. **Skip All Files Imported Before** will not **Import** a **Wall Material** already Imported. **Prompt if File Was Imported Before** asks whether to overwrite a previously **Imported Wall Material. Import All Files Again** converts the selected **Wall Materials** and overwrites existing files**.**

Change Import Path For All Files

This opens a Browse Window to select a save path for all **Wall Materials** being **Imported** now from CADP2.

Waste Imported Ones

Left click to remove CADP2 Materials from the import list that already exist in the **Global** database.

Import All

Left click to **Import All** CADP2 Materials in the selected CADP2 Material file according to the settings of the options.

Cancel

Left click **Cancel** to stop all **Import** operations and close the window.

Save Speaker Models Window

See also Save Wall Materials Window
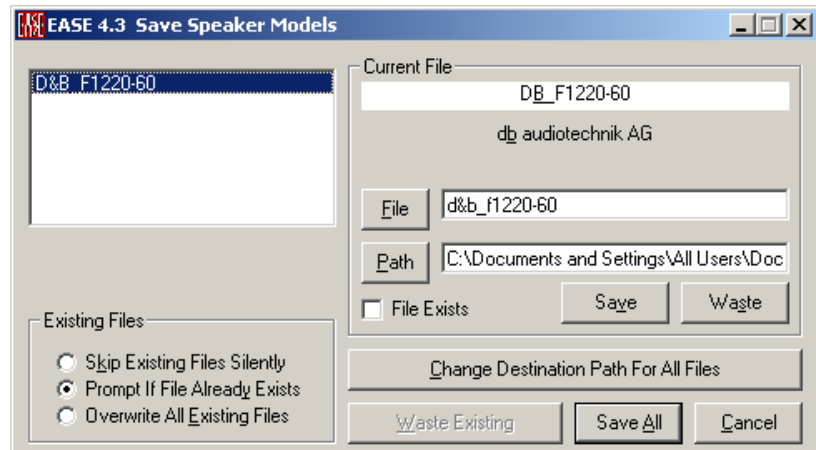
Speaker Model List Window

This window lists the **Speaker Models** in the selected folder. When the window opens, the first **Speaker Model** will be highlighted, and will be listed as the **Current File**. To select another model, Left click on it.

Current File

This is the file selected in the **Speaker Model List** Window. The **Manufacturer's Name** will be listed below the window.

File

This Filename will be used for the current EASE 4.4 **Speaker Model** data. Left click **File** to use the Current File name, or type a new name in the data window.

Path

This Path will be used for EASE 4.4 **Speaker Model** data. Accept the path shown, Left click on **Path** button to browse for a new path, or type a new path. Note: This changes the Path only for the current selected Speaker Model. To change the **Path** for all **Speaker Model**s, use **Change Destination Path For All Files**.

File Exists

A check mark for **File Exists** indicates a **Speaker Model** with that name is already in the selected **subfolder**.

Save

Left click immediately saves the selected **Speaker Model** to the filename and path.

Waste

Left click to remove the selected **Speaker Model** from the import list.

Change Destination Path For All Files

This opens a Browse Window to select a save path for all **Speaker Models** being **Imported** now from CADP2.

Existing Files

This selects the criteria for file replacement. **Skip Existing Files Silently** will automatically not overwrite existing files. **Prompt If File Already Exists** will ask before overwriting. **Overwrite All Existing Files** will not ask and will **Overwrite**.

Waste Existing

Left click to remove **Speaker Models** from the import list that already exist in the **Global** database.

Save All

Left click to **Import All Speaker Models** in the **Speaker Model List Window** according to the settings of the options.

Cancel

Left click **Cancel** to stop all **Import** operations and close the window.

Save Wall Materials Window
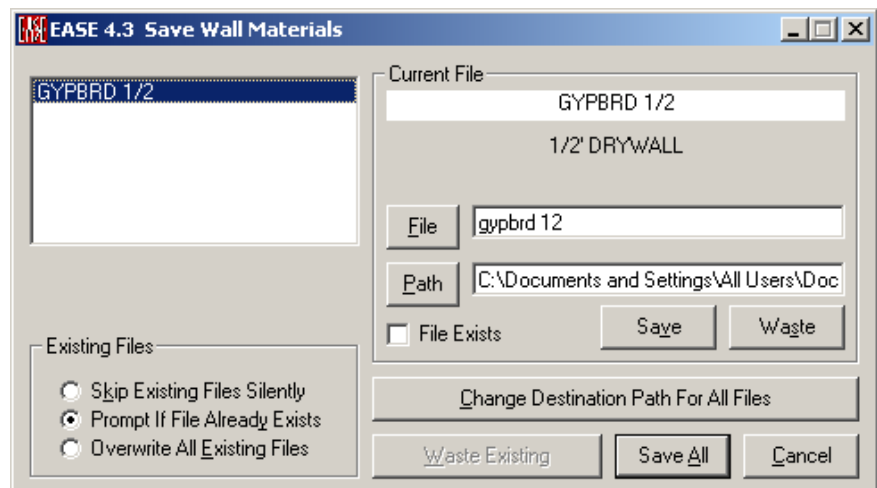
Wall Material List Window

This window lists the **Wall Materials** in the selected folder. When the window opens, the first **Wall Material** will be highlighted, and will be listed at the **Current File**.

Current File

This is the file selected in the **Wall Material List Window**. The **Manufacturer's Name** will be listed below the window.

File

This Filename will be used for the current EASE 4.4 **Wall Material** data. Left click **File** to use the **Current** File name, or type a new name in the data window.

Path

This Path will be used for EASE 4.4 **Wall Material** data. Accept the path shown, Left click on **Path** button to browse for a new path, or type a new path. *Note: This changes the Path only for the current selected Wall Material. To change the **Path** for all **Wall Materials**, use **Change Destination Path For All Files**.*

File Exists

A check mark for **File Exists** indicates a **Wall Material** with that name is already in the selected **subfolder**.

Save

Left click immediately saves the selected **Wall Material** to the filename and path.

Waste

Left click to remove the selected **Wall Material** from the import list.

Change Destination Path For All Files

This opens a Browse Window to select a save path for all **Wall Materials** being **Imported** now.

Existing Files

This selects the criteria for file replacement. **Skip Existing Files Silently** will automatically not overwrite existing files. **Prompt If File Already Exists** will ask before overwriting. **Overwrite All Existing Files** will not ask and will **Overwrite**.

Waste Existing

Left click to remove **Wall Materials** from the import list that already exist in the **Global** database.

Save All

Left click to **Import All Wall Materials** in the **Wall Material List Window** according to the settings of the options.

Cancel

Left click **Cancel** to stop all **Import** operations and close the window.

Import-Export DXF

The DXF Converter of EASE 4.4 can handle all elements used in EASE.

This means Edges, Faces, Areas, Loudspeakers, Seats, Lamps and IR Emitters.

If you would like to import a DXF file in EASE 4, you need to realize that not all elements which are possible in your CAD drawing can be read by the DXF Converter.

In almost all cases you must simplify your CAD project with respect to 3D-objects or any other complex components like Regions.

If you want to import speakers, seats, lamps or emitters, do not explode those **BLOCK**s, but put them on suitable layers (see below).

When you are finished simplifying the drawing you should have only the simple elements listed below under **Import DXF**.

In the case that you have a huge drawing and you do not want to erase the elements that should not imported in EASE, please **FREEZE** the **LAYER** or switch it **OFF**.

Some hints for AutoCAD-Users

The preferred method to create a new room in AutoCAD is to draw using **3D SOLID**s.

The special shape of the room elements are then made with the commands **UNION**, **SUBTRACT**, **INTERSECT**, **SLICE** and **INTERFERE**.

The easiest way to convert simple **3D SOLID**s with no curved surfaces and **REGION**s to elements that can be read by EASE is to use the XEDGES command available in AutoCAD 2007 or later. But keep in mind that you need to use the "**Closed Multiple Lines to Faces**" option then which needs every edge between two faces to have two identical lines. That's why it is better to use EXPLODE first and then XEDGES to produce lines from the REGIONS, or do the XEDGES twice. Furthermore take into account that Splines are not read in to EASE.

If you have AutoCAD 2006 or earlier then the drawing can be exported to 3D Studio "*.3DS" file format (3DSOUT). If you then import this format back in to AutoCAD (3DSIN), you will have meshes of the surfaces. If you want to import materials, please sort the faces to the right layers. The layer names must have the names of the EASE materials. If you don't want to do the procedure with 3D-Studio export / import, you need to explode the **BOX**es and **WEDGE**s and **3D SOLID**s to **LINE**s. Do not use 3D **SOLID**s with round faces (**SPHERE, CYLINDER, CONE** or **TORUS**), because those solids explode to **BODY**s, which cannot be imported into EASE with the current converter. The same is true for **EXTRUDED** round 2D elements and **REVOLVE**d **3D SOLIDS**.

Another very good idea is to use the commands for **3D SURFACES** in AutoCAD: **BOX, WEDGE, PYRAMID, CONE, SPHERE, DOME, DISH, TORUS, MESH, REVSURF** (revolved surface), **TABSURF** (tabulated surface), **RULESURF** (ruled surface) and **EDGESURF** (edge surface). These commands make nets of polylines with selectable mesh density. Here all curves are approximated by plane areas.

If you have received an AutoCAD drawing that you want to import in to EASE, you may need to process it first, to make sure it only has **transmittable** drawing elements (see below). Parts of the drawing which do not belong to the room should be **ERASE**d or put on frozen **LAYER**s.

If you are not sure what kind of elements you have in your drawing and how many of them there are, use the LISP command **SSX**. Type **SSX** and then don't pick an element, use the **ENTER** key. Next type **E** for element and then the name of the element you are interested in, for instance **BODY**, **BLOCK** and so on. After the final **ENTER** the number of elements that are in the drawing is output. If you pick one element from the display after typing **SSX,** that type of the element is explored. Alternatively you can use the "Property" window, to analyze your drawing. In newer versions of AutoCAD you can use the QSELECT command to see the entities in the "Object Type" box.

There are some programs, like "3D Studio (MAX)" (*.3DS) or "Corel Dream 3D" (*.D3D or *.RD4) which have a DXF export of 3D faces and which produce no problems.

Some hints, if you do not have AutoCAD

If you are an EASE user that does not have AutoCAD and you have received a DXF file from somewhere, you will need to use EASE to investigate what is in the CAD drawing. You likely do not know anything about the included elements, but nevertheless you want to import it into EASE. In this case try the following steps.

To get a fast impression of the contents of the DXF 'black box', use the DXF Import, do not choose any of the check-boxes and type zero for the '**Vertex Snap Cube**' to maintain all original coordinates. This will make the import routine faster.

After importing into EASE, have a look at the contents and make the first decisions.

Do you think that the DXF should contain more objects (maybe because it is a big file)? Then first try the option "**Include 'off' and 'frozen' Layers**". Do you see more objects now?

Second decision, see if the coordinates are in the right locations. If not, try to change the unit conversion values in the DXF Import window.

In the case where you see a lot of edges in your imported project which can build faces, choose the '**Closed multiple Lines to Faces**' option.

In case you see a lot of small faces in your imported project, choose the '**Collect Scattered Faces**' option. If this option creates faces which intersect, which means that one face is going through another face, without an intersection line, then choose '**Cut Intersecting Faces**'.

If you get too many vertices on the borders of the faces, try to '**Straighten Border of Faces**' and increase the value of the '**Vertex Snap Cube**' for a rougher grid.

To make the project simpler, try to increase the '**Plane Face Tolerance**' parameter. Then the '**Collect Scattered Faces**' option will combine more faces and the number of resulting faces will decrease.

Last we will mention the '**Waste Outside Faces**' option. Use this option only if you are sure that the project has a lot of faces that do not belong to the inside of the room.

If you are unable to manipulate the DXF with AutoCAD, you will not be able to set appropriate spy-points (see below). The automatically set spy-point is in the geometrical center of all elements in DXF. So you cannot be sure that this point will be inside the room to analyze!

For the first run do not choose a high '**Detection Order**' or '**Auto**' because if the project has a lot of faces it can take quite a long time to process. On the other hand, with this option you have the additional advantage that this routine will align all faces and will find two-fold faces.

Import DXF Window

This window sets options for importing AutoDesk DXF files into EASE.
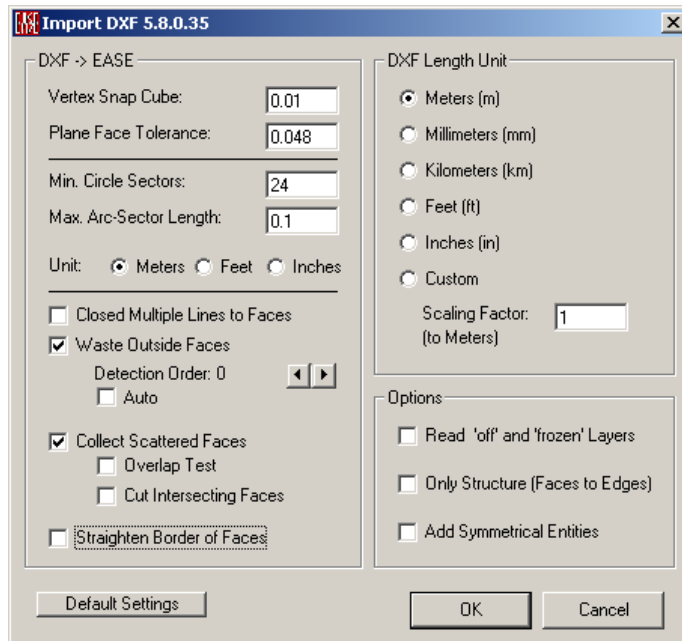
Default Settings

Left click sets all conversion parameters to their defaults.

OK

Left click accepts all conversion parameters and begins the conversion.

Cancel

Left click cancels the conversion and closes the window.

DXF -> EASE

This sets conversion parameters for the DXF to EASE conversion.

Vertex Snap Cube

If there are two points in the DXF file having coordinates which differ less than this increment in one direction, these points will weld together to one point. The coordinates of the second (neighbor) point will be changed to the coordinates of the first point.

Plane Face Tolerance

This sets the acceptable tolerance for **Vertices** lying within a plane.
Two points of the face cannot have a larger face-perpendicular distance than this parameter declares.

Min. Circle Sectors

This sets the minimum number of line segments that will be used for each circle. All circular items in EASE must be represented by discrete line segments, as curved surfaces are not allowed. This is also used for all arcs and will use half this number for a half circle, for instance.

Max. Arc-Sector Length

This sets the maximum length of each line segment of a divided circle or arc. For large circles this will increase the number of line segments that divide a circle in EASE.

Unit

This sets the unit used to express all settings in the options above.

Closed Multiple Lines to Faces

If checked, closed multiple lines will be converted to **Faces**. This will create a **Face** from a set of lines that are planar, are connected end-point to start-point, and completely enclose a region.

Waste Outside Faces

If checked, the DXF import routine will use a ray tracing algorithm during import to detect the inside faces and to mark the outside ones. Faces which are found outside the room will be assigned the material "Waste" in EASE. To remove them physically, delete them in EASE. If there are a lot of faces to remove, export the project to DXF and delete the layer "Waste" in AutoCAD.

In the ray tracing algorithm twofold Faces are found and also marked.

Detection Order (Scroll bar)

Here you can set the detection order of the Ray Tracing algorithm.

To limit the calculation time try lower orders first.

Auto

EASE will run up to that order (max. 10) until it is estimated that all internal faces are found. This option may last very long.

Spy-Points

A spy-point is a source of detection-rays. To set appropriate spy-points you have to draw "Points" in the DXF File on the special layer "EASE-SPY".

For very complex projects it is strongly recommended to draw many spy-points. Make at least one in every aisle or next room connected by an open window. In this case you can choose detection order 1 or 2 and the time for the ray-tracing will be acceptable.

If you have no spy-point in your DXF File, EASE will start with one in the center of the DXF coordinates of the room.

Collect Scattered Faces

If checked, scattered **Faces** will be collected together into one **Face**. This will create a single **Face** from a set of faces that are planar, and completely fill a region.

Overlap Test

This function should only be used if the DXF import with regular settings shows holes or missing faces. Due to some ways of how drawings are entered in AutoCAD it can be that the collection of scattered **Faces** creates holes in

overlapping areas. If such errors are obvious in the EASE drawing the import should be repeated with **Overlap Test** switched on.

Cut Intersecting Faces

If the collecting of scattered faces has created faces that intersect each other (and they have the same border points), this option will cut those faces into pieces.

Straighten Border of Faces

If checked, the borders of **Faces** will be straightened as they are imported.

(Imagine three successive points at the border of a face and connect the first with the third by a line. If the second point is nearer to the connection line than a quarter of the snap-tolerance for points, then this middle point will be deleted.)

DXF Length Unit

This tells EASE the units of the DXF file.

Conversion to Meters from

EASE uses Meters internally for all data and calculations, regardless of how units are set for user data entry and display. When converting from the DXF file, all coordinates will be converted to Meters. This selection tells EASE the units of the DXF file.

Scaling Factor

This tells EASE to scale (multiply all linear dimensions of) the DXF file by the factor in the entry box.

Options

Read 'off' and 'frozen' Layers

If checked, any elements in the DXF file that are on layers that are off or frozen are read in.

Only Structure (Faces to Edges)

Maybe you have a complicated DXF model which cannot be imported easily and a lot of work would need to be done in EASE to repair the model to use it as an EASE room. In some cases it is recommended that you then import the DXF as **Edges** only. You can use the coordinates of the **Edges** to draw your own EASE **Faces**. When finished you can then delete all these auxiliary **Edges**.

Add Symmetrical Entities

If checked, the DXF data will be assumed to be for half of a symmetrical room, and all entities will be imported as symmetrical.

Importable DXF Elements

In the following all DXF Elements are listed that can be imported into EASE.

For Edges, Faces, Areas:

Lines

- are read as **Edges**,

- with thickness: as a quadrangle **Face**,
- if you choose the option "**Closed multiple Lines to Faces**", then:
  if several connected lines build a plane, they will be read as one **Face**.

Polylines [2D (pline) and 3D (3dpoly)]

- open polylines are treated like connected lines and are read as **Edges**,
- included arcs are converted to lines (see below: Arc),
- a polyline is read as a **Face** if it is closed and builds a plane area otherwise it is cut into several plane parts,
- to import open polylines as **Faces**, use the "**Closed Multiple Lines to Faces**" option,
- closed 2D polylines with thickness build a complete body (with floor and ceiling).

2D solids (solid)

- read as **Faces**,
- with thickness: several **Faces** are created to build a complete body.

3D Face

- if the quadrangle is not plane, it will be divided into 2 triangles.

Circle

- will be read as a polygon **Face**. The number of edges of the polygon depends on the parameters chosen in the **Import DXF** Window (**Min. Circle Sectors** and **Max. Arc-Sector Length**),
- with thickness: several **Faces** are created to build a complete body.

Arc

- will be read as several lines. The number of edges of the polygon depends on the parameters chosen in the **Import DXF** Window (**Min. Circle Sectors** and **Max. Arc-Sector Length**).

Meshes [Polyface (pface, edgesurf, tabsurf, rulesurf, revsurf) and Polygonal (mesh)]

- are read as **Faces** for each set of 4 points in the mesh, like they are seen in AutoCAD.

Block

- is read as exploded,
- if it is on a special "EASE" layer, see next item.

For Loudspeakers, Seats, Lamps, Emitters:

Block

- to read **BLOCK**s as EASE elements, they must reside on a layer with a name that starts with "EASE" and then an arbitrary character (normally '-'); the next two characters decide if and to what kind of EASE Element the **BLOCK** will be read.

- **SP** (eakers) or **LO** (udspeakers)   **Speaker**

  SE (ats)   **Seat**

  LA (mps) or **LI** (ghts)   **Lamp**

  IR (infrared) or **EM** (itter)   **IR Emitter**
  or **RA** (diator) or **MO** (dulator)

- EASE reads the positions and the orientations (angles) of the DXF blocks, the cases (shapes) are ignored.

For SPY-points:

Spy-points are used as initial sources for the ray-tracing algorithm if you choose the "**Waste Outside Faces**" checkbox. If you put several spy-points at specific places, you can work with a lower detection order and save much time for the input routine.

Point

- to read **POINT**s as EASE Spy-Points, they must reside on a layer with a name starting with "EASE-SPY".

Colors

The AutoCAD Entity color defines the EASE Face Color.

Two-Fold Face Coding

As mentioned above, the Layer names are the EASE Material names. If a Face is on a Layer which has two Materials in the name, separated by " $ " (like "Face Material Label $ Rear Material Label"), this Face will be imported as "Two-Fold". The first name will be the Face-Material and the second will be the Rear-Material.

Wall Material Coding

If you are working with recent AutoCAD versions, say AutoCAD 2008, then there is almost no restriction for the Layer- and Block- names. If you have an older version, like AutoCAD 2000, then some special characters or symbols cannot be included in Layer names. If the desired EASE Wall Materials or Speaker Models include such characters, you can use a simple conversion. Create layer names where each "illegal" character (e.g. /) is converted to {HX}, where HX is the hexadecimal representation of the character (e.g. {2F}).

Export DXF Window

This window sets options for exporting AutoDesk DXF files from EASE. EASE exports DXF files as AutoCAD 2004 format.
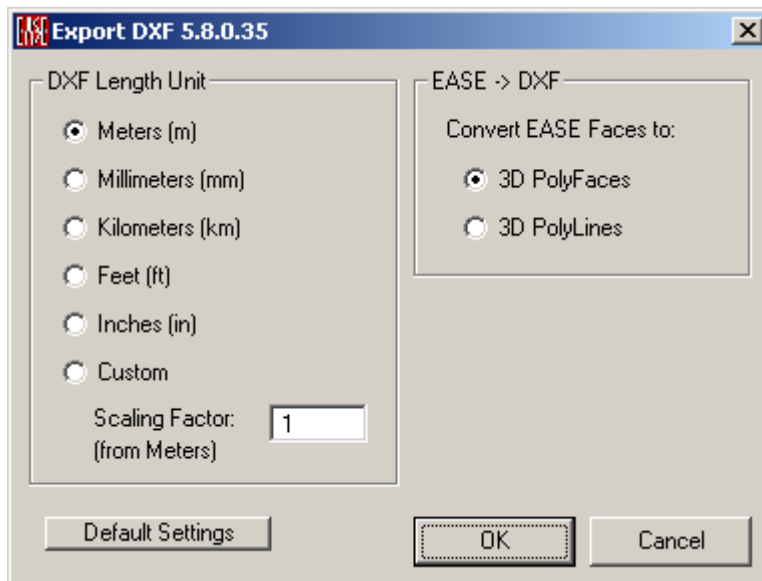
Default Settings

Left click sets all parameters to their defaults.

OK

Left click accepts all conversion parameters and begins the conversion.

Cancel

Left click cancels the conversion and closes the window.

EASE -> DXF

This sets parameters for export of EASE data to AutoDesk DXF format.

Convert EASE Faces to:

3D PolyFaces: This option will create Polyface Meshes. It is recommended for rendering purposes in AutoCAD.

3D Polylines: This AutoCAD element is a wire frame of an EASE Face. This would be the best choice, if you want to change your project in AutoCAD and then re-import it into EASE.

DXF Length Unit

This sets the units for the DXF file.

EASE uses Meters internally for all data and calculations, regardless of how units are set for user data entry and display. When converting EASE Data to

DXF format, all coordinates will be converted from Meters to the units chosen here.

Scaling Factor (from Meters)

This tells EASE to scale (multiply all linear dimensions of) the EASE data by the factor in the entry box to obtain the DXF data.

Colors

The EASE Wall Material Color is the color for the AutoCAD Layer.
The EASE Face Color defines the AutoCAD Entity color.

Two-Fold Face Coding

If the EASE Face is Two-Fold, it will be placed on a Layer which has both Materials in the name, separated by " $ "
(like "Face Material Label $ Rear Material Label").

Wall Material Coding

EASE exports in the AutoCAD 2004 DXF format, where some special characters and symbols cannot be included in Layer names and Block names. If the EASE Wall Materials or Speaker Models include such characters, a simple conversion is used. Each "illegal" character (e.g. /) is converted to {HX}, where HX is the hexadecimal representation of the character (e.g. {2F}).

Import SKP Window

This window sets options for importing Trimble Sketchup files into EASE.
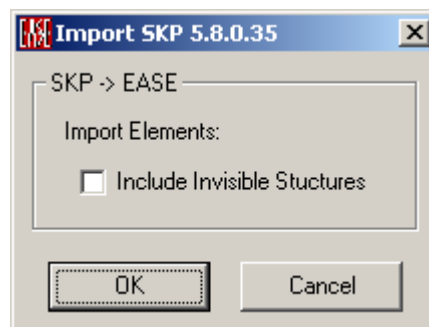
SKP -> EASE

This window sets options for importing Trimble SKP data into EASE 4.4.

EASE can import SKP files from SketchUp 8 or earlier.

Import Elements

Include Invisible Structures: This option should be used if there are invisible elements in the SketchUp file, which need to be imported into EASE.

OK

Left click accepts all conversion parameters and begins the conversion.

Cancel

Left click cancels the conversion and closes the window.

EASE two-fold Faces

If there are layer names that include the " $ " divider, then the SketchUp face is imported as an EASE two-fold face.

EASE coat Faces

All holes in a SketchUp face are converted to EASE coats on the face that contains the hole(s).

If there is a face covering the hole, like a window, the window face should be on a "two-fold" layer name.

If there is a hole at the bottom of a column, this hole will become a bottom face in EASE automatically.

Wall Material Coding

Wall Materials are imported from SketchUp Faces.

Case 1: There are no SketchUp face materials defined

The EASE Face materials are taken from the Layer names. If there are "two-fold" layer names, then the first part is taken as the EASE front material name and the second part is taken as the rear wall material for the two-fold EASE face.
The layer color is used for the EASE face color and as the material color.

Case 2: The SketchUp face has a SketchUp material

The SketchUp rear material is taken as the EASE Front Material, since it is pointing towards the inside of the room, normally.
The SketchUp front material is taken as the EASE rear material, if it is on a "two-fold" layer.

The corresponding material colors are used for the EASE Face colors, the layer color is used for the EASE material color.

If you would like to overwrite the SketchUp materials, please delete the SketchUp material for this face. Or create a SketchUp group of the faces to change with a name starting with "FaceGroup". For these faces the group layer name is used for the EASE face material.

Export SKP Window

This window sets options for exporting Trimble SketchUp files from EASE. EASE exports SKP Files as SketchUp 6 format.

EASE -> SKP

This window sets options for exporting Trimble SKP data from EASE.

Quality of Drawing

Draft (fast): This option should be used if there are no or only a few non-planar EASE Faces.
The Export procedure needs to triangulate all non-planar EASE Faces. These "triangulation lines" will be visible in SketchUp. If there are a lot of those lines, the impression of the EASE room may become lost.

Presentation (medium): This option should be used if there are a lot of non-planar EASE Faces. To get rid of the artificial triangulation lines, every Face will be enclosed by a SketchUp Group. Then only the group borders will be shown. The SketchUp View will be exactly like the EASE view.
The disadvantage is the longer conversion time. So this feature should only be used if one is not satisfied with the Draft view.

EASE (slow): This option should be used when exporting a working (ready) EASE project. After small changes in SketchUp one can re-import this EASE-SKP-File with little or no loss of information. Normally one can re-import with Check Data done.

Assign Wall Material Window

This window is shown after the import of a DXF or SKP file. It allows relating layer or material names of the original drawing to names of **Wall Materials** in EASE. This is particularly useful if the acoustic properties of the surfaces of a room are already known and entered in the DXF/SKP file as layer or material names. The user can then select a **Wall Material** for each layer in order to automatically assign them in EASE to the **Faces** of that layer or material.

Note that this window can be resized for better reading of labels and text fields.
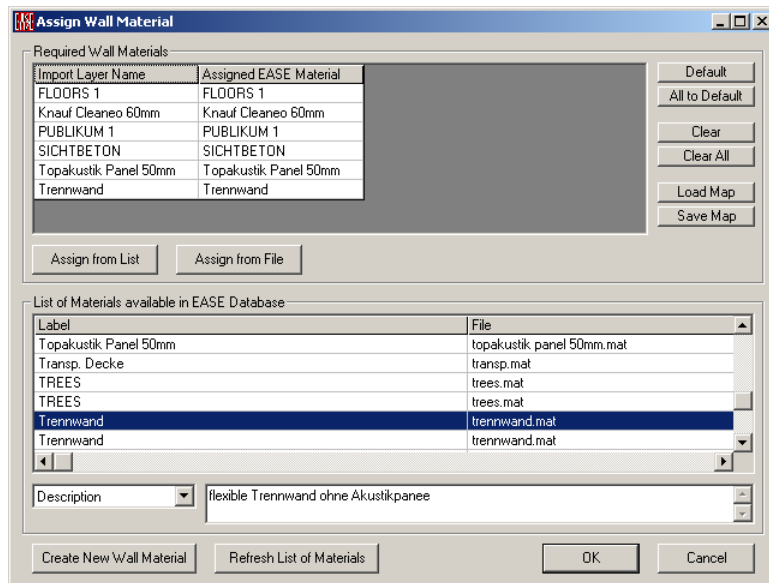
Create New Wall Material

Opens the EASE Material Base program to enter and save a new Wall Material file.

Note that afterwards you have to press **Refresh List of Materials** to be able to assign the new Wall Material.

Refresh List of Materials

Updates the lower list that shows all EASE Wall Material files on the local computer.

OK

Left click accepts all assignments and begins the process.

Cancel

Left click cancels the process and closes the window.

Required Wall Materials

Shows all layer names used in the imported DXF/SKP file. A **Wall Material** should be assigned to those which are related to actual acoustic properties of the surfaces included in the layer.

Assign from List

This assigns the item that is currently selected in the lower list of available **Wall Materials** to the selected layer name.

Assign from File

This allows browsing for a **Wall Material** on the local computer. This is necessary if the file has never been opened by EASE before so that it would know about it.

Default

Assigns the best-matching **Wall Material** to the selected layer name.

All to Default

Assigns the best-matching **Wall Material** to each layer name. Note that when the window opens this is done automatically.

Clear

Removes the assignment of the selected layer name.

Clear All

Remove the assignment from all layer names.

Load Map

Allows loading a text-formatted map file that contains a table of layer names and **Wall Material** files. This map file may have been created manually or saved before using **Save Map**.

This function is particularly useful, if a set of projects sharing the same material database is imported or if a particular project is imported multiple times. It will save you from re-assigning the same **Wall Materials** after every import.

Save Map

Allows saving a text-formatted map file that contains a table of layer names and **Wall Material** files. This map file can be loaded later on using **Load Map**.

This function is particularly useful, if a set of projects sharing the same material database is imported or if a particular project is imported multiple times. It will save you from re-assigning the same **Wall Materials** after every import.

List of Materials available in EASE Database

Shows the list of known **Wall Material** files. The table consists of a **Label** column, a **File** column and a **Path** column. If needed they can be resized for better viewing.

If more details are needed the drop-down list below the table can be used to show the **Description**, the **Label**, the **Filename** or the **Path** of the selected **Wall Material**.

Chapter XIV: Ease Page Designer

EASE Page Designer

EASE Page Designer (**EasePad**) is an EASE add on, allowing multiple picture layouts, text annotations and editing of the page layout format before printing, or for use in printed reports and presentations.

EasePad Main Window
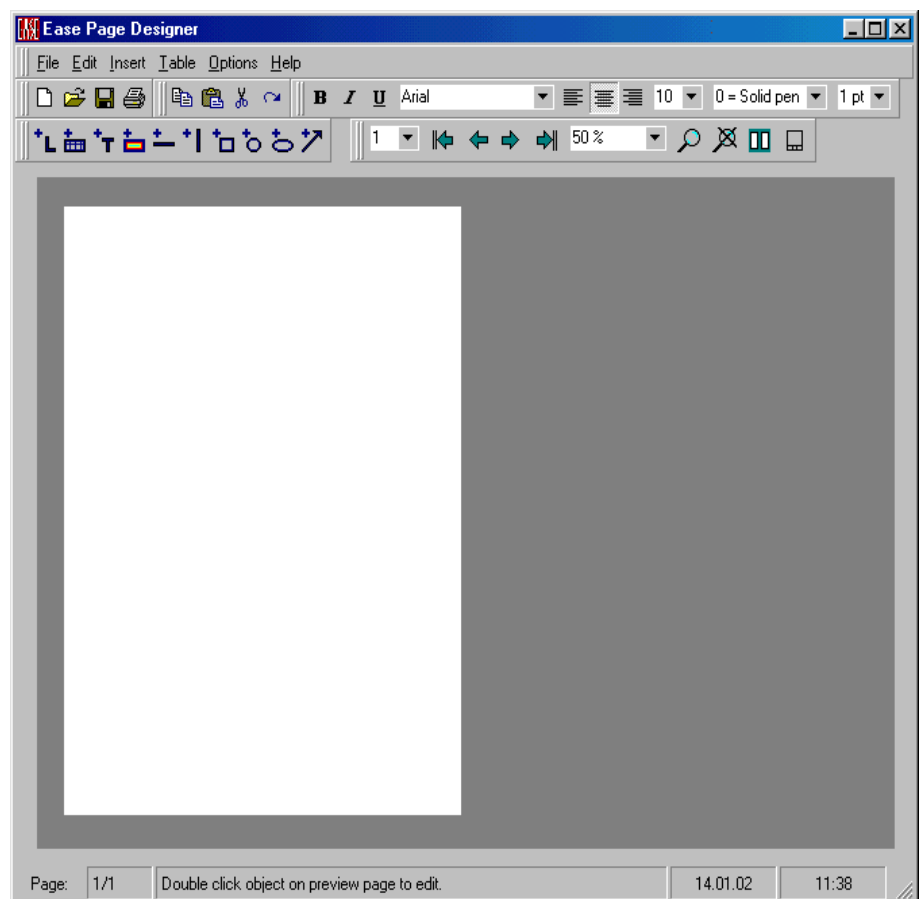
File Menu

This menu accesses file management and printing.

New

This deletes all existing pages and creates a new EasePad project with one empty page.

Open Report File

This allows opening of EasePad project files (.rlf). To use the command browse to the folder for the project file, select the file and left click **Open**.

Load Layout

This allows loading of EasePad layout files (.rly). To use the command browse to the folder for the layout file, select the file and left click **Open**. The loaded layout will be applied to all pages.

Save

This saves the current EasePad project immediately to the existing .rlf file. To save a new project see *Save As Report File*.

Save As Report File

This saves the current EasePad project to a different file name using the .rlf extension. To use the command select the folder to save the project, enter the name of the new file and left click **Save.**

Save Current Page As Picture

This saves the current Page as **Picture** to a file. Supported formats are:

Windows Bitmap……………………………*.BMP

JPEG……………………………………………*.JPG

CompuServe GIF……………………………*.GIF

Portable Network Graphics…………………*.PNG

Tagged File Format…………………………*.TIF

LuRa Tech Wavelet…………………………*.LWF

Zsoft Paintbrush……………………………..*.PCX

Windows Icon……………………………….*.ICO

Enhanced Windows Metafile………………*.EMF

Truevision Targa……………………………*.TGA.

Send Picture To Clipboard

This copies the selected Picture to the windows clipboard**.**

Send Current Page To Clipboard

This copies the current Page to the windows clipboard**.**

Save Layout

This saves the layout of the current Page in an EasePad layout file with the extension .rly. The saved layout items are:

- Page Orientation
- Page Size
- Keep Picture Ratio Flag
- Header
- Footer
- Title Block

Print

This prints the current EasePad project . To use the command select before printing the print procedure :

- print current Page
- print selected pages
- print all pages.

For printing of selected pages enter page numbers before. Separate single pages by ";" and areas by "-", e.g. 3;5;7 or 3-7.

Exit

This exits EasePad.

Edit Menu

This menu allows manipulation of project pages and page objects.

Undo

Reverses the previous action.

Copy

Copies the selected page object inside the EasePad project.

Paste

Pastes the copied page object.

Cut

Deletes the selected page object.

Header

Opens the Edit Header/Footer Window for creating a header label.

Footer

Opens Edit Header/Footer Window for creating a footer label.

Add Page

Adds a project page behind the last page.

Delete Page

Deletes the current shown project page.

Bring To Front

Brings the selected page object to the front of an overlapping objects stack.

Send To Back

Sends a selected page object to the back of an overlapping objects stack .

Insert Menu

This menu allows insertion of various page objects. The mouse pointer over the page defines the object position (upper left corner). The different object types are:

Label

Inserts a text line.

Text

 Inserts a text paragraph.

Table

Inserts a table.

Picture

Inserts a picture. Supported formats are:

> Windows Bitmap…………………………*.BMP
>
> JPEG……………………………………*.JPG
>
> CompuServe GIF…………………………*.GIF
>
> Enhanced Windows Metafile………………*.EMF

Horz Line

Inserts a horizontal line.

Vert Line

Inserts a vertical line.

Rectangle

Inserts a rectangle.

Circle

Inserts a circle.

Ellipse

Inserts an ellipse.

Arrow

Inserts an arrow.

Table Menu

This menu allows manipulation of table type objects.

Add Column

Adds a column to the selected table object.

Delete Column

Deletes a column from the selected table object.

Add Row

Adds a row to the selected table object.

Delete Row

Deletes a row from the selected table object.

Options Menu

This menu allows changes of page layout options.

Page Settings

Opens the EasePad Page Settings Window.

Title Block Layout

Adds/deletes title block and frame to/from all project pages.

Help Menu

This menu allows access to all forms of help.

Help Topics

This offers a list of commonly asked help subjects. We have made a concerted effort to develop the Help files and the manual together. If you need an answer to what a particular command does go to the help files! You will likely find your answer there!

About

This displays information about the EasePad program.

Page Settings Window

This allows changes of page layout settings.
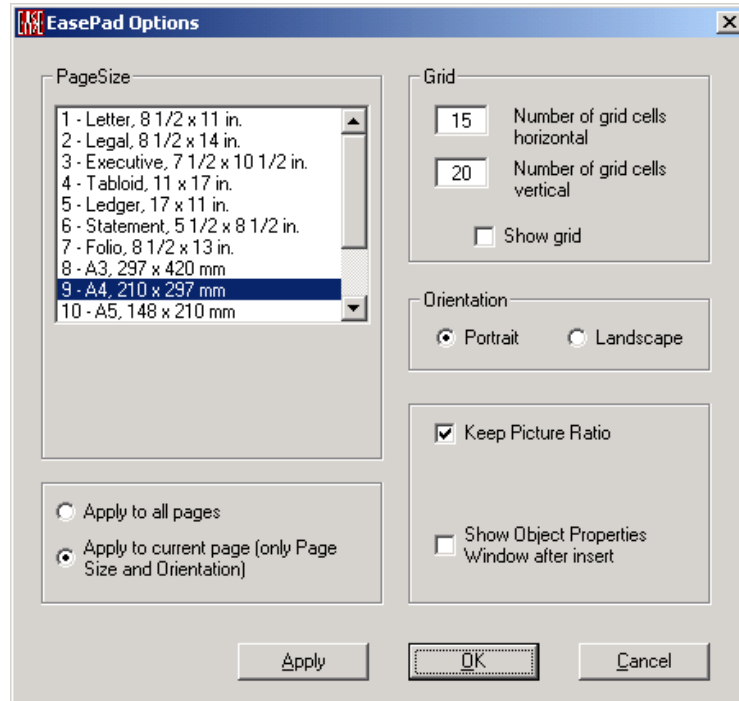
Page Size

Allows the selection of page size for printing.

Grid

Allows you to configure and draw a page grid.

Orientation

Allows changing the page orientation.

Keep Picture Ratio

Allows to fix the height/width ratio for enlarging or reducing of picture type objects.

Show Object Properties Window after insert

Allows opening the Object Properties Windows automatically after a new object is inserted.

Apply to all pages

Applies the selected options to all pages

Apply to current page

Applies the selected page size and orientation only to the current page

Apply

Left click **Applies** changes and keeps **Edit Object** window open.

OK

Left click **Applies** changes and closes **Edit Object** window.

Cancel

Left click discards changes and closes **Edit Object** window.

Edit Object Window

This allows setting of object parameters. To get this window left click to pick the object (label, text, table, picture, horz line, vert line, rectangle, circle, ellipse or arrow) and then Shortcut F4 or RMB Properties.
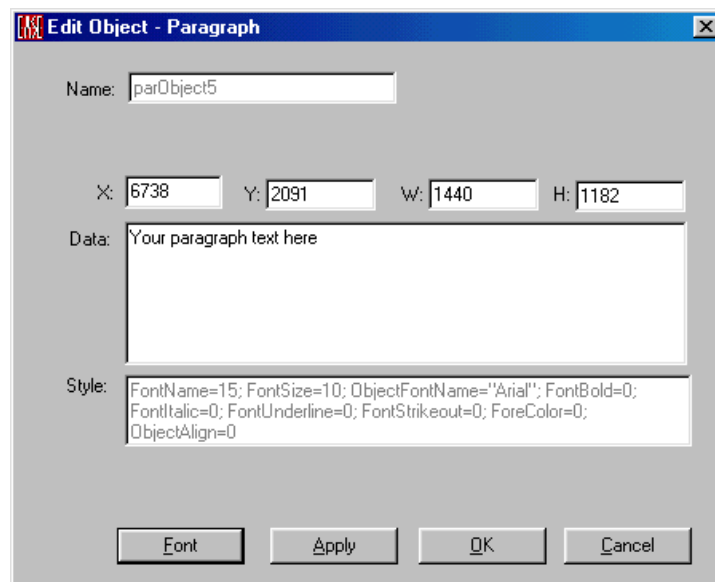
Name

This field shows the name of the object.

X

Horizontal object position in twips*.

Y

Vertical object position in twips*.

W

Object width in twips*.

H

Object height in twips*.

*A twip is 1/20 of a printer's point (1,440 twips equal one inch, and 567 twips equal one centimeter).

Data (for label, text and table type objects only)

Object text. Left click opens for table type objects a table grid for text editing.

Font (for label, text and table type objects only)

Displays font dialog The font dialog box allows selection of a font by specifying a font type, size, color, and style.

Format (for table type objects only)

Table column number and width in twips*.

Browse (for picture type objects only)

Allows changing of picture file linked to the object.

Fore Color (for horz line, vert line, rectangle, circle, ellipse and arrow type objects only)

Displays color dialog. The Color dialog box allows you to select an object fore color from a palette or to create and select a custom color.

Fill Color (for rectangle, circle, and ellipse type objects only)

Displays color dialog. The Color dialog box allows you to select an object fill color from a palette or to create and select a custom color.

Fill Style (for rectangle, circle, and ellipse type objects only)

Allows selecting a object fill style from a pull down list.

Apply

Left click **Applies** changes and keeps **Edit Object** window open.

OK

Left click **Applies** changes and closes **Edit Object** window.

Cancel

Left click discards changes and closes **Edit Object** window.

Edit Header/Footer Window

This allows creating and editing of project header and footer lines.
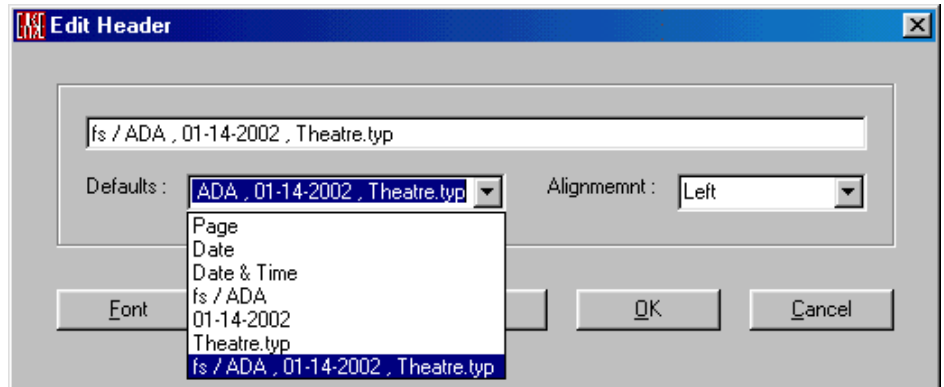
Defaults

Allows selection of header/footer text from a pull down default items list.

Alignment

Allows selecting the header/footer position from a pull down list.

Font

Displays font dialogue. The font dialog box allows you to select a font by specifying a font type, size, color, and style.

Apply

Left click **Applies** changes and keeps **Edit Header/Footer** window open.

OK

Left click **Applies** changes and closes **Edit Header/Footer** window.

Cancel

Left click discards changes and closes **Edit Header/Footer** window.

Chapter XV: EASE InfraRed Device Base

EASE InfraRed Device Base

The **EASE Infrared Device Base** software is used to create and modify EASE data files for infrared sources, that is, radiators, modulators and combined devices. Infrared receivers are created and modified using the EASE Infrared Receiver Editor program which is dealt with in a separate document.

InfraRed Device Base Main Window

This displays, edits, creates, and saves **Infrared Radiator and Infrared Modulator** data.

Key Conventions

F1   Help

Ctrl+
N	**New Device**
O	**Open Device**
S	**Save Device**
A	**Save Device As**

File Menu

This accesses **File** management.

New Device

This creates a new **InfraRed Device Model** using data supplied by the user.

Shortcut: Ctrl+N

To use this command:

1. Left Click on **New Device**. This opens the New InfraRed Device Window.

2. Choose a **Device Type** and left click **OK**.

You can now use functions from the Edit menu to modify the new device.

Open Device

This opens EASE files for **Infrared Device Models**, that is, **IR Radiators** and **IR Modulators,** for viewing and editing.

Shortcut: Ctrl+O

To use this command:

1. Left click on **Open Device**. This opens the **Open File** Window.

2. Use **Look In** to find the folder holding the **InfraRed Device Model Fil**e and Left click on the **InfraRed Device Model Filename**.

3. Left click on the **Open** button.

Save Device

This saves the current **InfraRed Device Model** data to the current device file.

Shortcut: Ctrl+S

Save Device As

This saves the current **InfraRed Device Model** to a new **Filename**. This allows different versions of the same device.

Shortcut: Ctrl+A

To use the command:

1. Left click on **Save Device As** to open a **Save File** window.

2. Use **Save In** to select a folder, enter the new **Filename** in the **File** window, and Left click on **Save**.

Import ASCII

This imports **Comma and Quotes Delimited** files saved by spreadsheet programs, allowing automatic entry of properly formatted data. For an example, see the
…\EASE 4.4\Easepath\Examples_ASCII\IR folder. To use this command:

1. Left click on **Import ASCII** to open an **Open File** window.

2. Use the **Look In** window to find the folder holding the import file, Left click on the ASCII filename (.**XIR**) to **Import,** and Left click on **Open** button.

Exit

This exits the program.

Edit Menu

This menu accesses **InfraRed Device Model** data in tabular form.

Device Data

Opens the IR Device Data Window where the general properties of the **IR Radiator** and/or **IR Modulator** can be viewed and changed.

See Speaker Data Window.

Attenuation Data

Opens the Attenuation Data Window where the directional properties of the **IR Radiator** can be viewed and changed. See Attenuation Data Window.

View Menu

This menu allows access to all viewing tools.

Draw Balloon

Left click opens the **Directivity Balloon** in the **Draw Balloon** module. See **EASE Balloon.**

Cartesian Coverage

This shows the 3,6,9-dB coverage lines in an x-y coordinate domain.

Polar Coverage

This shows a polar graph of the 3,6,9-dB coverage lines.

Coverage Lines

This toggles the display of coverage lines vs. angle.

3 dB

A check here displays the 3dB coverage line.

6 dB

A check here displays the 6dB coverage line.

9 dB

A check here displays the 9dB coverage line.

All

A check here displays all three coverage lines.

Help Menu

This menu allows access to all forms of help.

Help Topics

This offers a list of commonly asked help subjects. We have made a concerted effort to develop the Help files and the manual together. If you need an answer as to what a particular command does go to the help files. You will likely find your answer there.

About

This displays information about your EASE program.

Create New InfraRed Device Window

InfraRed – Device

This window is shown before a new infrared device is created. In this window the underlying type of infrared device must be defined before further properties can be specified.

Radiator

The device is an infrared radiator without an integrated modulator.

Modulator

The device is an infrared modulator without an integrated radiator

Radiator / Modulator Combined

The device is an infrared radiator with an integrated infrared modulator.

OK

Confirms the type of the new device.

Cancel

Cancels the creation of the new device.

InfraRed Device Data Window

In this window the general properties of the infrared radiator and/or modulator can be viewed, entered and modified.

Radiator Data Tab

This tab page accesses data that determines the general properties of an infrared radiator.
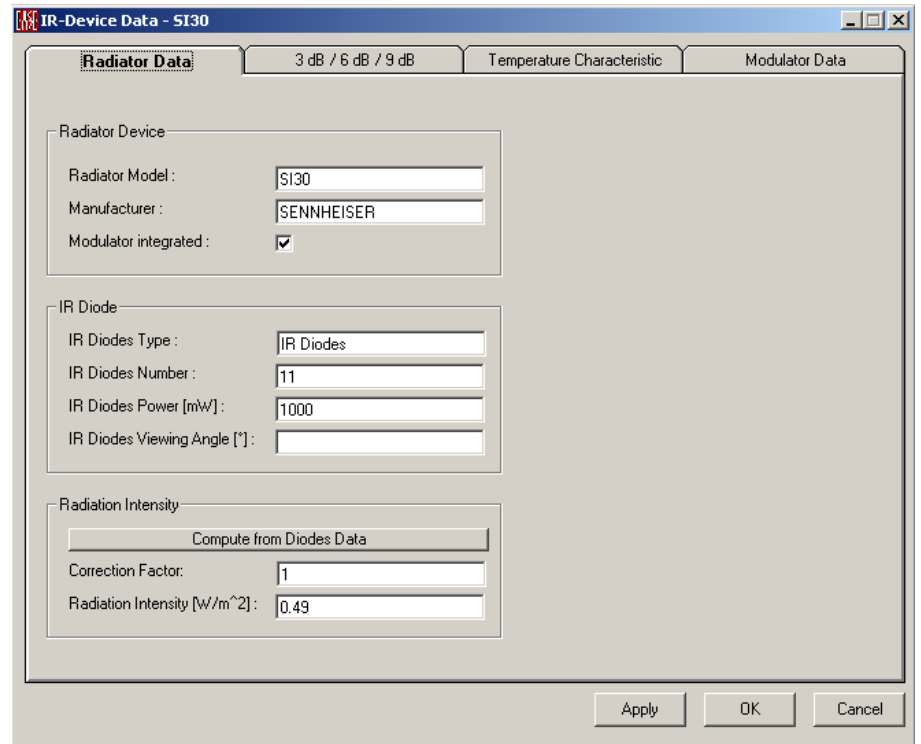
Radiator Device

Radiator Model

This is the model number or product name of the radiator.

Manufacturer

This is the name or brand of the manufacturer of the radiator.

Modulator Integrated

This property is checked if the radiator can be used only in a combination with a particular modulator.

IR Diode

The power radiation characteristics of the radiator can be determined if the characteristics of the diodes used in the radiator design are known.

IR Diodes Type

Name or type of diode. This is informational only.

IR Diodes Number

Number of diodes used in the radiator.

IR Diodes Power [mW]

Radiation power of the diode used in the radiator.

IR Diodes Viewing Angle [°]

Half-intensity angle of the diode used in the radiator.

Radiation Intensity

Compute from Diodes Data

Uses the number of diodes, the diode power, and the diode half-intensity angle to calculate the resulting **Radiation Intensity** of the **IR Radiator**. If any of the three values are missing, a dialog will be displayed as needed to enter the value.

Correction Factor

A correction factor can be entered in order to account for internal losses or gains that affect the **Radiation Intensity** due to the design of the radiator.

Radiation Intensity [W / m ^2]

This is the overall infrared power per area unit that the **IR Radiator** emits.

3 dB / 6 dB / 9 dB Tab

This tab opens a table for the 3, 6, and 9 dB coverage cones for viewing and editing. This table can be entered directly or **EASE InfraRed Device Base** can compute the cones from the **Attenuation Balloon** data.

Each row of the table shows the angular value on the front-to-back semi-circle (meridian) at which the radiation level is reduced by 3 dB, 6 dB, or 9 dB, respectively. The on-axis direction is 0° and the backward direction is 180°. Each row corresponds to one meridian, starting left (0°) over top (90°) and right (180°) to bottom (270°) when looking from inside the device.
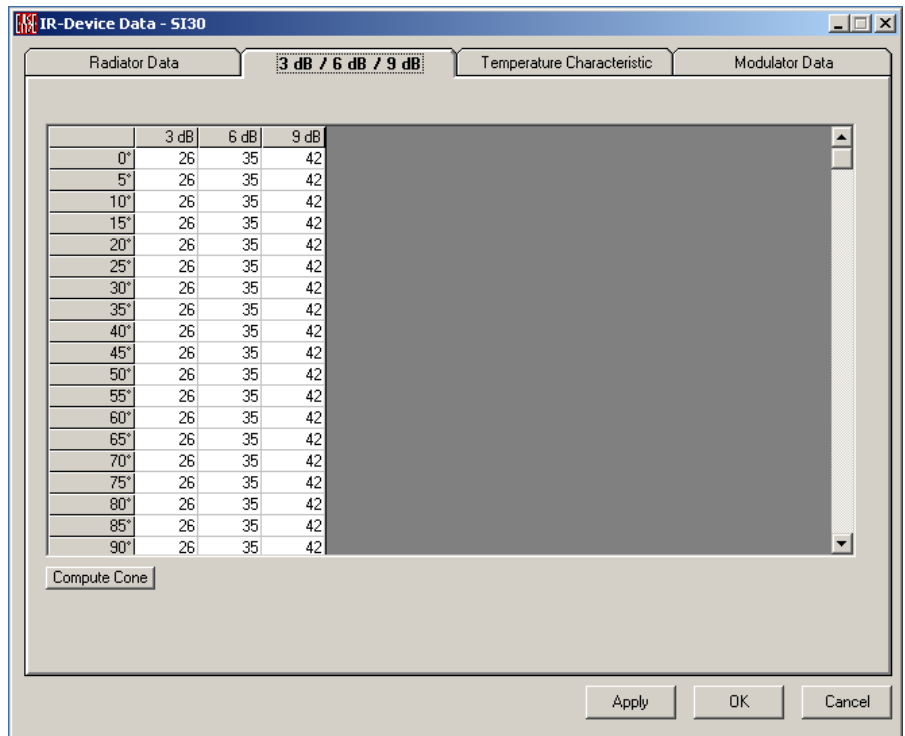
Compute Cone

Left click **computes Coverage Cones** from current **Attenuation Balloon Data.**

Temperature Characteristic Tab

This tab allows entering a correction curve for the radiation power based on the ambient temperature.
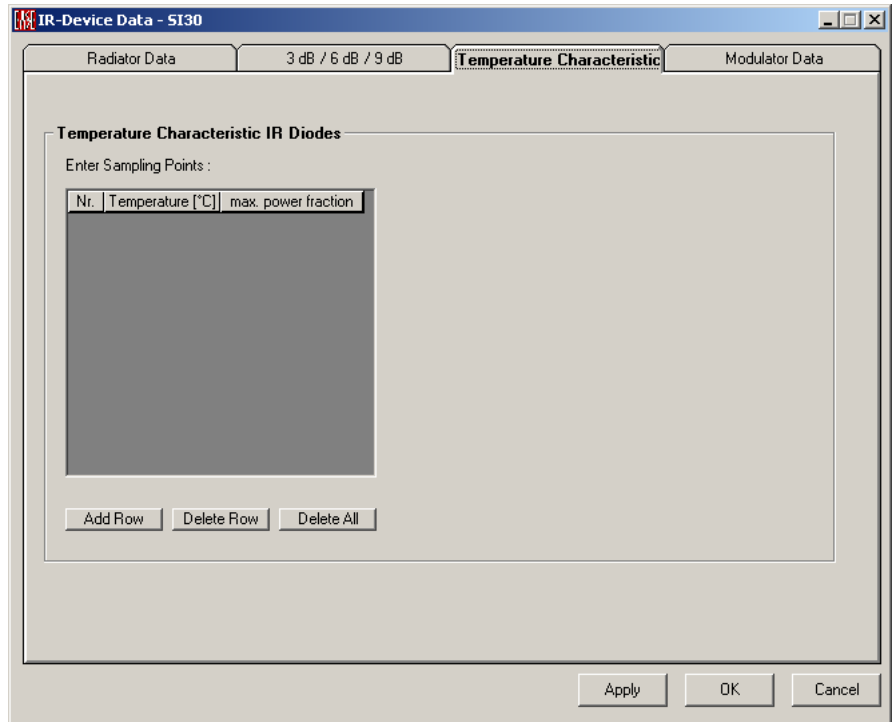
Temperature Characteristic IR Diodes

The correction curve for the temperature characteristic should consist of at least two data points. Given for a specific temperature, each data point indicates a power increase or reduction relative to the nominal value. Corrections for other temperature values are interpolated from existing data.

Add Row

Adds a data point to the correction curve.

Delete Row

Removes the selected data point from the correction curve.

Delete All

Removes all data points and thus clears the correction curve.

Modulator Data Tab

This tab page accesses data that determines the properties of an infrared modulator.

Modulator Device

Modulator Model

This is the model number or product name of the modulator.

Manufacturer

This is the name or brand of the manufacturer of the modulator.

Radiator Integrated

This property is checked if the modulator can be used only in a combination with a particular radiator.

Modulator Data

Modulation Band

The modulator can either be defined to use the wide infrared transmission bands or the narrow bands.

Wide

The modulator is using the wide infrared bands of 2.3 MHz, 2.8 MHz, 3.3 MHz or 3.8 MHz.

Narrow

The modulator is using the narrow infrared bands from 55 kHz to 1335 kHz.

Max. RF Channel

Determines the highest transmission channel and frequency available with this modulator.

Min. RF Channel

Determines the lowest transmission channel and frequency available with this modulator.

RF Channels Number

Displays the overall amount of transmission channels based on the lowest and the highest channel.

Apply

This **Applies** all current data and leaves the **InfraRed Device Data** window open.

OK

This **Applies** all current data and closes the **InfraRed Device Data** Window.

Cancel

This discards all changes not **Applied** and closes the **InfraRed Device Data** window.

Attenuation Data Window

This window opens **Attenuation Balloon** data tables for viewing, editing, and data entry.

Chart

The table shows attenuation values in dB relative to the on-axis direction. Data points are given on a spherical grid in a resolution of 5°. Each row corresponds to a parallel from the front (0°) to the back (180°). Each column corresponds to a meridian from the left (0°) over the top (90°) and the right (180°) to the bottom (270°) when looking from inside the device.

The Attenuation Data is then used for infrared coverage calculations in EASE. It can also be used to determine the nominal 3, 6, 9 dB coverage cones in the Device Data window.

Data Menu

This menu accesses the estimation of data using an **Elliptical Lobe** calculation, and allows changes to be **Applied**, or discarded.

Compute Elliptic Lobe

Left click accepts only a single **Horizontal Polar** and a single **Vertical Polar** as data. The program then estimates all other data points using an **Elliptical Lobe** calculation, overwriting all other data with the **Elliptical Lobe** estimate.

In order to use this interpolation routine, data for the 0°, 90°, 180°, 270° columns need to be defined. All other columns will be overwritten. Each quarter will be interpolated individually.

Apply

This applies current **Attenuation Data** but does not save it to a file, thus allowing it to be used in a calculation.

Exit

This closes the **Attenuation Data** Window without saving data.

Chapter XVI: Ease Guard

Registration Instructions

1. After you have installed EASE go to the AFMG Download Portal

   http://www.afmg-support.eu/AFMGDLPortal/Start.aspx

   and login with the download account data provided to you.

2. In the download area select "Licence Guard Setups" and download the EASE Guard setup archive belonging to your EASE User ID. After the download has succeeded extract the downloaded EASE Guard setup archive and run Setup.exe to install the EASE Guard program.

3. After you have finished with the EASE Guard installation, start EASE by double clicking the EASE icon on your desktop.

4. When the first window opens with the question „EASE is not licenced. Would you like to register it now?", quit with „Yes". This will close EASE and open the EASE Guard program.

5. Follow the instruction in the EASE Guard manual which comes with the EASE Guard setup.

License Policy

User ID

The User ID is a number supplied to you by your EASE distributor. This number is necessary to confirm your previous license and / or your purchase of the new program. Without it you cannot download a licence key, receive a **License File** or request license support.

Online Licensing

To further improve your comfort we have created an EASE licensing web application to run on our web server. It allows – after user registration and receiving a **User ID** - you to easily download an EASE license via internet (being online with your EASE computer assumed). That means the software sends the computer's reference information to our web application, which creates a **Licence File** on our server. This file is automatically downloaded and installed. So with a single button push *Download Licence* you can unlock EASE.

By subscribing to the license agreement you are entitled to install the program on one computer or more, depending on the license package purchased. After those

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installations, additional licenses must be purchased. Please see your distributor for prices

If you intend to uninstall EASE from one or more of the original computers then please upload the license information from that computer by clicking on *Upload Licence*. This will allow you to download this licence again and then unlock EASE on a different computer

Licensing By File

You should only use this option if you are not able to use the online licensing functions.

Reference File

The **Reference File** is a file generated by the EASE Guard program and placed in the EASE *LicenceFiles* folder. This file is different for each installation. If you have more than one computer each will have its own **Reference File.** You can obtain a licence in two ways:

1. Sending the **Reference File** to AFMG (supportq@afmg.eu) by E-Mail or regular Mail.

2. Using the "Licencing by File Online" web site under http://www.ada-acousticdesign.de/EASEOnlineLKG/CreateLicenceFile.aspx

License File

The **License File** is file generated by AFMG, which is linked to the **Reference File**. The **License File** is supplied to the user by E-Mail or regular Mail or can be downloaded from the "Licencing by File Online" web site (see above). Loading this file into the EASE Guard with *Install Licence* unlocks the particular EASE version purchased.

If you intend to uninstall EASE from one or more of the original computers then please remove the license information from that computer before by *Termination*. *Terminate Licence* creates a **Termination File** which you must send to AFMG by E-Mail or regular Mail**.** This will allow you to order a new license for the terminated one and unlock EASE on a different computer or computers.

EASE Guard Licence Manager Window

This window allows the user the licencing of his EASE version.
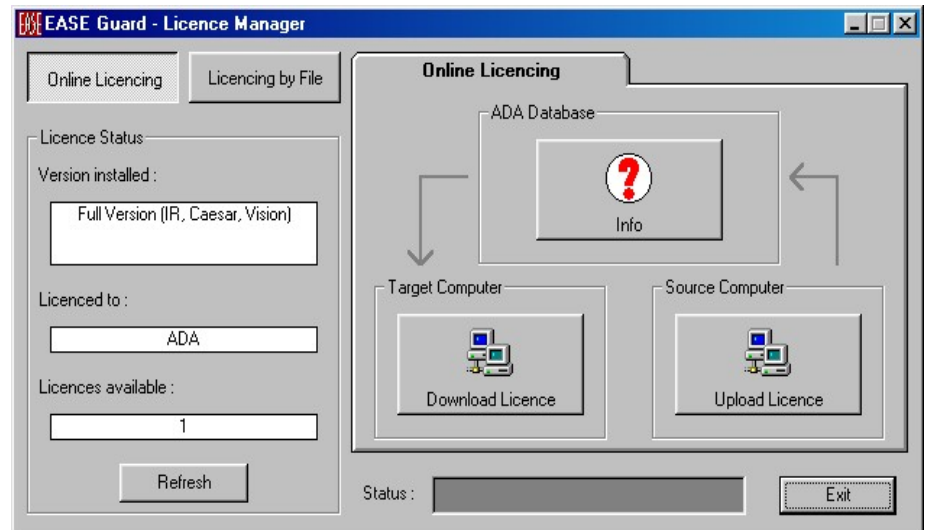
Licence Status

Version installed

This field shows which EASE version is unlocked.

Licenced to

This field shows the user name for which the installed licence is registered.

Licence available

This field shows how many licences are available on this computer

Refresh

Left click reloads licence information.

Status

This field is a progress display of the download process.

Exit

Left click closes the EASE Guard Licence Manager Window.

Online Licencing

Left click shows the Online Licencing Tab in the right part of the EASE Guard
Licence Manager.

ADA Database

Info

Left click checks the EASE customer database on the AFMG/ADA web server
and downloads information about the user registration, the purchased version
and the number of still available licences.

Target Computer

Download Licence

Left click downloads one licence from the AFMG/ADA web server. The number in the **Licence available** field will be increased by one.

Source Computer

Upload Licence

Left click terminates all available licences. The licences will be uploaded to the AFMG/ADA web server and will be available for later new downloads. If the user intents hardware manipulations (hard disk, mother board), operating system upgrades or to buy a new computer he should use this procedure to prevent a licence lost. It just means a licence backup for a certain time. After this procedure EASE will reset to demo version mode.

Licencing by File

If it isn't possible for a user to be online with this computer he can order an EASE licence per email too. Therefor he has to generate a reference file and to send this file to AFMG (support@afmg.eu). As response he will receive a licence file from AFMG which is needed to unlock EASE.

Licence Tab
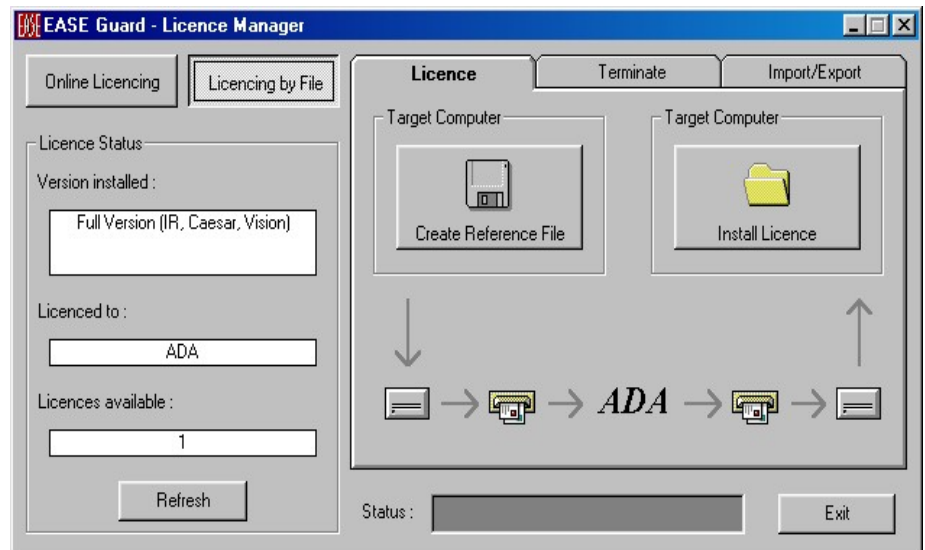
Create Reference File

Left click creates a reference file (*.erf format) .To use the command:

1. Left click on **Create Reference File.**

2. This opens a Save File Window.

3. Using the **Save In** window select the folder to save the reference file to.

4. Left Click on the **Save** button

After saving a "Send Email now?" prompt appears. Left click "Yes" sends a licence order with the reference file as attachment automatically with an installed email client (e.g. MS Outlook or MS Outlook Express) to AFMG. It's also possible to save only the reference file and to mail it later attached to a licence order to AFMG.

Install Licence

Left click loads a licence file (*.elf format). To use this command:

1. Left click on Install Licence.

2. This will open the Open File Window.

3. Using the Look In portion of the window find the folder holding the licence file.

4. Left click on the licence file name.

5. Left click on the Open button

If the licence files reference signature matches to this computer the licence will installed. The licence information and parameters will be shown in the Licence Status frame.

Terminate Tab

This tab allows a licence termination in this computer. The user should only use this option if this computer isn't online and a licence upload isn't possible.
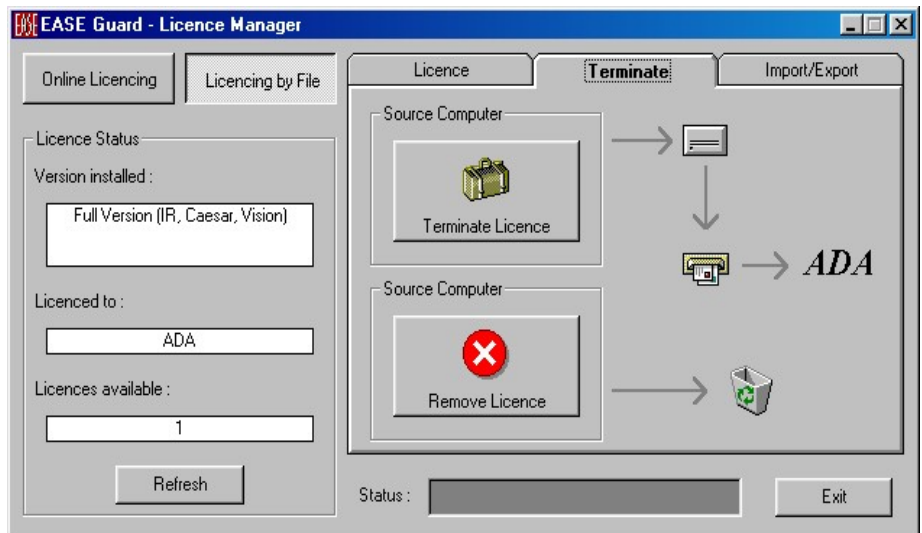
Terminate Licence

This allows uninstalling the current licence. Left click creates a termination file (*.etf format). To use the command:

1. Left click on **Terminate Licence.**

2. This opens a Save File Window.

3. Using the **Save In** window select the folder to save the termination file to.

4. Left Click on the **Save** button

After saving a "Send Email now?" prompt appears. Left click "Yes" sends the termination file automatically with an installed email client (e.g. MS Outlook or MS Outlook Express) to AFMG. It's also possible to save only the termination file and to mail it later to AFMG. There it will be verified and if it is correct the user can order any time a replacement licence for the terminated one (see Online Licencing/ Upload Licence). After this procedure EASE will be reset to demo version mode.

Remove Licence

This removes all traces of the licence in this computer.

Note: Be very careful with this button! All license information will be deleted from the computer. This option should only be used in case of general licensing problems due to software or hardware errors. Please contact AFMG before using this command otherwise your EASE license may be lost completely.

Import / Export Tab

This tab allows the licence transfer between two – source and target - computers. The source computer is the computer from where a licence will be exported, which will be later imported into the target computer.
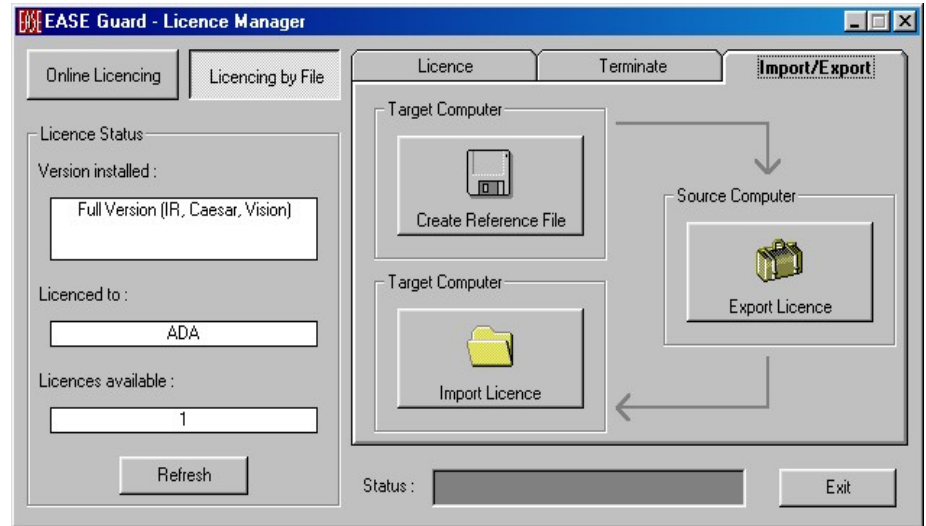
Target Computer

Create Reference

Left click creates the target computers reference file (*.erf format). To use the command:

1. Left click on **Create Reference File.**
2. This opens a Save File Window.
3. Using the **Save In** window select the folder to save the reference file to.
4. Left Click on the **Save** button

After saving you have to copy the target computers reference file to the source computer (see **Export Licence** below).

Import Licence

Left click loads first the source computers export file (*.exf format). To use this command:

1. Left click on Install Licence.
2. This opens the Open File Window.
3. Using the Look In portion of the window find the folder holding the reference file.
4. Left click on the export file name.
5. Left click on the Open button

If the export files reference signature matches to this computer the licence will be installed. The licence information and parameters will be shown in the Licence Status frame.

Source Computer

Export Licence

Left click loads first the target computers reference file (*.erf format). To use this command:

1. Left click on Export Licence.
2. This will open the Open File Window.
3. Using the Look In portion of the window find the folder holding the reference file.
4. Left click on the reference file name.
5. Left click on the Open button

If the reference signature matches to this computer's licence profile an EASE export file (*.exf format) will be generated and a Save File Window will be opened:

1. Using the **Save In** window select the folder to save the export file to.
2. Left Click on the **Save** button

After saving you have to copy the export file to the target computer (**Install Licence**.)

Appendix A: Acoustic Formulae

Room-acoustical Fundamentals for Auditoriums and Concert Halls (reprint of chapter 6.1 and 6.2 of AHNERT/TENNHARDT/6.0/)

6.1   Introduction

With musical or spoken performances in auditoriums and concert halls, acoustic evaluation is mainly based on the subjective perception of audience and performers. These judgments are generally not based on defined criteria, but characterize the sensed tonal perception. Besides the secondary factors influencing the overall acoustic impression, like for instance comfortableness of the seats, air conditioning, interference level, optical, architectural and stylistic impression, it is especially the expectation of the listener that plays a significant role for the acoustic evaluation. If a listener in a classical concert is sitting next to the woodwind instruments but hears the brass instruments much louder, even though he cannot see them, his expectations as a listener and thus the acoustics are "off". Numerous subjective and objective room-acoustical criteria were defined and their correlation determined in order to objectify these judgments. However, these individual criteria are closely linked with each other and their acoustic effects can neither be exchanged nor individually altered. They become effective for judgment only in their weighted totality. The judgment of the performers, on the other hand, can be regarded as a kind of "workplace evaluation". Only the musician, singer or speaker who feels completely at ease with all "fringe" factors will also praise the acoustical quality. The main factors judged here are the sound volume and the mutual listening, which is also responsible for the intonation. An acoustically adequate response from the auditorium has to be realized for the performers so that this positive correspondence supports the overall artistic experience. The overall acoustic impression of his own work as it is perceived in the reception area plays a very subordinate role for the performer. What is important for him, however, are rehearsal conditions where the acoustics are as close as possible to those of the actual performance and acoustical criteria that depend as little as possible on the occupation density both in the audience area as well as in the platform area. Generally, a performance room must not show any disturbing reflection characteristics like echo effects or flutter echoes. All seats have to guarantee a good audibility that is in good conformity with the auditory expectation. This requires a balanced sound of high clarity and an adequate spaciousness. Localization shifts or deviations between acoustical and visual directional impression must not occur. If the room is used as a concert hall, the spatial unity between the auditorium and the platform areas has to be maintained in order to avoid sound distortions.

Based on these considerations and well-founded, objective measurement technical examinations and subjective tests, partially in reverberation-free rooms within artificially generated sound fields, it was possible to define room-

acoustical quality criteria that enable an optimum listening and acoustical experience in dependence on the usage function of the room. The wider the spectrum of usage is, the broader is the limit of the desirable reference value ranges of these criteria. Without extensive variable acoustical measures – also electronic ones – only a compromise brings about a somewhat satisfactory solution. It stands to reason that this compromise can only be as good as the degree in which the room-acoustical requirements coincide with it.

A precondition for an optimum room-acoustical design of auditoriums and concert halls is the very early coordination in the planning phase. The basis here is the establishment of the room's *primary structure* according to its intended use (room shape, volume, topography of the spectators' and the platform areas). The *secondary structure* that decides the design of the structures on the walls and ceilings as well as their acoustic effectiveness has to be worked out on this basis. A planning methodology for guaranteeing the room-acoustical functional and quality assurance of first-class concert halls and auditoriums as well as rooms with a complicated primary structure is reflected in the application of simulation tests by means of mathematical and physical models.

6.2   Room-acoustical Criteria used in AURA, Requirements

The acoustical evaluation by listeners and actors of the acoustical playback quality of a signal that is emitted from a natural acoustic source or via electro-acoustical devices is mostly very imprecise. This evaluation is influenced by existing objective causes like disturbing climatic, seating and visibility conditions as well as by subjective circumstances like for instance the subjective attitude and receptiveness towards the content and the antecedents of the performance. Very differentiated is the subjective rating of music, where the term "good acoustics" is defined, depending on the genre, as a sufficient sound volume, a good time and register clarity of the sound, and a spaciousness that meets the composition. Timbre changes that deviate from the "natural" timbre of the acoustic sources and from the usual distance dependence (high frequency sounds are less effective at a larger distance from the place of performance than at closer range) are judged as being unnatural, if traditional music is concerned. These experiences determine also the listening expectation for a very spatial and reverberating sound in a large cathedral, whereas one expects a "dry" sound in the open. Thus deviations from this experience are regarded as being bothersome. A listener seated in the front section of a concert hall expects a clearer sound than one seated in a rear section. On the other hand, however, he wants to enjoy an optimally balanced acoustic pattern on all seats, as he has grown up with the media and mainly post processed sound productions that are independent of the room, and thus acquired auditory expectations, which do not allow an evaluation of the objectively existing room.

The evaluation of speech is generally a bit easier, since optimum audibility and clear intelligibility are desired herein an atmosphere that is not influenced by the room or electro-acoustical means. Perhaps with the exception of sacral rooms, the spaciousness does generally not play such an outstanding role in this regard, whereas sound volume and intelligibility are all the more important.

Numerous room-acoustical criteria were defined in order to clarify the terms applied for the subjective and objective assessment of a spoken or musical performance. In the following we have listed a relevant selection of them, in which context one should note that there is a close correlation between the individual criteria. One single optimally determined parameter might not at all be acoustically satisfactory, because another parameter influences the judgment in a negative way. For example, the optimum value range of center time and definition can only be evaluated with a subjectively correct estimated

reverberation time. The guide values of the reverberance measure are valid only if the clarity measure C$_{80}$ is in the optimal range.

On principle, the room-acoustical quality criteria can be subdivided into time and energy criteria. The main type of use – speech or music, then determines the recommendations for the guide values to be targeted. With multi-purpose halls (without available variable measures for changing the acoustics), a compromise is required that should orient itself on the main type of use.

Below are listed all acoustic measures recommended by ISO standard 3382; the new AURA module in EASE calculates the most important ones:

- **Reverberation Time**

- **Strength Measure**

- **Center Time**

- **Echo Criterion**

- **Definition Measure C$_{50}$ for Speech**

- **Speech Transmission Index**

- **Articulation Loss**

- **Clarity Measure C$_{80}$ for Music**

- **Lateral Efficiency**

All measures are explained below.

6.2.1 Time Criteria

6.2.1.1   Reverberation Time RT

The reverberation time RT is not only the oldest, but also the most well-known room-acoustical quantity. It is the time that passes after an acoustic source in a room has been turned off until the mean steady-state sound-energy density w(t) has decreased to 1/1.000.000 of the initial value w$_0$ or until the sound pressure has decayed to 1/1.000, i.e. by 60 dB:

$$w(RT) = 10^{-6} w_0$$

(6.1)

Thus the time response of the sound energy density in reverberation /6.1/ results as:

$$w(t) = w_0 \exp\left(-6\ln 10 \frac{t}{RT}\right) = w_0 \exp\left(-13{,}82 \frac{t}{RT}\right)$$

(6.2)

The steady-state condition is reached only after the starting time t$_{st}$ of the even sound distribution in a room (approximately 20 sound reflections within 10 ms) after the starting time of the excitation /6.2/:

$$t_{st} = 1...2 \, (0{,}17...0{,}34) \sqrt{V}$$

(6.3)

t$_{st}$ in ms, V in m³ (ft³)

The defined drop of the sound pressure level of 60 dB corresponds roughly to the dynamic range of a large orchestra /6.3/. The listener, however, can follow

the decay process only until the noise level in the room becomes perceptible. This subjectively assessed parameter *reverberation time duration* thus depends on the excitation level as well as on the noise level.

The required evaluation dynamic range is difficult to achieve even with objective measuring, especially in the low frequency range. Therefore, the reverberation time is determined by measuring the sound level decay in a range from -5 dB to -35 dB and then defined as RT_{30dB} (also RT_{30}). The initial reverberation time (IRT according to ATAL, /6.2/, RT_{15dB} between -5 dB and -20 dB) and the early decay time (EDT according to JORDAN, /6.2/, RT_{10dB} between 0 dB and -10 dB) are mostly more in conformity with the subjective assessment of the duration of reverberation, especially at low-level volumes. This also explains the fact that the reverberation time subjectively perceived in the room may vary, while the values measured objectively according to the classical definition with a dynamic range of 60 dB or 30 dB are, except admissible fluctuations, generally independent of the location. .

Serving as a single indicator for the principal characterization of the room in an occupied or unoccupied state, the reverberation time is used as the mean value between the two octave bandwidths 500 Hz and 1000 Hz or the 4 one-third octave bandwidths 500 Hz, 630 Hz, 800 Hz and 1000 Hz, and referred to as the *mean reverberation time*.

The desirable convenient value of the reverberation time RT depends on the kind of performance (speech or music) and the size of the room. For auditoriums and concert halls, the desired values of the mean reverberation time for between 500 Hz and 1000 Hz with a room occupation of between 80 % and 100 % are given in Fig. 6.1 and the admissible frequency tolerance ranges are shown in Figs. 6.2 and 6.3. This shows that in order to guarantee specific warmth of sound with musical performances, an increase of the reverberation time in the low frequency range is admissible (see section 6.1.1.2), while with spoken performances a decrease of the reverberation time is desirable in this frequency range (see section 6.1.2.9).

The reverberation time of a room as defined by EYRING mainly depends on the size of the room and on the sound absorbing properties of the boundary surfaces and non-surface forming furnishings:

$$RT = 0{,}163 \ (0{,}049) \frac{V}{-\ln(1-\overline{\alpha})S_{tot} + 4mV}$$

(6.4)

RT	Reverberation time in s
V	Room volume in m³ (ft³)
$\alpha = A_{tot}/S_{tot}$	Room-averaged coefficient of absorption
A_{tot}	Total absorption surface in m² (sq. ft.)
S_{tot}	Total room surface in m² (sq. ft.)
m	Energy attenuation factor of the air in m^{-1}, see Fig. 6.4

The correlation between the mean sound absorption coefficient and the reverberation time for different relations between room volume V and total surface S_{tot} is graphically shown in Fig. 6.5.

The total sound absorption surface of the room A_{tot} consists of the planar absorption surfaces with the corresponding partial surfaces S_n and the corresponding frequency-depending coefficient of sound absorption α_n plus the non-surface forming absorption surfaces A_k consisting e.g. of the audience and the furnishings:

$$A_{tot} = \sum_n \alpha_n S_n + \sum_k A_k$$

<div align="right">(6.5)</div>

For an average sound absorption coefficient of up to α = 0,25, the formula (6.4) by EYRING /in 6.2/ can be simplified by means of series expansion according to SABINE /6.4/ to:

$$RT = 0,163\,(0,049)\,\frac{V}{A_{tot} + 4mV}$$

<div align="right">(6.6)</div>

RT	Reverberation time in s
V	Room volume in m³ (ft³)
A_{tot}	Total absorption surface in m² (sq. ft.)
m	Energy attenuation factor of the air in m^{-1}, see Fig. 6.4 (in EASE acc. ISO 9613-1)

The correlation between the reverberation time RT, the room volume V, the equivalent sound absorption surface A_{tot} and the unavoidable air damping m is graphically shown in Fig. 6.6.

The above stated frequency-dependent sound absorption coefficient has to be determined by measuring or calculation of the diffuse all-round sound incidence. Measurement is generally done in the reverberation room by using formula (6.6). If the sound absorption coefficient is measured by using an impedance tube (or KUNDT's tube) with vertical sound incidence, the results can only be converted to the diffuse sound incidence by means of the diagrams of MORSE and BOLT /6.2/, if one can assume that the complex input impedance of the absorber is independent of the angle, i.e. if the lateral sound propagation is inhibited in the absorber (e.g. porous material with a high specific flow resistance).

Properly speaking, the above-mentioned derivatives of the reverberation time from the sound absorption in the room are only valid for approximately cube-shaped rooms with an even distribution of the sound absorbing surfaces within the room. With room shapes deviating heavily from a square or a rectangle, or in case of a necessary one-sided layout of the absorbing audience area, these factors also have a decisive effect on the reverberation time. With the same room volume and the same equivalent sound absorption surface in the room, inclining the side wall surfaces towards the room's ceiling or towards the sound absorbing audience area results in deviations of the measured reverberation time of up to 100 %. For numerous room shapes there exist calculating methods with different degrees of exactness, so for example for cylinder-shaped rooms /6.5/. The cause of these differences lies mainly with the geometrical conditions of the room and their influence on the resulting path length of the sound rays determining the reverberation.

The *absorbed sound power* P_{ab} of a room can be derived from the ratio energy density w = sound energy W/volume V under consideration of the differential coefficient P_{ab} = dW/dt representing the rate of energy decay in the room and taken from (6.6) and (6.5) (see. /6.6, p.18/):

$$P_{ab} = \frac{1}{4}\,cwA$$

<div align="right">(6.7)</div>

c   Sound velocity

In steady-state, the absorbed sound power is equal to the Power P fed into the room. This results in the *average sound energy density* w_r in the diffuse sound field of the room as

$$w_r = \frac{4P}{cA}$$

(6.8)

While the sound energy density w_r in the diffuse sound field is approximately constant, the direct sound energy and thus also its density w_d decreases at close range to the source with the square of the distance r from the source, according to

$$w_d = \frac{P}{c} \frac{1}{4\pi r^2}$$

(6.9)

(Strictly speaking, this is valid only for spherical acoustic sources /6.6/; given a sufficient distance it can be applied, however, to most practically effective acoustic sources).

For the sound pressure in this range of predominantly direct sound, this results in a decline with 1/r. (Strictly speaking, this decline sets in only outside of an interference zone, the *near field*. The range of this near field is of the order of the dimensions of the source and 0.4 m away from its center.)

If the direct sound and the diffuse sound energy densities are equal ($w_d = w_r$), the equations (6.8) and (6.9) can be equated, that means it is possible to determine a specific distance from the source, the *reverberation radius (critical distance for omnidirectional sources)* r_H. With a spherical acoustic source there is

$$r_H = \sqrt{\frac{A}{16\pi}} \approx \sqrt{\frac{A}{50}} \approx 0{,}141\sqrt{A} \approx 0{,}057\sqrt{\frac{V}{RT}}$$

(6.10)

r_H in m, A in m² or sq. ft., V in m³ or ft³, RT in s.

With a directional acoustic source (speaker, sound transducer), this distance is replaced by the *critical distance r_R*:

$$r_R = \Gamma(\vartheta)\sqrt{\gamma \cdot r_H}$$

(6.11)

with

$\Gamma(\vartheta)$:   angular directivity ratio of the acoustic source (the ratio between the sound pressure that is radiated at the angle δ against the reference axis and the sound pressure that is generated on the reference axis at the same distance, with other words – the polars)

γ: front-to-random factor of the acoustic source

6.2.1.2　　Bass Ratio BR (BERANEK)

Besides the reverberation time RT at medium frequencies, the frequency response of the reverberation time is of great importance, especially at low frequencies, as compared to the medium ones. The bass ratio, i.e. the ratio between the reverberation times at octave center frequencies of 125 Hz and 250 Hz and octave center frequencies of 500 Hz and 1000 Hz (average reverberation time), is thus calculated basing on the following relation /6.7/:

$$BR = \frac{RT_{125Hz} + RT_{250Hz}}{RT_{500Hz} + RT_{1000Hz}}$$

(6.12)

For music, the desirable bass ratio is BR $\approx$ 1.0... 1.3, for speech, on the other hand, the bass ratio should at most have a value of BR $\approx$ 0.9... 1.0.

6.2.2 Energy Criteria

According to the laws of system theory, a room can be acoustically regarded as a linear transmission system that can be fully described through its impulse response h(t) in the time domain. If the unit impulse δ(t) is used as input signal, the impulse response is linked with the transmission function in the frequency domain through the Fourier transform:

$$\underline{G}(\omega) = F\{h(t)\}$$

$$h(t) = F^{-1}\{\underline{G}(\omega)\} = \frac{1}{2\pi} \int_{-\infty}^{+\infty} \underline{G}(\omega) \exp(j\omega t) d\omega$$

(6.13)

As regards the measuring technique, the room to be examined is excited with a very short impulse (delta unit impulse) and the impulse response h(t) is determined at defined locations in the room (see Fig. 6.7).

Here, the impulse response contains the same information as a quasi-statically measured transmission frequency response.

Generally, the time responses of the following sound-field-proportionate factors (so-called reflectograms) are derived from measured or calculated room impulse responses h(t):

Sound pressure:

$$p(t) \approx h(t)$$

(6.14)

Sound energy density:

$$w(t) \approx h^2(t)$$

(6.15)

Ear-inertia weighted sound intensity:

$$J_{\tau_0}(t) \approx \int_0^t h^2(t') \exp\left[(t'-t)/\tau_0\right] dt'$$

with

$$\tau_0 = 35 ms$$

Sound energy

$$W(t) \approx \int_0^t h^2(t')dt'$$

(6.17)

Basic reflectogram figures are graphically shown in fig. 6.8.

In order to simplify the mathematical and measuring-technical correlation, a sound-energy-proportional factor is defined as *sound energy component* $E_{t'}$. Being a proportionality factor of the sound energy, this factor shows the dimension of an acoustical impedance and is calculated from the sound pressure response p(t):

Sound energy component:

$$E_{t'} = \int_0^{t'} p^2(t)dt$$

(6.18)

t' in ms

For determining a sound-volume-equivalent energy component, t' has to be set = ∞. In practical rooms of medium size, t' ≈ 800 ms is sufficient.

For measuring of all speech-relevant room-acoustical criteria, an acoustic source with the frequency-dependent directivity pattern of a human speaker has on principle to be used for exciting the sound field, while with musical performances it is sufficient to use a non-directional acoustic source for the first approximation.

The majority of the room-acoustical quality criteria is based on the monaural, directionally unweighted assessment of the impulse response. Head-related binaural criteria are still an exception. The influence of the sound-incidence direction of early initial reflections on room-acoustical quality criteria is principally known. Since subjective evaluation criteria are still missing to a large extent, however, this may also be generally disregarded when measuring or calculating room impulse responses. For the determination of most of the relevant criteria, the energetic addition of the two ear signals of an artificial head is sufficient here.

Just like the directional dependence, the frequency dependence of the room-acoustical energy criteria has also not been researched in depth, so that it is generally sufficient at the moment to evaluate the octave with the center frequency of 1000 Hz.

6.2.2.1 Strength Measure G (P. LEHMANN)

The strength measure G is the 10-fold logarithmic ratio between the sound energy components at the measuring location and those measured at 10 m distance from the same acoustic source in the free field. It characterizes the volume level:

$$G = 10 \lg(\frac{E_\infty}{E_{\infty,10m}})dB$$

Here, $E_{\infty,10\,m}$ is the reference sound energy component existing at 10 m distance with the free sound transmission of the acoustic source.

According to /6.8 or 6.9/, the optimum values for musical and speech performance rooms are located between

+1 dB ≤ G ≤ +10 dB

which means that the loudness at any given listener's seat in real rooms should be roughly equal or twice as high as in the open at 10 m distance from the sound source.

6.2.2.2   Sound Pressure Distribution ΔL

The decrease of sound pressure level ΔL in dB describes the distribution of the volume at different reception positions in comparison with a reference measuring position or also for a specific measuring position on the stage in comparison with others. If the sound energy component at the reference measuring position or for the reference measuring position on stage is labeled with E_0 and at the reception measuring position or for the measuring position on stage with E, one calculates a sound pressure level distribution ΔL:

$$\Delta L = 10 \lg(\frac{E_\infty}{E_{\infty,0}}) dB$$

(6.20)

It is of advantage for a room if ΔL for speech and music is in a range of

0 dB ≥ ΔL ≥ -5 dB

6.2.2.3   Interaural Cross-Correlation Coefficient IACC

The IACC is a binaural, head-related criterion and serves for describing the equality of the two ear signals between two freely selectable temporal limits t_1 and t_2. In this respect, however, the selection of these temporal limits, the frequency evaluation as well as the subjective statement are not clarified yet. In general, one can examine the signal identity for the initial reflections ($t_1 = 0$ ms, $t_2 = 80$ ms) or for the reverberation component ($t_1 \geq t_{st}$, $t_2 \geq$ RT, see section 6.1.1.1). The frequency filtration should generally take place in octave bandwidths of between 125 Hz and 4000 Hz.

According to /6.10 or 6.11/, the standard interaural cross-correlation function IACF is defined as

$$IACF_{t_1,t_2}(\tau) = \frac{\int_{t_1}^{t_2} p_L(t) \cdot p_R(t + \tau) dt}{\left[\int_{t_1}^{t_2} p_L^2(t) dt \cdot \int_{t_1}^{t_2} p_R^2(t) dt\right]^{1/2}}$$

(6.21)

with $p_L(t)$ impulse response at the entrance to the left auditory canal

$p_R(t)$ impulse response at the entrance to the right auditory canal

Then the interaural cross-correlation coefficient IACC is:

$$IACC_{t_1,t_2} = \max \left| IACF_{t_1,t_2}(\tau) \right|$$

for -1 ms $< \tau < +1$ ms

6.2.2.4   Center Time t$_s$ (KÜRER)

For music and speech performances, the center time t_s is a reference value for spatial impression and clarity and results at a measuring position from the ratio between the summed-up products of the energy components of the arriving sound reflections and the corresponding delay times and the total energy component. It corresponds to the instant of the first moment in the squared impulse response and is thus determined according to the following ratio:

$$t_s = \frac{\sum_i t_i E_i}{E_{ges}}$$

(6.22)

The higher the center time t_s is, the more spatial is the acoustic impression at the listener's position. The maximum achievable center time t_s is based on the optimum reverberation time. According to HOFFMEIER /6.12/, there is a good correlation between center time and intelligibility of speech with a frequency evaluation of 4 octaves between 500 Hz, 1000 Hz, 2000 Hz and 4000 Hz.

For music, the desirable center time t_s is:

$t_s \approx$ (70 to 150) ms with a 1000 Hz octave

and for speech:

$t_s \approx$ (60 to 80) ms   with four octaves between

500 Hz to 4000 Hz

6.2.2.5   Echo Criterion EK (DIETSCH)

If we look at the build-up function of the center time $t_s(\tau)$:

$$t_s(\tau) = \frac{\int_0^\tau |p(t)|^n t \cdot dt}{\int_0^\tau |p(t)|^n \cdot dt}$$

(6.23)

using as exponents for the incoming sound reflection

n=0,67 with speech and

n=1   with music,

and compare it with the difference quotient

$$EK(\tau) = \frac{\Delta t_s(\tau)}{\Delta \tau_E}$$

(6.24)

we can discern echo distortions for music or speech when applying values of $\Delta\tau_E = 14$ ms for music and $\Delta\tau_E = 9$ ms for speech, ascertained by subjective tests /6.13/. The echo criterion depends on the motif. With fast and accentuated speech or music, the limit values are lower.

For 50% ($EK_{50\%}$) and 10% ($EK_{10\%}$), respectively, of the listeners perceiving this echo, the limit values of the echo criterion amount to:

echo perceptible with music for $EK_{50\%}: \geq 1,8$; $EK_{10\%} > 1,5$

echo perceptible with speech for $EK_{50\%}: \geq 1,0$; $EK_{10\%} > 0,9$

6.2.2.6   Definition Measure C_{50} for Speech (AHNERT)

The *definition measure C_{50}* describes the intelligibility of speech and also of singing. It is generally calculated in a bandwidth of 4 octaves between 500 Hz and 4000 Hz from the tenfold logarithm of the ratio between the sound energy arriving at a reception measuring position up to a delay time of 50 ms after the arrival of the direct sound and the following energy:

$$C_{50} = 10\lg\left(\frac{E_{50}}{E_\infty - E_{50}}\right)dB$$

(6.25)

A good intelligibility of speech is generally given when

$C_{50} \geq 0$ dB

The frequency-dependent definition measure C_{50} should increase by appr. 5 dB with octave center frequencies over 1000 Hz (starting with the octave center frequencies 2000 Hz, 4000 Hz and 8000 Hz), and decrease by this value with octave center frequencies below 1000 Hz (octave center frequencies 500 Hz, 250 Hz and, 125 Hz).

According to *Höhne* and *Schroth* /6.14/, the limits of the perception of the difference of the definition measure are at

$\Delta C_{50} \approx \pm 2,5$ dB

An equivalent, albeit less used criterion is the *degree of definition D*, also called D_{50}, that results from the ratio between the sound energy arriving at the reception measuring position up to a delay time of 50 ms after the arrival of the direct sound and the entire energy (given in %):

$$D = \frac{E_{50}}{E_\infty}$$

(6.26)

The correlation with the definition measure C_{50} is determined by the formula

$$C_{50} = 10\lg\left(\frac{D_{50}}{1 - D_{50}}\right)dB$$

(6.27)

One should thus strive for an intelligibility of syllables of at least 85 %

D= D_{50} ≥ 0.5, or 50%

6.2.2.7 Speech Transmission Index STI (HOUTGAST, STEENEKEN)

The determination of the STI-values is based on measuring the reduction of the signal modulation between the location of the sound source, e.g. on stage, and the reception measuring position with octave center frequencies of 125 Hz up to 8000 Hz.

The authors proceeded on the assumption that not only reverberation and noise reduce the intelligibility of speech, but generally all external signals or signal changes that occur on the path from source to listener. For ascertaining this influence they employ the *modulation transmission function* (MTF) for acoustical purposes. The available useful signal S (signal) is put into relation with the prevailing interfering signal N (noise). The thus determined *modulation reduction factor* m(F) is a factor that characterizes the interference with speech intelligibility:

$$m(F) = \frac{1}{\sqrt{1 + (2\pi F \cdot RT / 13,8)^2}} \cdot \frac{1}{1 + 10^{-(\frac{S/N}{10dB})}}$$

(6.28)

with   F modulation frequency in Hz,

                 RT reverberation time in s,

S/N   signal/noise ratio in dB.

To this effect one uses modulation frequencies from 0.63 Hz to 12,5 Hz in third octaves. In addition, the modulation transmission function is subjected to a frequency weighting (WMTF - weighted modulation transmission function), in order to achieve a complete correlation to speech intelligibility. In doing so, the modulation transmission function is divided into 7 frequency bands which are each modulated with the modulation frequency (14) /6.15/. This results in a matrix of 7 x 14= 98 modulation reduction factors m_i.

These modulation reduction factors m_i are additionally influenced by so-called masking and threshold effects, i.e. all m_i values have to be corrected by the following factor:

corr = 1 / (1 + M + T)

with:

M = Masking value (amf acc. EN 60268-16, table A.1) multiplied by the Intensity ratio of the levels in the following octave bands (Ik-1/Ik)

T = Intensity ratio between the threshold (Lrs,k) and the actual Level (LA) in the 7 octave bands (acc. EN 60268-16, table A.2)

The (apparent) effective signal-noise ratio X can be afterwards calculated from these corrected modulation reduction factors m_i:

$$X_i = 10 \lg\left(\frac{m_i}{1 - m_i}\right) dB$$

(6.29)

These values will be averaged and for the 7 octave bands the Modulation Transfer Indices MTI = (Xaverage + 15)/30 are calculated. After a frequency

weighting in the 7 bands (partially separated for male or female speech) you obtain the Speech Transmission Index STI.

In order to render 20 years ago this relatively time consuming procedure in "real-time operation", the *RASTI-procedure* (rapid speech transmission index) was developed from it in cooperation with the company Brüel & Kjaer /6.16/. The modulation transmission function is calculated here only for two octave bands (500 Hz and 2 kHz) that are especially important for the intelligibility of speech and for select modulation frequencies, i.e. in all for 9 modulation reduction factors m_i. However, this measure is used increasingly less.

SCHROEDER /6.29/ could show, that the 98 modulation reduction factors $m(F)$ may also derived from a measured impulse response, in our case from a simulated one by using AURA in EASE:

$$m(F) = \frac{\int_0^\infty h^2(t)\, e^{-j2\pi F t}\, dt}{\int_0^\infty h^2(t)\, dt}$$

(6.30)

According to definition the STI-value is calculated by using the results of (6.29):

$$STI = \frac{X + 15}{30}$$

(6.31)

Basing on the comparison of subjective examination results with a maximum possible intelligibility of syllables of 96%, the STI-values are graded in subjective values for syllable intelligibility according to the following table 6-1 (EN ISO 9921: Feb. 2004):

Syllable intelligibility	STI-value
poor	0 to 0.3
satisfactory	0.3 to 0.45
good	0.45 to 0.6
very good	0.6 to 0.75
excellent	0.75 to 1.0

6.2.2.8   Articulation Loss Al_{cons} with Speech (PEUTZ, KLEIN)

PEUTZ /6.17/ and KLEIN /6.18/ have ascertained that the articulation loss of spoken consonants Al_{cons} is decisive for the evaluation of speech intelligibility in rooms. Starting from this discovery they developed a criterion for the determination of intelligibility:

$$Al_{cons} \approx 0{,}652 \left(\frac{r_{\varrho H}}{r_H} \right)^2 \cdot RT\%$$

(6.32)

r_{LH}:   Distance sound source - listener

r_H: Reverberation radius or, in case of directional sound sources, critical distance r_R

RT: Reverberation time in s

The correlation is shown in fig. 6.9.

From the measured room impulse response one can determine Al_{cons} acc. to PEUTZ /6.17/, if for the direct sound energy one applies the energy after about 25 ms to 40 ms (Default 35 ms), and for the reverberation energy the residual energy after 35 ms:

$$Al_{cons} \approx 0,652 \left(\frac{E_\infty - E_{35}}{E_{35}} \right) \cdot RT\%$$

(6.33)

Assigning the results to speech intelligibility yields:

$Al_{cons} \leq 3\%$ ideal intelligibility,

$Al_{cons} = 3$ to 8% very good intelligibility,

$Al_{cons} = 8$ to 11% good intelligibility,

$Al_{cons} > 11\%$ poor intelligibility,

$Al_{cons} > 20\%$ worthless intelligibility (limit value 15%).

Long reverberation times entail an increased articulation loss. With the corresponding duration, this reverberation acts like noise on the following signals and thus reduces the intelligibility.

Fig. 6.10 shows the articulation loss Al_{cons} as a function of the S/N ratio and the reverberation time RT. The left diagram allows us to ascertain the influence of the difference L_R (diffuse sound level) – L_N (noise level) and of the reverberation time RT on the Al_{Cons} value, which gives $Al_{ConsR/N}$. Depending on how large the signal-to-noise ratio (L_D-L_{RN}) is, this value is then corrected in the right diagram in order to obtain $Al_{ConsD/R/N}$. The noise and the signal level have to entered as dB(A) values.

The illustration shows also that with an increase of the S/N ratio to more than 25 dB it is practically no longer possible to achieve an improved intelligibility. (In praxis, this value is often even considerably lower, since with high volumes, for example above 90 dB, and due to the heavy impedance changes in the middle ear that set on here as well as through the strong bass emphasis that occurs owing to the frequency-dependent ear sensitivity.)

6.2.2.9   Subjective Intelligibility tests

A subjective evaluation method for speech intelligibility consists in the recognizability of clearly spoken pronounced words (so-called test words) chosen on the basis of the word-frequency dictionary and a language-relevant phoneme distribution. In German intelligibility test l*ogatoms* (monosyllable consonant-vowel-groups that do not readily make sense, so that a logical supplementation of logatoms that were not clearly understood during the test is not possible, e.g. 'grirk', 'spres') are used for exciting the room. In English-speaking countries, however, test words as shown in Table 6.1 are used /6.19/.

Per test there are between 200 and 1000 words to be used. The ratio between correctly understood words (or logatoms or sentences) and the total number read yields the *word* or *syllable* or *sentence intelligibility V* rated in percentages. The *intelligibility of words V_W* and the *intelligibility of sentences V_S* can be derived from fig. 6.11. The following table 6.2 shows the correlation between the intelligibility values and the ratings:

Table 6.2:

Rating	Syllable intelligibility V_L in %	Sentence intelligibility V_S in %	Word intelligibility V_W in %
Excellent	90 to 96	96	94 to 96
Very good	67 to 90	95 to 96	87 to 94
Good	48 to 67	92 to 95	78 to 87
Satisfactory	34 to 48	89 to 92	67 to 78
Poor	0 to 34	0 to 89	0 to 67

The results of the subjective intelligibility test are greatly influenced by speech velocity, which includes the number of spoken syllables or words within the articulation time (articulation velocity) and the break time. Therefore are often used so-called predictor sentences that are not part of the test have to precede the words or logatoms. These sentences consist of three to four syllables each, for example: "Mark the word...", "Please write down...", "We're going to write…". Additionally to providing a continuous flow of speech, this also serves for guaranteeing that the evaluation takes place in an approximately steady-state condition of the room.

There is a close correlation between the subjectively ascertained syllable intelligibility and room-acoustical criteria. According to /6.20/, for example, a long reverberation time reduces the syllable intelligibility (Fig. 6.12), owing to the occurrence of masking effects, despite an increase in loudness (see equation (6.8)).

Quite recently, comprehensive examinations concerning the frequency-dependence of speech-weighting room-acoustical criteria were conducted in order to find the influence of spatial sound coloration /6.12/. It was ascertained that with broadband frequency weighting between 20 Hz and 20 kHz the *definition measure C_{50}* (see section 6.1.2.6) correlates very insufficiently with the syllable intelligibility. Through a frequency evaluation across three to four octaves around a center frequency of 1000 Hz, however, the influence of the sound coloration can sufficiently be taken into account. Even better results regarding the subjective weightings are provided by the frequency analysis, if the following frequency responses occur (see fig. 6.13):

As the definition declines with rising frequency due to sound coloration, the intelligibility of speech is also low (bad intelligibility $\rightarrow$ 3). This includes also the definition responses versus frequency with a maximum value at 1000 Hz, poor intelligibility $\rightarrow$ 4 in fig. 6.13.

The definition responses versus rising frequency to be aimed at for room-acoustical planning should either be constant (good intelligibility $\rightarrow$ 1) or increasing (very good intelligibility $\rightarrow$ 2). With regard to auditory psychology, this result is supported by the importance for speech intelligibility of the consonants situated in this higher frequency range.

The determination of speech intelligibility through the definition measure C_{50} can easily lead to faulty results as the mathematical integration limit of 50 ms is not a jump function with regards to intelligibility without knowledge of the surrounding sound reflection distribution.

The best correlation with the influence of the spatial sound coloration exists between the subjective speech intelligibility and the *center time t_S* (see section

6.1.2.4) with a frequency weighting between the octave of 500 Hz to the octave of 4000 Hz. According to HOFFMEIER /6.12/, the syllable intelligibility V measured at the point of detection is then calculated as:

$$V = 0.96 \cdot V_{sp} \cdot V_{S/N} \cdot V_R$$

(6.34)

with V_{sp}:   Influence factor of the sound source

(trained speaker $V_{sp}=1$, untrained speaker $V_{sp} \approx 0.9$)

$V_{S/N}$:   Influence factor of the useful level (speech level) L_x and of the disturbance level L_{st} acc. to fig. 6.14 /6.6/

$$V_R = -6 \cdot 10^{-6} (t_S / ms)^2 - 0.0012 \, (t_S / ms) + 1.0488$$

The correlation shown in Fig. 6.15 can also be derived between articulation loss and syllable intelligibility. For low reverberation times, syllable intelligibility is almost independent of the articulation loss. An inverse correlation behavior sets in only with increasing reverberation time. It is evident that with the usual Al_{cons} values between 1 % and 50 %, syllable intelligibility can take on values between 68% and 93% (meaning a variation of 25%) and that for an articulation loss <15% (the limit value of acceptable intelligibility) the syllable intelligibility V_S reaches always, independently of the reverberation time, values over 75% which corresponds roughly to a definition measure of $C_{50} > -4$ dB.

This correlation can also be seen in fig. 6.16, which shows the correlation between measured STI/RASTI-values and articulation loss Al_{cons}. One sees that acceptable articulation losses of Al_{cons} <15% require STI-values in the range from 0.4 to 1 (meaning between satisfactory and excellent intelligibility). Via the equation

$$Al_{cons} = e^{5.42 \left(0.9482 - STI \right)}$$

(6.35)

it is also possible to establish an analytical correlation between the two quantities. This equation is used in case of RASTI too.

6.2.2.10   Clarity Measure C80 for Music (ABDEL ALIM)

The clarity measure C_{80} /6.21/ describes the temporal transparency of musical performances (defined for an octave center frequency of 1000 Hz) and is calculated from the tenfold logarithm of the ratio between the sound energy arriving at a reception measuring position up to 80 ms after the arrival of the direct sound and the following sound energy:

$$C_{80} = 10 (\lg \frac{E_{80}}{E_{\infty} - E_{80}}) dB$$

(6.36)

The value for a good clarity measure C_{80} depends strongly on the musical genre. For romantic music, a range of approximately

-3 dB $\leq C_{80} \leq$ +4 dB

is regarded as being good, whereas classic and modern music will allow values up to + 6..8 dB.

According to *Höhne* and *Schroth* /6.14/, the perception limit of clarity measure differences is about

$$\Delta C_{80} \approx \pm 3,0 \text{ dB}.$$

According to REICHARDT et al /6.22/, there is an analytical correlation between the clarity measure C_{80} and the center time t_S, as given by the following formula:

$$C_{80} = 10,83 - 0,095 \cdot t_S$$
$$t_S = 114 - 10,53 \cdot C_{80}$$

(6.37)

with C_{80} in dB, t_S in ms

This correlation is graphically depicted in fig. 6.17.

6.2.2.11   Sound Coloration Measures K_T and K_H for Music (SCHMIDT)

The sound coloration measures /6.23/ evaluate the volume-equivalent energy fractions of the room impulse response of low and high frequency components (K_T, octave around 100 Hz and K_H, octave around 3150 Hz, respectively) related to a medium frequency range in an octave bandwidth of 500 Hz:

$$K_T = 10 \lg\left(\frac{E_{\infty,100Hz}}{E_{\infty,500Hz}}\right) dB$$

(6.38)

$$K_H = 10 \lg\left(\frac{E_{\infty,3150Hz}}{E_{\infty,500Hz}}\right) dB$$

(6.39)

The measures correlate with the subjective impression of the spectral sound coloration conditioned by the acoustical room characteristics.

Optimum values: $K_{T;H} = (-3....+3)$ dB

6.2.2.12   Spatial Impression Measure R for Music (U.LEHMANN)

The spatial impression measure R /6.24, 6.25/ consists of the two components spaciousness and reverberance. The spaciousness is based on the ability of the listener to ascertain through more or less defined localization that a part of the arriving direct sound reaches him not only as direct sound from the sound source, but also as reflected sound from the room's boundary surfaces (the perception of "envelopment" in music). The reverberance is generated by the non-stationary character of the music that constantly generates build-up and decaying processes in the room. As regards auditory perception, it is mainly the decaying process that becomes effective as reverberation. Both components are not consciously perceived separately, their mutual influencing of the room is very differentiated /6.26/. Among the energy fractions of the sound field that increase the spatial impression are the sound reflections arriving after 80 ms from all directions of the room as well as sound reflections between 25 ms and

80 ms, that are geometrically situated outside a conical window of ±40°, whose axis is formed between the location of the listener and the center of the sound source. Thus all sound reflections up to 25 ms and the ones from the front of the above-mentioned conical window have a diminishing effect on the spatial impression of the room. The tenfold logarithm of this relation is then defined as the spatial impression measure R in dB:

$$R = 10 \log \left(\frac{(E_\infty - E_{25}) - (E_{80R} - E_{25R})}{E_{25} + (E_{80R} - E_{25R})} \right) dB$$

(6.40)

E_R: Sound energy fraction,

measured with a directional microphone

(beaming angle ±40° at 500 Hz to 1000 Hz, aimed at the sound source)

One achieves a mean (favorable) room impression if the spatial impression measure R is within a range of approximately

-5 dB ≤ R ≤ +1 dB.

Spatial impression measures below -5 dB up to -10 dB are referred to as being less spatial, others between +1 dB up to +7 dB as very spatial.

6.2.2.13 Lateral Efficiency LE for Music (JORDAN), LF (BARRON) and LFC (KLEINER)

For the subjective assessment of the apparent extension of a musical sound source, e.g. on stage, the early sound reflections arriving at a listener's seat from the side are of eminent importance, as compared with all other directions. Therefore the ratio between the laterally arriving sound energy components and those arriving from all sides, each within a time of up to 80 ms, is determined and its tenfold logarithm calculated therefrom.

If one multiplies the arriving sound reflections with $\cos^2\vartheta$, being ϑ the angle between the direction of the sound source and that of the arriving sound wave, one achieves the more important evaluation of the lateral reflections. With measurements this angle-dependent evaluation is achieved by employing a microphone with bi-directional characteristics:

Lateral Efficiency LE:

$$LE = \frac{E_{80\,Bi} - E_{25\,Bi}}{E_{80}}$$

(6.41)

E_{Bi}:   Sound energy component,

measured with a bi-directional microphone (gradient microphone)

The higher the lateral efficiency, the acoustically broader the sound source appears.

It is of advantage if the lateral efficiency is within the following range:

$0{,}3 \le \text{LE} \le 0{,}8$

For obtaining a uniform representation of the energy measures in room acoustics, these can also be defined as lateral efficiency measure 10 lg LE. Then the favorable range is between

-5 dB $\le$ 10 lg LE $\le$ -1 dB.

According to BARRON it is the sound reflections arriving from the side at a listener's position within a time window from 5 ms to 80 ms that are responsible for the acoustically perceived extension of the musical sound source (contrary to JORDAN who considers a time window from 25 ms to 80 ms). This is caused by a different evaluation of the effect of the lateral reflections between 5 ms and 25 ms.

The ratio between these sound energy components is then a measure for the lateral fraction LF:

$$LF = \frac{E_{80Bi} - E_{5Bi}}{E_{80}}$$

(6.42)

where: E_{Bi}:   Sound energy component,

measured with a bi-directional microphone (gradient microphone)

It is of advantage if LF is within the following range:

$0{,}10 \le \text{LF} \le 0{,}25$,

or, with the logarithmic representation of the lateral fraction measure 10 lg LF, within:

-10 dB ≤ 10 lg LF ≤ -6 dB

Both lateral efficiencies LE and LF have in common that thanks to using a gradient microphone the resulting contribution of a single sound reflection to the lateral sound energy behaves like the square of the cosine of the reflection incidence angle, referred to the axis of the highest microphone sensibility /6.27/. KLEINER defines therefore the lateral efficiency coefficient LFC in better accordance with the subjective evaluation, whereby the contributions of the sound reflections vary like the cosine of the angle:

$$LFC = \frac{\int_5^{80} |p_{\ddot{a}}(t) \cdot p(t)| dt}{E_{80}}$$

(6.43)

6.2.2.14   Reverberance measure H (BERANEK)

The reverberance measure describes the reverberance and the spatial impression of musical performances. It is calculated for the octave of 1000 Hz from the tenfold logarithm of the ratio between the sound energy component arriving at the reception measuring position as from 50 ms after the arrival of the direct sound and the energy component that arrives at the reception position within 50 ms:

$$H = 10 \lg(\frac{E_\infty - E_{50}}{E_{50}}) dB$$

(6.44)

In contrast to the definition measure C_{50} an omni source is used during the measurements of the reverberance measure H.

Under the prerequisite that the clarity measure is within the optimum range, one can define a guide value range of

0 dB ≤ H ≤ +4 dB

for concert halls, and of

-2 dB ≤ H ≤ +4 dB

for musical theatres with optional use for concerts.

A mean spatial impression is achieved if the reverberation factor H is within a range of

 -5 dB ≤ H ≤ +2 dB

SCHMIDT /6.2/ examined the correlation between the reverberance measure H and the subjectively perceived reverberation time RT_{sub} (see fig. 6.18). For a reverberance measure H = 0 dB, the subjectively perceived reverberation time coincides with the objectively measured reverberation time.

6.2.2.15 Register Balance Measure B_R (TENNHARDT)

With musical performances, the relation of the partial volumes of individual orchestra instrument groups between each other and to the singer is an important quality criterion for the balance (register balance) and is defined by the frequency-dependent time structure of the sound field /6.28/. The register balance measure B_R between two orchestra instrument groups x and y is calculated from the A-frequency weighted volume-equivalent sound energy components of these two groups, corrected by the reference balance measure B_{xy} of optimum balance:

$$B_{R_{xy}} = 10\lg(\frac{E_{\infty_x}}{E_{\infty_y}})dB(A) + B_{xy}$$

(6.45)

with B_{xy} in dB(A):

Group y		Group x				
		A	**B**	**C**	**D**	**S**
	A	-	**-5,8**	**1,5**	**0**	**-2,8**
	B	**5,8**	-	**7,3**	**5,8**	**3,0**
	C	**-1,5**	**-7,3**	-	**-1,5**	**-4,3**
	D	**0**	**-5,8**	**1,5**	-	**-2,8**
	S	**2,8**	**-3,0**	**4,3**	**2,8**	-

Group A: String instruments

Group B: Woodwind instruments

Group C: Brass instruments

Group D: Bass instruments

Group S: Singers

Significant differences in balance do not occur if:

4 dB(A) < B_R < -4 dB(A)

and if this tendency occurs binaurally.

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Figures chapter 6

Fig. 6.1 Recommended value of the mean reverberation time $RT_{recommended}$ between 500 Hz and 1000 Hz for speech and music presentations as a function of room volume V

Fig. 6.2 Frequency dependent tolerance range of reverberation time RT referred to $RT_{recommended}$ for speech presentations

Fig. 6.3 Frequency-dependent tolerance range of reverberation time RT referred to $RT_{recommended}$ for music presentations

Fig. 6.4 Air absorption coefficient m as a function of relative humidity F

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Fig. 6.7 Basic solution of signal theory for identification of an unknown room

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Fig. 6.9 Articulation loss Al_{cons} as a function of reverberation time RT, and distance ratio r_{LH}/r_R

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Fig. 6.13 Correlation between attainable intelligibility and frequency dependence of the definition measure C_{50}

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Fig. 6.15 Syllable intelligibility I_S as a function of the articulation loss Al_{cons}. Parameter: reverberation time RT. Preconditions: approximately statistical reverberation behavior; signal-to-noise ratio S/N $\geq$ 25 dB

Fig. 6.16 Relationship between Al_{cons} values and RASTI values

Fig. 6.17 Center time t_S as a function of the clarity measure C_{80}

Fig. 6.18 Subjectively perceived reverberation time RT_{subj} as a function of reverberance measure H and objective reverberation time RT as a parameter
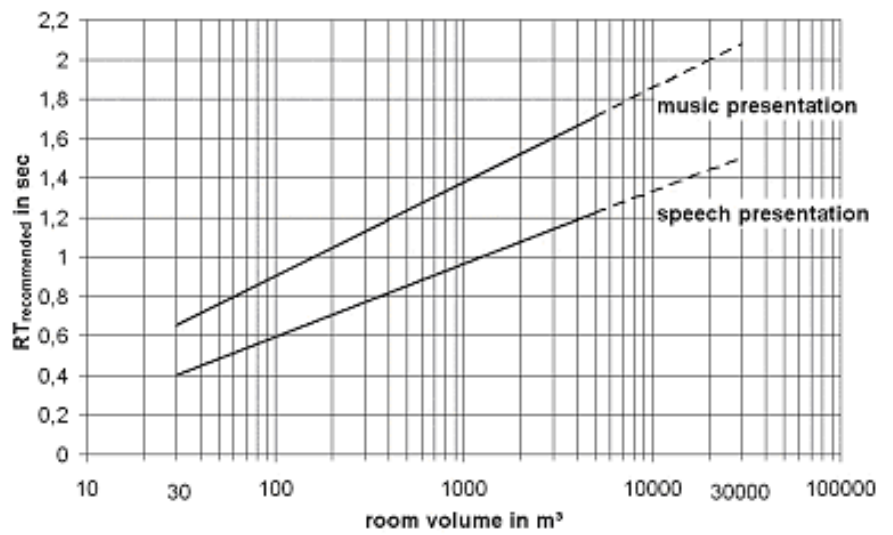
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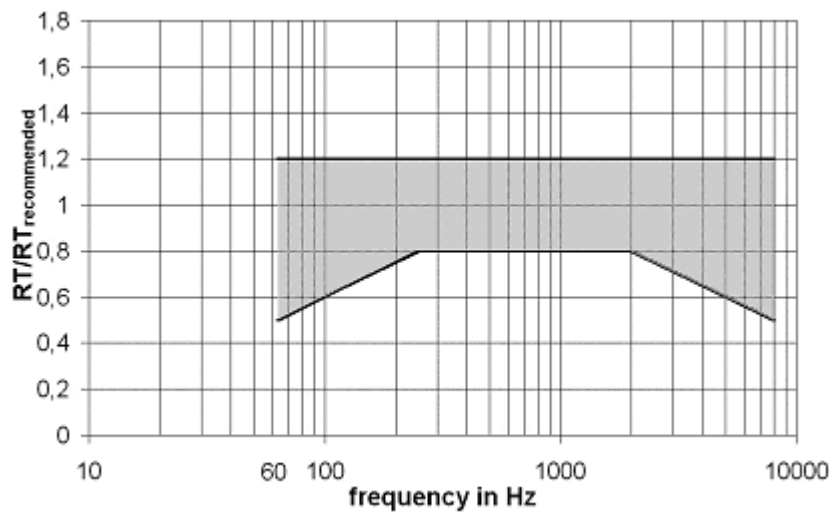
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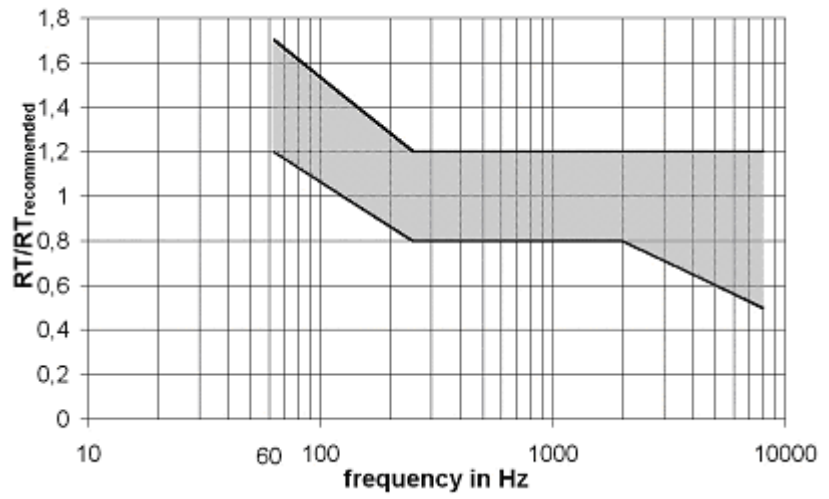
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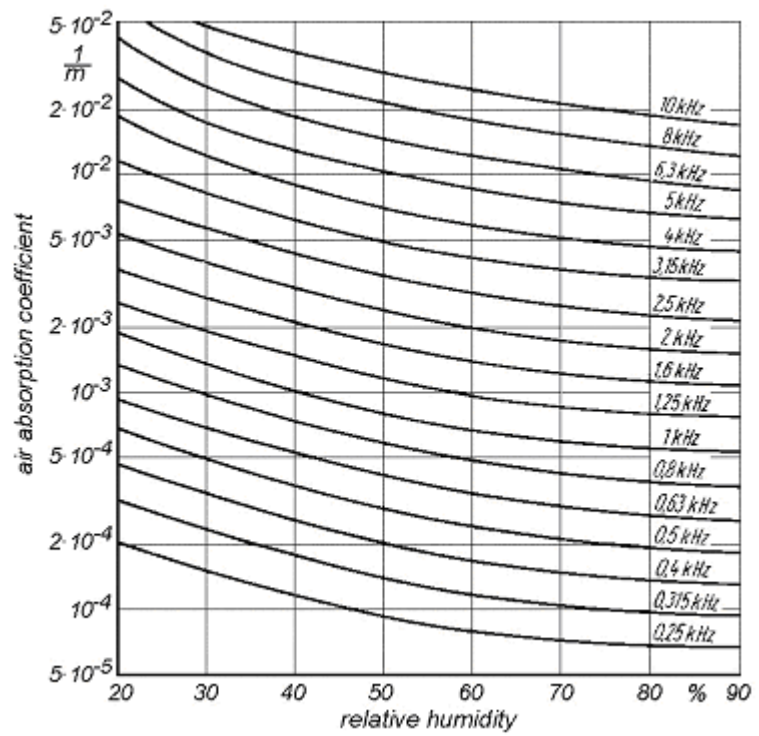
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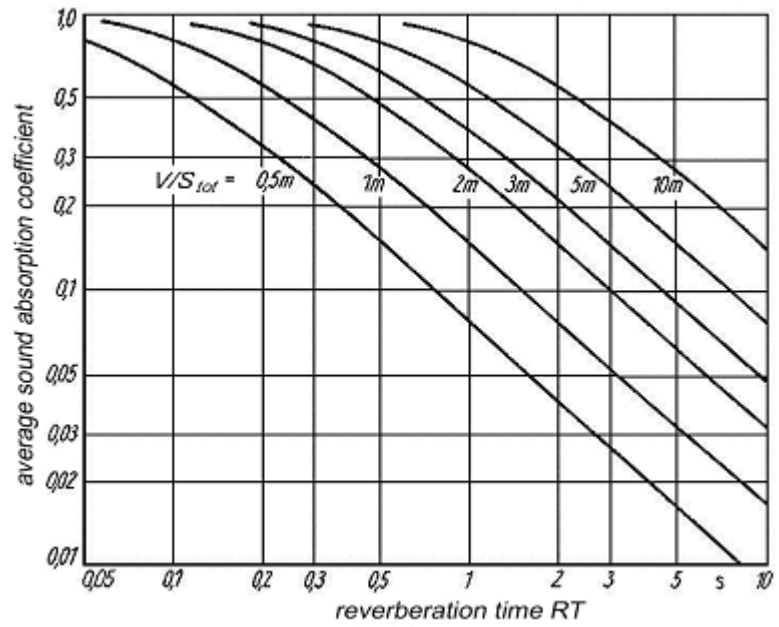
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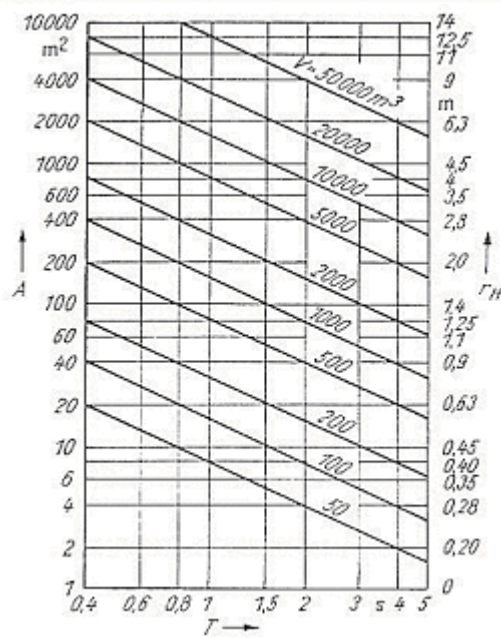
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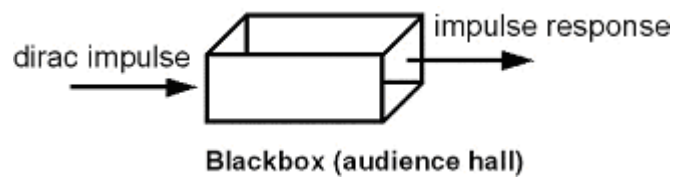
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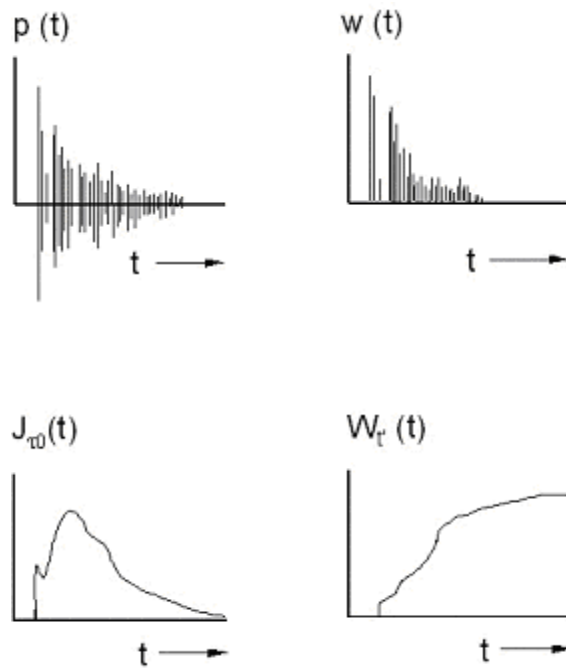
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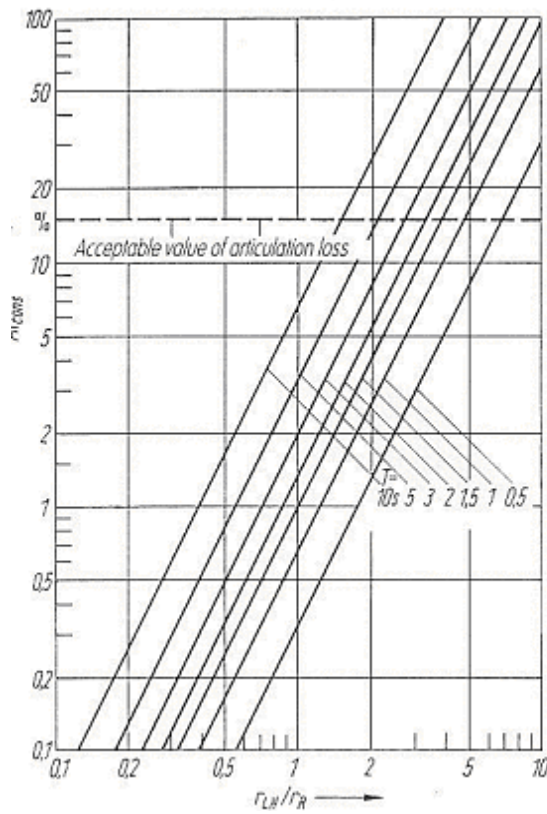
Fig. 6.9
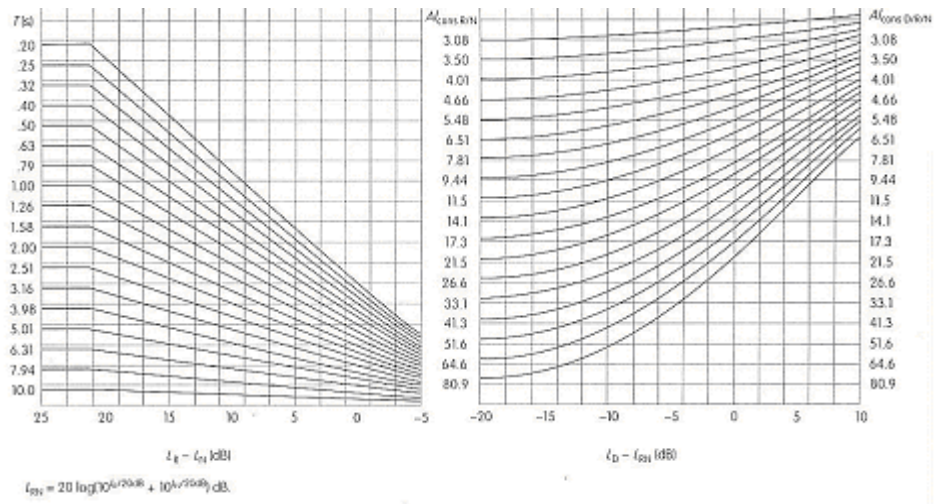
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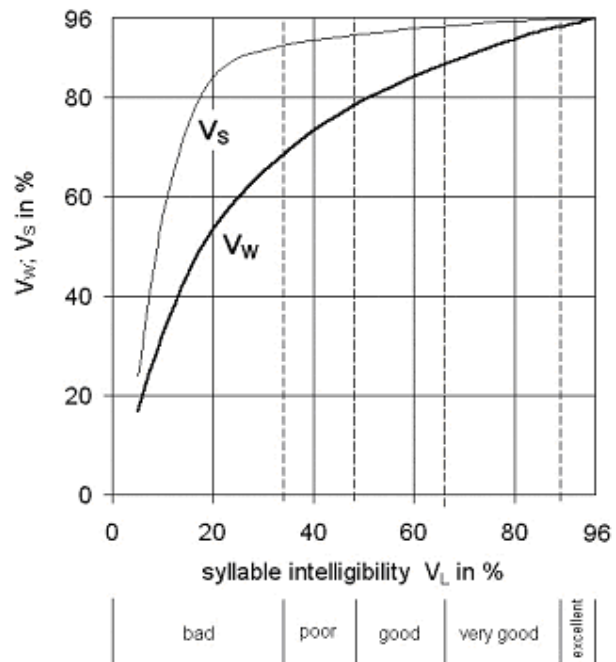
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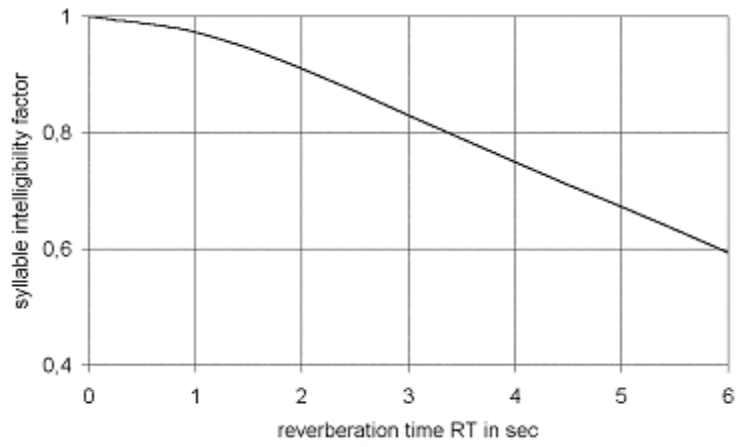
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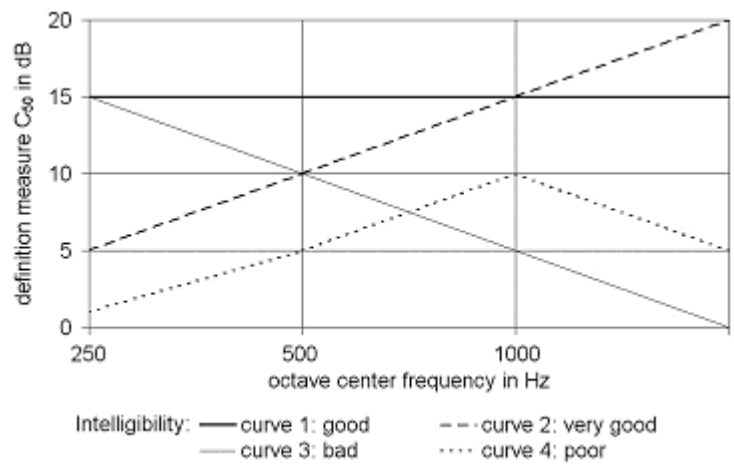
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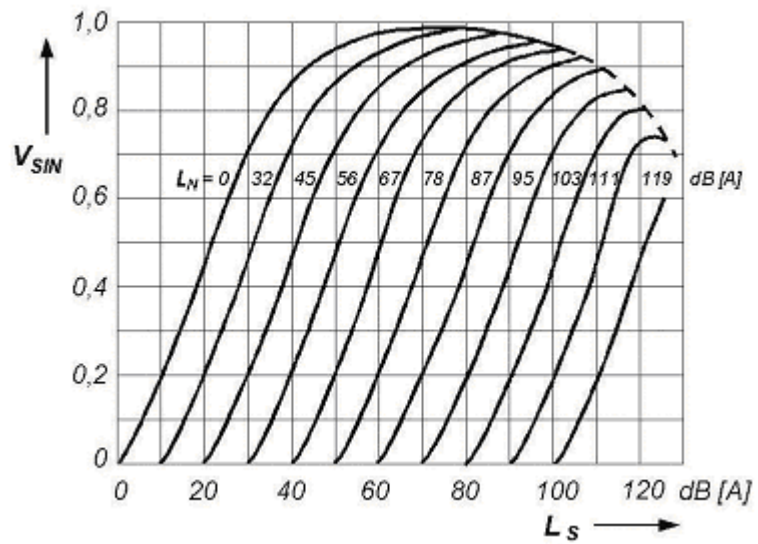
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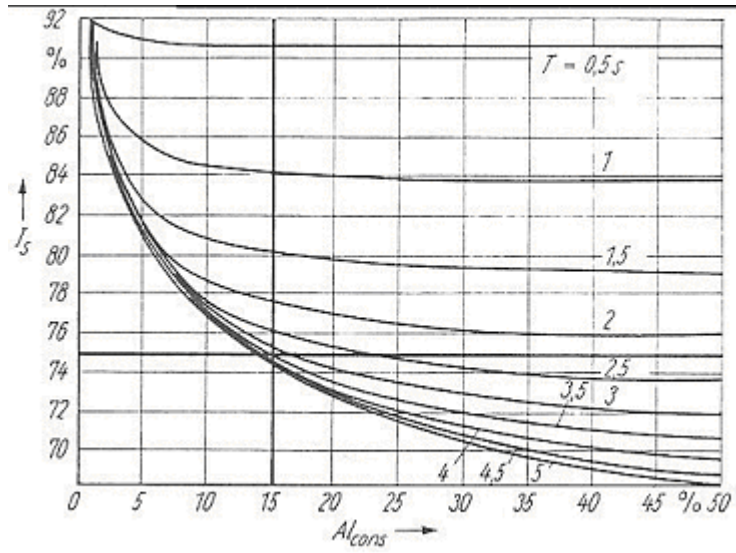
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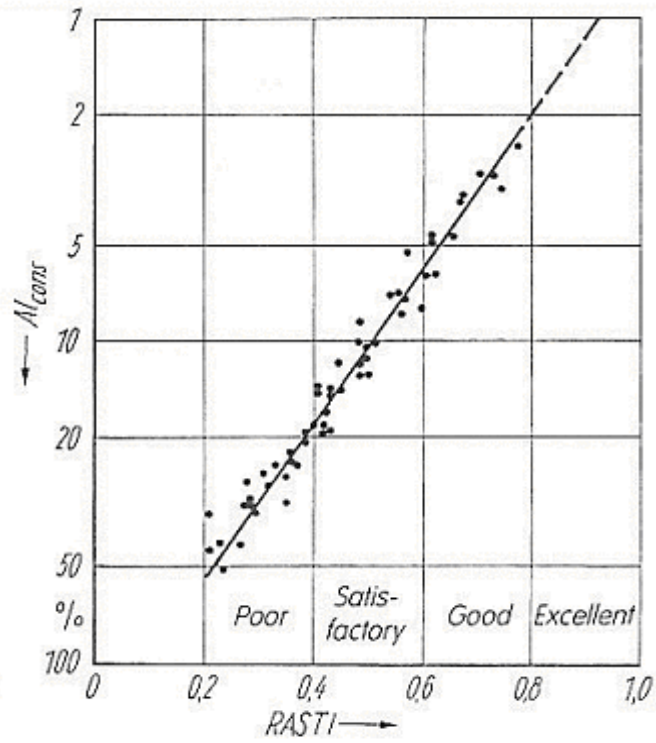
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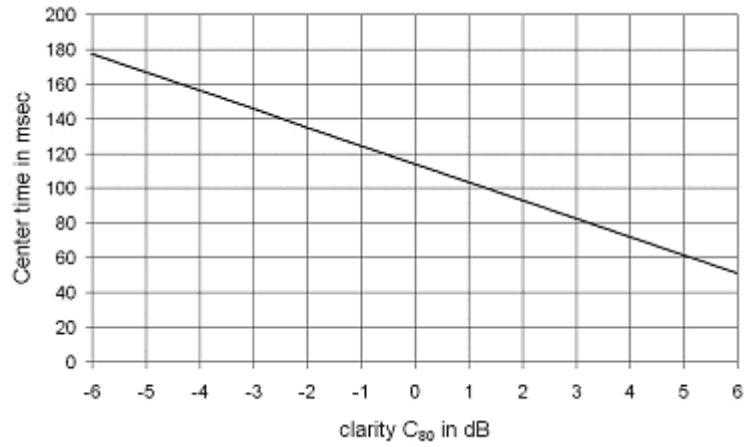
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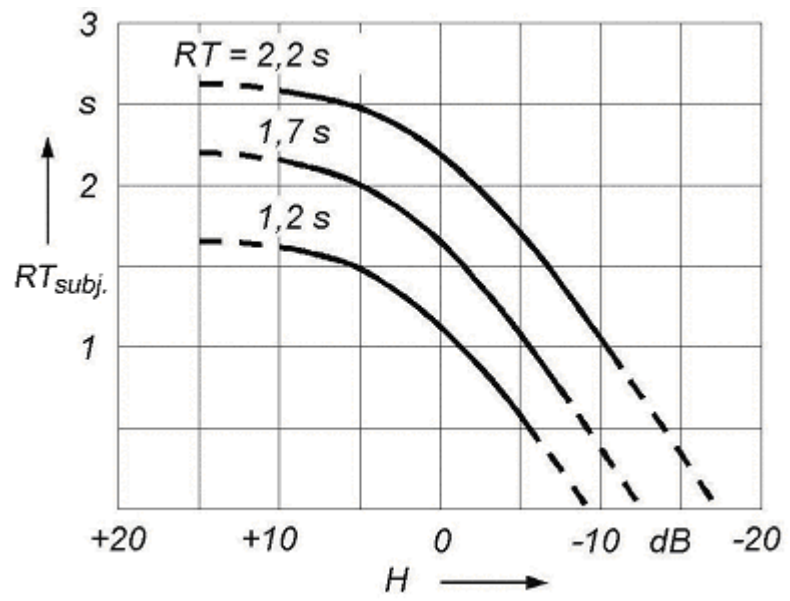
Fig. 6.18

Further Measures

Reverberation Time

Reverberation Time RT_{60} Formulae of Eyring and Sabine

Eyring

$$RT = \frac{0.163 \cdot V}{4\mu V - S \cdot \ln(1 - \alpha)}$$

where:

$$\mu = \frac{170}{\Psi\%}\left(\frac{f}{kHz}\right)^2 \cdot 10^{-4}\, m^{-1}$$

Ψ = humidity %

α = average absorption coefficient

V = room volume m^3

S = room surface m^2

f = frequency

Sabine

$$RT = 0.163 \cdot \frac{V}{\alpha \cdot S}$$

Direct SPL

One Speaker:

$$L = 10\lg\tilde{p}^2\, dB = 20\lg\tilde{p}\, dB$$

$$L_{dir} = L_K + 10\lg P_{el}\, dB - 20\lg r_{LH}\, dB + 20\lg \Gamma_L(\vartheta_H)\, dB$$

where:

$$L_K = \text{sensitivity}(1\text{m},1\text{W}) \text{ dB}$$

$$P_{el} = \text{max. electrical power}$$

$$r_{LH} = \text{distance loudspeaker to listener}$$

$$\Gamma_L\left(\vartheta_H\right) = \frac{\tilde{p}\left(\vartheta_H\right)}{\tilde{p}_0} = \text{angular directivity ratio (polars)}$$

$$Q = \gamma \cdot \Gamma^2\left(\vartheta_H\right) = Q \text{ - factor (dependent on angle)}$$

$$\gamma = \frac{\tilde{p}_d^2}{\tilde{p}_K^2}\bigg|_{\text{same electrical power}} = \text{front - to - random factor}$$

$$\tilde{p}_d = \text{pressure produced in main direction with directed speaker}$$

$$\tilde{p}_K = \text{pressure produced with an omnidirectional speaker}$$

$$\tilde{p} = \text{sound pressure}$$

$$\rho = \text{air density}$$

Power Summation

The dB SPL is calculated using simple energy addition. This does not show the cancellations and additions resulting from running time phase interference.

$$\tilde{p}_{all}^2 = \tilde{p}_1^2 + \tilde{p}_2^2 + \tilde{p}_3^2 + \ldots + \tilde{p}_n^2$$

Interference Sum (Default)

This is the standard method of calculating the interference between sources using running time phase interference. Computed is the potential energy part, which is then doubled in order to account for the kinetic energy part. This method is exact for a planar wave, but only an approximation for the superposition of waves with different propagation direction.

Interference Sum is active is neither Potential nor Kinetic Energy are checked.

$$\tilde{p}_{all}^2 = \left(\tilde{p}_1 + \tilde{p}_2 + \tilde{p}_3 + \ldots + \tilde{p}_n\right)^2$$

Potential Energy

This uses only the pressure part of the energy to calculate the map.

$$E_{pot} = \left(\tilde{p}_1 + \tilde{p}_2 + \tilde{p}_3 + \ldots + \tilde{p}_n\right)^2 \cdot \frac{1}{2\rho c}$$

where c is the sound velocity. Sound velocity and air density are not required as far as only the dB level $L = 10 \log (E/E_0)$ is computed.

Kinetic Energy

This uses only the speed part of the energy to calculate the map.

$$E_{kin} = \left(\mathbf{k}_1\tilde{p}_1 + \mathbf{k}_2\tilde{p}_2 + \mathbf{k}_3\tilde{p}_3 + \ldots + \mathbf{k}_n\tilde{p}_n\right)^2 \cdot \frac{1}{2\rho c}$$

where c is the sound velocity. Sound velocity and air density are not required as far as only the dB level L = 10 log (E/E$_0$) is computed. $\mathbf{k}_i$ are the unity vectors of the wave propagation direction.

This formula is only valid for the superposition of plane sine waves.

If all vectors $\mathbf{k}$ are parallel, E$_{kin}$ equals E$_{pot}$.

Potential + Kinetic Energy

This is the total energy, i.e. the sum of potential and kinetic energy.

$$E_t = E_{pot} + E_{kin}$$

Note:

In practical acoustical calculations waves are assumed to be planar, not spherical. If, in the real world, your system produces planar waves then you will get results that are very similar to the interference sum calculations. Also, in the real world, measurements can only be done in the pressure domain using microphones. Kinetic energy is the speed component of the total energy. Its effect is not in use in sound reinforcement but does affect interference at very specific angles, e.g. orthogonal (90° apart), where the pressure values can cancel each other but the speed vectors cannot.

Clarity Measures

This is the ratio of energy before and after a certain split time in decibels. The scaling of all C-Plots is in dB differential.

C7

This is the ratio of energy before and after 7 milliseconds in decibels. This map is used to predict the strength of direct sound of sources.

$$C_7 = 10 \lg \frac{\int_0^{7ms} \tilde{p}^2(t)\, dt}{\int_{7ms}^{\infty} \tilde{p}^2(t)\, dt}\ dB$$

Any value above –15 dB allows a good localization of the sound source.

The closer the value is to 0 the better the localization.

C50

This is the definition (ratio of energy before and after 50 milliseconds) in decibels. This map is used to predict intelligibility of the spoken word.

$$C_{50} = 10 \lg \frac{\int_0^{50ms} \tilde{p}^2(t)\, dt}{\int_{50ms}^{\infty} \tilde{p}^2(t)\, dt}\ dB$$

Any value above 0 dB in a standard room allows good speech intelligibility of the sound source.

Any value above -5 dB in a more reverberant than normal room allows good speech intelligibility of the sound source.

C80

This is the clarity (ratio of energy before and after 80 milliseconds) in decibels.

$$C_{80} = 10 \lg \frac{\int_0^{80ms} \tilde{p}^2(t)\, dt}{\int_{80ms}^\infty \tilde{p}^2(t)\, dt}\, dB$$

This map is used to predict the articulation of different modes of music. This articulation is dependent upon the speed of the music, the type of instrument and the reverberation of the room.

There are four types of instruments:

1. Blown instruments (e.g. organ, tuba, clarinet, etc.) These instruments have a slow attack and slow decay.

2. Bowed instruments (e.g. violin, viola, cello, bass etc.) These instruments have slightly quicker attack and slow decay.

3. Plucked instrument (e.g. guitar, string bass, harpsichord, etc.) These instruments have quick attack and medium slow decay.

4. Percussive instruments (e.g. piano, drums, electronic instruments, xylophone etc.) These instruments have a quick attack and a quick decay.

The scale of C80 is as follows:

- 0 +/- 2 dB is ideal for Organ or blown instruments played at slow rate of speed. This is perfect for organ recital halls

- 2 +/-2dB is ideal for bowed instruments and is best shown by a room made for classical or symphonic instrumental music. The speed of the music is quicker. The music of live choirs is also good at this level. This would be good for traditional churches

- 4 +/-2dB is ideal for plucked instruments. The speed of the music is quicker as well as more modern. This would be described as folk music or in churches as Light Contemporary. This would also cover light popular music such as Light Jazz

- 6 +/-2dB is ideal for percussive instruments. This can be described best as Rock and Roll. In churches this will be known as Full Contemporary.

At no point should the number exceed +8dB, if music is to be performed in this venue.

Csplit

This is the ratio of energy before and after the selected split time in decibels.

$$C_{split} = 10 \lg \frac{\int_0^{split\ time} \tilde{p}^2(t)\ dt}{\int_{split\ time}^\infty \tilde{p}^2(t)\ dt}\ dB$$

Pressure Levels

This is the sum of the sound intensity of the active loudspeakers within a certain time in decibels.

L7

This is the sum of the direct and reverberant sound energy within the first 7 milliseconds in decibels.

$$L_7 = 10 \lg \int_0^{7ms} \tilde{p}^2(t)\ dt\ dB$$

L50

This is the sum of the direct and reverberant sound energy within the first 50 milliseconds in decibels.

$$L_{50} = 10 \lg \int_0^{50ms} \tilde{p}^2(t)\ dt\ dB$$

L80

This is the sum of the direct and reverberant sound energy within the first 80 milliseconds in decibels.

$$L_{80} = 10 \lg \int_0^{80ms} \tilde{p}^2(t)\ dt\ dB$$

Lsplit

This is the sum of the direct and reverberant sound energy between the period of 0 and the selected split time in decibels.

$$L_{split} = 10 \lg \int_0^{split\ time} \tilde{p}^2(t)\ dt\ dB$$

Alcons

General

Since the invention of AlCons by Peutz in 1971 there are a couple of definitions used in the industry. Today the so-called Long Form equation is still in use. That equation gives the best correlation between subjective ratings and predicted.

Since EASE 4.3 Al_{cons} is derived from STI values according to the already above mentioned relationship:

$$Al_{cons} = e^{5,42\left(0,9482-STI\right)}$$

Distribution of intelligible energies

500Hz is considered the lowest frequency in which Voice Intelligibility is considered. The contribution of 500Hz to Voice Intelligibility is approximately 16%

1000Hz is considered the middle frequency in which Voice Intelligibility is considered. The contribution of 1000Hz to Voice Intelligibility is approximately 25%

2000Hz is considered the highest frequency in which Voice Intelligibility is considered. The contribution of 2000Hz to Voice Intelligibility is approximately 34%

Other frequencies that are in the Voice range are used for "body" and "snap" in the spoken word.

Recommended percentile charts

- 0% to 3% equals Excellent
- 3% to 7% equals Very Good
- 7% to 12% equals Good
- 12% to 15% equals Fair
- 15% to 18% equals Poor
- above 18% is Unacceptable

STI

This calculation is based upon the routines explained .

STI Score Intelligibility
- 0.75 to 1 equals Excellent
- 0.6 to 0.75 equals Very Good
- 0.45 to 0.6 equals Good
- 0.3 to 0.45 equals Fair
- 0.25 to 0.3 equals Poor

- 0 to 0.25 equals Unacceptable

Privacy Index (PI)

This **Privacy Index** is based on the **Articulation Index (AI)**:

$$PI = (1 - AI) * 100 \%$$

Level of Privacy	AI	PI
Confidential	0.00 – 0.05	100 % - 95 %
Normal (Non-Intrusive)	0.05 – 0.20	95 % - 80 %
Marginal/Poor	0.02 – 0.40	80 % - 60 %
No Privacy	> 0.04	< 60 %

- **Confidential**
    - hear only "muffled" sound
    - may be audible, but not intelligible
    - expected privacy level for private offices

- **Normal**
    - hear and understand words and some sentences
    - not distracting
    - expected privacy level for most open plan spaces

- **Marginal/Poor**
    - hear most sentences clearly
    - distraction is common
    - worker stress is evident
    - affects concentration

Appendix B: EASE in use – an overview

Key Strokes

General Key Conventions

Alt+underlined letter	Opens Menu
Underlined letter	Selects function after menu is open
F1	Opens the context sensitive Help window
F9	Opens the options window
Tab	Moves the active entry window to next position.
SHFT+Tab	Moves the active entry window to previous position.
Enter	The same as an OK or Yes
Esc	The same as a Cancel or No
Alt+F4	Closes Current Window
Ctrl+Alt+Del	To escape from a frozen window (**End Task**)
Ctrl+Alt+E	Brings the Room Edit Window to the foreground
Ctrl+Alt+A	Brings the Area Mapping Window to the foreground
Ctrl+Alt+R	Brings the Room Mapping Window to the foreground
Ctrl+Alt+T	Brings the Ray Tracing Window to the foreground

Where scrollbars are used:

Left Arrow	Moves the horizontal rotation scrollbar to the left
Right Arrow	Moves the horizontal rotation scrollbar to the right
Up Arrow	Moves the vertical rotation scrollbar upwards

Down Arrow	Moves the vertical rotation scrollbar downwards
PgUp	Moves the Zoom scrollbar up to Zoom-In
PgDn	Moves the Zoom scrollbar down to Zoom-Out

EASE Main Window

F1	Help
F5	Check Data
F9	Options
Home	Moves the selection bar to the beginning of the list
End	Moves the selection bar to the end of the list
Up Arrow	Moves the selection bar upwards
Down Arrow	Moves the selection bar downwards
Tab	Moves the selection bar to next section which section
SHFT+Tab	Moves the selection bar to previous section which section
Ctrl+O	Open Project
Ctrl+N	New Project
Ctrl+S	Save Project
Ctrl+A	Save Project As

Project Data

Main Window

F1	Help
F2	Assign Item
F3	Show all items with the same assignment
F4	Property sheet
F5	Check Data
F6	Apply and Save Project Data
F7	Grid/Display settings
F8	Activates the selected item
F9	Options
F10	Status bar settings
F11	Zoom In w/o the scroll bars with no limit
F12	Zoom Out w/o the scroll bars with no limit
x	Changes to x-View and changes the selected editing plane to the y-z plane
y	Changes to y-View and changes the selected editing plane to the x-z plane

z		Changes to z-View and changes the selected editing plane to the x-y plane
3		3D-View
Home		Full View
o		Toggles the Omniview mode
Del		Deletes selected item
Ins		Duplicates an item and inserts it into the drawing
k		Keep item to measure distance between two selected items
p		Activates the Pick Function Mouse mode
d		Activates the Drag Function Mouse mode
c		Set the point selected with LMB at center of the display
n		Activates the Spin Function
V		Activates Insert Vertex Mouse Mode
E		Activates Insert Edge Mouse Mode
F		Activates Insert Face Mouse Mode
L		Activates Insert Loudspeaker Mouse Mode
A		Activates Insert Audience Area Mouse Mode
S		Activates Insert Listener Seat Mouse Mode
H		Check Holes
T		Activates Turn Mouse Mode
Left Arrow		Moves the horizontal rotation scrollbar to the left
Right Arrow		Moves the horizontal rotation scrollbar to the right
Up Arrow		Moves the vertical rotation scrollbar upwards
Down Arrow		Moves the vertical rotation scrollbar downwards
PgUp		Moves the Zoom scrollbar up to Zoom-In
PgDn		Moves the Zoom scrollbar down to Zoom-Out
Space		Set the point selected with LMB at center of the display
Ctrl+		
		Changes Pick and Turn Mouse Mode to Drag Mouse Mode
F2		Change Color
F3		Global Assign items with the same properties
F8		Deactivates all Items
F12		Delete Stacked Vertices
F		Find item

N	New Project (stand-alone mode)
O	Open Project or Acquire Project Data (stand-alone mode)
S	Save Project or Apply Project Data (stand-alone mode)
A	Save Project As (stand-alone mode)
Z	Undo
Y	Redo
Left Arrow	Move viewpoint to the left
Right Arrow	Move viewpoint to the right
Up Arrow	Move viewpoint upwards
Down Arrow	Move viewpoint downwards
PgUp	Move the selected frequency +1
PgDn	Move the selected frequency –1

Shift+

	Changes Pick and Drag Mouse Mode to Turn Mouse Mode
F2	Change Rear Material
F3	Show all faces with the same Rear Material
F11	Pick next item of the project
F12	Pick previous item of the project
0 or k	Show distance between two selected items
Left Arrow	Move item selected in the -X
Right Arrow	Move item selected in the +X
Up Arrow	Move item selected in the +Y
Down Arrow	Move item selected in the -Y
PgUp	Move item selected in the +Z
PgDn	Move item selected in the –Z
c	Activates Fixed Center Mouse Mode
d	Displace selected item
t	Activates Fixed Cut Mouse Mode
x	Changes to x-View, changes the selected editing plane to the y-z plane and opens the Options Window to allow editing of the plane value
y	Changes to y-View, changes the selected editing plane to the x-z plane and opens the Options Window to allow editing of the plane value
z	Changes to z-View, changes the selected editing plane to the x-y plane and opens the Options Window to allow editing of the plane value

Shift+Ctrl+

F2	Change Rear Color
F3	Change All Same Rear Materials
F10	RMB (RM Menus)
F12	Deletes Unattached Vertices
V	Opens Vertices table
E	Opens Edges table
F	Opens Faces table
L	Opens Loudspeakers table
A	Opens Audience areas table
S	Opens Listener Seats table
I	Opens IR Emitters table
M	Opens Lamps table
O	Opens Objects table
W	Opens Wall Material table

Area Layout Window

F1	Help
F9	Options
PgUp	Move area selected in the +Z
PgDn	Move area selected in the –Z

Shift+

Left Arrow	Move area selected in the -X
Right Arrow	Move area selected in the +X
Up Arrow	Move area selected in the +Y
Down Arrow	Move area selected in the -Y

Item View Window

F1	Help
F11	Zoom In
F12	Zoom out

Shift+

F11	Pick next item of the project
F12	Pick previous item of the project

Eyes

Main Window

F1	**Help**
F8	**Full View**

F9	Options	
F10	Status bar settings	
F11	**Zoom In**	
F12	**Zoom Out**	
p	Activates the Pick Function Mouse mode	
d	Activates the Drag Function Mouse mode	
t	Activates Turn Function Mouse Mode	
x	x-View	
y	y-View	
z	z-View	
3	**3D-View**	
Left Arrow	Moves the horizontal rotation scrollbar to the left	
Right Arrow	Moves the horizontal rotation scrollbar to the right	
Up Arrow	Moves the vertical rotation scrollbar upwards	
Down Arrow	Moves the vertical rotation scrollbar downwards	
PgUp	**Zoom In**	
PgDn	**Zoom Out**	
Home	**Full View**	
Esc	Stop **Walker**	

Ctrl+

	Changes Pick and Turn Mouse Mode to Drag Mouse Mode	
O	**Open Project** (Stand-alone mode) or **Acquire Project Data**	
Left Arrow	Move viewpoint to the left (20%)	
	(External View only)	
Right Arrow	Move viewpoint to the right (20%)	
	(External View only)	
Up Arrow	Move viewpoint upwards (20%)	
	(External View only)	
Down Arrow	Move viewpoint downwards (20%)	
	(External View only)	
PgUp	Move the selected **Frequency** +1/3 Octave	
	(External View only)	
PgDn	Move the selected **Frequency** −1/3 Octave	
	(External View only)	
Home	Center (External View only)	
Tab	Next Viewpoint (Perspective View only)	

| BackTab | Previous Viewpoint (Perspective View only) |

Shift+

	Changes Pick and Drag Mouse Mode to Turn Mouse Mode
F11	Next Viewpoint (Perspective View only)
F12	Previous Viewpoint (Perspective View only)

Walker Window

F7	Invoke Probe
F8	Auralize Direct Sound
F9	Toggle Perspective/External View
Home	Go to (0,0,0)
Esc	Stop Walking
Left Arrow	Step Left	(Standing)
	Turn Left 10°	(Walking)
Right Arrow	Step Right	(Standing)
	Turn Right 10°	(Walking)
Up Arrow	Step Ahead	(Standing)
	Move Forward	(Walking)
Down Arrow	Step Back	(Standing)
	Move Backward	(Walking)
PgUp	Step Up	(Standing)
	Turn Up 10°	(Walking)
PgDn	Step Down	(Standing)
	Turn Down 10°	(Walking)

Standard Mapping

F1	Help
F9	**Options**
F10	**Status Bar Options**
F11	**Zoom In**
F12	**Zoom Ou**t
p	Activates the Pick Function Mouse mode
d	Activates the Drag Function Mouse mode
t	Activates Turn Function Mouse Mode
x	x-View
y	y-View
z	z-View
3	3D-View
Left Arrow	Moves the horizontal rotation scrollbar to the left

Right Arrow	Moves the horizontal rotation scrollbar to the right
Up Arrow	Moves the vertical rotation scrollbar upwards
Down Arrow	Moves the vertical rotation scrollbar downwards
PgUp	**Zoom In**
PgDn	**Zoom Out**
Home	**Full View**

Ctrl+

	Changes Pick to Drag Mouse Mode
O	**Open Project (Stand-alone mode)** or **Acquire Project Data**
PgUp	Move the selected **Frequency** +1/3 Octave
PgDn	Move the selected **Frequency** –1/3 Octave

Probe

F1	**Help**
F7	View/Change Grid/Y-Axis
F8	**Full View**
F9	**Options**
F10	**Status Bar** settings
F11	**Zoom In**
F12	**Zoom Out**
x	x-View
y	y-View
z	z-View
3	3D-View
Home	Full View
PgUp	**Zoom In**
PgDn	**Zoom Out**
+	Increase Current Order
-	Decrease Current Order
Del	Deactivate Picked Pulse
Ins	Activate Picked Pulse
Down	**Frequency** -1/3 Octave (not 3D Graphs)
Up	**Frequency** +1/3 Octave (not 3D Graphs)
Left	Pick Previous Pulse (not 3D Graphs)
Left	Move EFC Cursor (Freq. Response only)
Right	Pick Next Pulse (not 3D Graphs)
Right	Move EFC Cursor (Freq. Response only)
Bksp	No Current Pulse, No Current Order, No EFC

		Cursor
	Esc	No Current Pulse, No Current Order, No EFC Cursor
	Alt-Bksp	Spin/Stop

Ctrl+

O	**Open Response File**
A	**Save Response File As**
X	View/Change Grid/X-Axis
Y	View/Change Grid/Y-Axis
+	Increase Current Order
-	Decrease Current Order
Left Arrow	Move viewpoint to the left (10%)
Right Arrow	Move viewpoint to the right (10%)
Up Arrow	Move viewpoint upwards (10%)
Down Arrow	Move viewpoint downwards (10%)
PgUp	Move the selected frequency +1
PgDn	Move the selected frequency –1
Tab	Pick Next Pulse
Tab	Move EFC Cursor (Freq. Response only)
BackTab	Pick Previous Pulse
BackTab	Move EFC Cursor (Freq. Response only)

Shift+

F11	Pick Next Pulse
F11	Move EFC Cursor (Freq. Response only)
F12	Pick Previous Pulse
F12	Move EFC Cursor (Freq. Response only)

Speaker Base

F1	Help
F4	Open **Speaker Data** Window
F9	**Options**
F10	**Statusbar** Options
F11	**Zoom In**
F12	**Zoom out**
D	Activates the Drag Function Mouse mode
P	Activates the Pick Function Mouse mode
T	Activates the Track Function Mouse mode
x	x-View
y	y-View
z	z-View

3	3D-View
Left Arrow	Moves the horizontal rotation scrollbar to the left
Right Arrow	Moves the horizontal rotation scrollbar to the right
Up Arrow	Moves the vertical rotation scrollbar upwards
Down Arrow	Moves the vertical rotation scrollbar downwards
PgUp	**Zoom In**
PgDn	**Zoom Out**
Home	**Full View**

Ctrl+

N	**New Speaker**
O	**Open Speaker**
S	**Save Speaker**
A	**Save Speaker As**
B	Displays the speaker **Balloon**.
M	Shows next balloon **Meridian**
P	Shows next balloon **Parallel**
PgUp	**Frequency** +1/3 Octave
PgDn	**Frequency** –1/3 Octave

Shift+

C	Activates Fixed Center Mouse Mode

Balloon

F1	**Help**
F9	**Options**
F10	**Statusbar** settings
F11	**Zoom In**
F12	**Zoom Out**
D	Activates the Drag Function Mouse mode
P	Activates the Pick Function Mouse mode
x	x-View
y	y-View
z	z-View
3	**3D-View**
Home	**Full View**
Left Arrow	Moves the horizontal rotation scrollbar to the left

Right Arrow	Moves the horizontal rotation scrollbar to the right
Up Arrow	Moves the vertical rotation scrollbar upwards
Down Arrow	Moves the vertical rotation scrollbar downwards
PgUp	**Zoom In**
PgDn	**Zoom Out**

Ctrl+

O	Open Speaker or Acquire Balloon Data
PgUp	Move the selected frequency +1
PgDn	Move the selected frequency –1

Shift+

C	Activates Fixed Center Mouse Mode

Material Base

F1	Help
Ctrl+N	New Wall Material
Ctrl+O	Open Wall Material
Ctrl+S	Save Wall Material
Ctrl+A	Save Wall Material As

Import/Export

F1	Help
F5	Check Data
x	x-View
y	y-View
z	z-View
3	3D-View
Ctrl+N	New Project (standalone mode only)
Ctrl+O	Open Project or Acquire Project Data (standalone mode only)
Ctrl+S	Save Project or Apply Project Data (standalone mode only)
Ctrl+A	Save Project As (standalone mode only)

Mouse

General Mouse Conventions

Left click	Press left mouse button once
LMB	Press left mouse button once
Left double click	Press left mouse button twice quickly.
Right click	Press right mouse button once
RMB	Press right mouse button once
Select	LMB can be clicked either once or twice depending on window.

EASE Main Window

Left click on selection in left pane will display contents on right pane.

Left double click on selection in right pane will display or open a window with information about the item.

Project Data

Main Window

Mouse Modes

Pick	This allows selection of the object pointed at by the mouse cursor.
Activate	This allows the selected item to be activated
Location	Allows showing and marking of the cursor location. Coordinates shown are dependent on the window view. Example: X view will allow the coordinates shown to be y and z, etc.
Center	This allows picking of a spot and centering that spot on the screen.
Drag	This allows moving the model around on the background. Click on the part of the screen you want to move and hold the LMB and move the mouse to where you want the point to be. RMB aborts current action.
Turn	This allows rotating the viewpoint of the model around on the background. Click on the part of the screen you want to rotate and hold the LMB and move the mouse to where you want the point to be. With holding down the RMB you can Zoom In and Out.

Mouse Mode Pick

LMB on item	This allows picking (selection) of item
LMB on background	This will unpick any item
RMB with picked item	This will open an operations menu for the selected item

RMB (nothing picked)	This will open an operation menu for general window adjustments

Mouse Mode Center

LMB on picture	This will center the selected spot of the picture.

Mouse Mode Turn

LMB on picture	This allows rotating the viewpoint of the model around on the background
RMB on picture	This allows zooming in and out

Mouse Wheel

Mouse wheel spinning allows zooming in and out.

Area Layout Window

LMB on item	This allows picking (selection) of an Audience Area and/or Listener Seat.

Item View Window

LMB	This allows picking of a spot and centering that spot on the screen.

Eyes

Mouse Mode Center

LMB on picture	In this mode, left click on a point pans the display to center that point in the display.

Mouse Mode Pick

LMB on picture	Opens the Walker Window for the picked position

Mouse Mode Turn

LMB on picture	This allows rotating the viewpoint of the model around on the background
RMB on picture	This allows zooming in and out

Mouse Wheel

Mouse wheel spinning allows zooming in and out.

Standard Mapping

Mouse Mode Peek

Mouse cursor	If cursor is dragged over the mapped areas **Value** on the statusbar will display the instant data.
LMB on mapped areas	This will display value at that spot
RMB on mapped areas	This will write value on the spot
RMB on background	This will allow adjustments of window criteria

Mouse Mode Center

> **LMB on picture**   This will center the selected spot of the picture.

Mouse Wheel

Mouse wheel spinning allows zooming in and out.

Probe

A Double click on the title of the chart opens the Options Window, selecting the correct page automatically.

A Double click on the bottom chart legend opens the Options Window, selecting the Legend page allowing modification of the abscissa (x-axis). (See **Edit-Change Grids**)

A Double click on the right chart legend opens the Options Window, selecting the Legend page allowing modification of the ordinate (y-axis). (See **Edit-Change Grids**)

A Double click on the center of the chart invokes an immediate redraw.

Standard Mapping

Mouse Wheel

Mouse wheel spinning allows zooming in and out.

Balloon

> **RMB on background**   Window Color, Options Menu

Mouse Wheel

Mouse wheel spinning allows zooming in and out.

Statusbars

EASE Main Window

The bar displays the current path of the project

Project Data

Main Window

Item	This displays the Item label and material or speaker model number.
Picked Location	This displays the location, in x, y, and z coordinates, of the point picked on a Face or Area. It will also display the coordinates of an item that is defined as a single point, such as a Vertex, Loudspeaker or Listener Seat.
Mouse Mode	This displays the operational mode of the mouse. This can be Pick, Drag, Zoom In, Zoom Out,

	Center, Location or e.g. Insert Vertex. In the case of an insertion mouse mode a number sign shows that the Hold function is active.
Horizontal Angle	This displays the horizontal viewing angle of the window.
Vertical Angle	This displays the vertical viewing angle of the window.
Cursor	This displays the current x, y, and z coordinates of the selected plane. In the case of an insertion mouse mode this is where a Vertex etc. is inserted.
Checked	This displays the condition of the building closure or face position with a **True** or **False**.

Area Layout Window

Aud. Area	This displays the Audience Area label
Listener Seat	This displays the Listener Seat label.
Mouse Mode	This displays the operational mode of the mouse. This can be Pick, Move and Insert Seat
Horizontal Shift	This will allow display of the number of (FT, Meters) in the X direction the audience area is moved from its original position. This allows display of areas that may intersect each other and obstruct the viewing of mapped data. This shift does not change the calculation of the data. The shift is only for display.
Vertical Shift	This will allow display of the number of (FT, Meters) in the Y direction the audience area is moved from its original position. This allows display of areas that may intersect each other and obstruct the viewing of mapped data. This shift does not change the calculation of the data. The shift is only for display.
Cursor	This allows viewing of the continuous cursor position while on an audience area.

Item View Window

Item	This displays the Item label
Scope	This displays the viewing cone angle
Hor	This displays the horizontal aiming angle with 0 degrees looking in the Y direction
Ver	This displays the vertical aiming angle with 0 degrees being level horizontally
Freq	This displays the frequency selected for the current display

Eyes

View Label	This displays the view position. EXT, Walker or Item.
Zoom	This displays the zoom percentage starting at

	100% for a Full picture.
Hor	This displays the horizontal viewing angle of the window
Ver	This displays the vertical viewing angle of the window
Cursor	This displays the current H and V coordinates of the screen
Freq	This displays the frequency selected for the current display

Standard Mapping

Freq	This displays the frequency selected for the current display
Aud. Area	This displays the Audience Area label
Value	This displays the value (dB SPL, AlCons, Time) at the cursor position when the mouse is positioned on the display.
Cursor	This displays the current x, y, and z coordinates of the selected Audience Area.

Probe

Freq	This displays the frequency selected for the current display
Pulse	This displays the selected pulse number in the reflectogram.
Lsp	This displays the selected pulses originating speaker
Time	This displays the selected pulses arrival time after the first direct sound pulse
Level	This displays the selected pulses level in dB
Order	This displays the selected pulses reflection order (0= Direct, 1= 1st reflection)
Hor	This displays the selected pulses Horizontal arrival direction compared to the head position
Ver	This displays the selected pulses vertical arrival direction compared to the head position

Speaker Base

Hor	This displays the horizontal angle of the speaker balloon relative to the window. 0 degrees is in the –Y direction
Ver	This displays the vertical angle of the speaker balloon relative to the window. 0 degrees is horizontal.
Freq	This displays the frequency selected for the current display
Sensitivity	This displays the sensitivity of the speaker at

		the selected frequency
	Directivity (Q)	This displays the directivity or Q of the speaker at the selected frequency
	Mer./Par	This displays the selected angle of the meridian or parallel of the directivity balloon.

Balloon

	Mouse Mode	This displays the operational mode of the mouse. This can be Pick, Peek, Drag, Zoom In, Zoom Out and Center.
	Freq	This displays the frequency selected for the current display
	Hor	This displays the horizontal angle of the speaker balloon relative to the window. 0 degrees is in the –Y direction
	Ver	This displays the vertical angle of the speaker balloon relative to the window. 0 degrees is horizontal.
	Cursor	This allows viewing of the cursor position.
	Value	This allows viewing of the attenuation values while using **Speaker View** and Mouse Mode **Peek**.

Material Base

	Freq	This displays the frequency at the cursor when the mouse is used on the chart
	Value	This displays the absorption (diffusion) coefficient at the cursor position when the mouse is used on the chart

Scrollbars

General Scrollbar Conventions

	Left Arrow	Moves the horizontal rotation scrollbar to the left
	Right Arrow	Moves the horizontal rotation scrollbar to the right
	Up Arrow	Moves the vertical rotation scrollbar upwards
	Down Arrow	Moves the vertical rotation scrollbar downwards
	PgUp	Moves the Zoom scrollbar up to Zoom-In
	PgDn	Moves the Zoom scrollbar down to Zoom-Out

Menus

General Menu Conventions

Alt+underlined letter	Opens Menu
Underlined letter	Selects function after menu is open
Ctrl+Shift+F10	WINDOWS RM Menus

Commandline Calls

Program	File	Action
EASE.EXE	*.ppj	Open Project
EASE.EXE	*.frd	Open Project
EASE.EXE	*.zip	Open Project
EASE.EXE	*.shp	Open Project
EASE.EXE	*.job	Open Project
EASE.EXE	*.roo	Open Project
EASEBALL.EXE	*.spk	Open Speaker Model
EASEEARS.EXE	*.bir	Auralize Filter
EASEEARS.EXE	*.rsp	Auralize Response
EASEEARS.EXE	*.wav	Play WAV file
EASEEYES.EXE	*.frd	Open Project
EASEIMEX.EXE	*.frd	Open Project
EASEIMEX.EXE	*.roo	Import EASE 2.1 Project/Global Base
EASEIMEX.EXE	*.job	Import CADP2 Job File
EASEPROB.EXE	*.mpc	Open Impact File
EASEPROB.EXE	*.rsp	Open Response File
EASERAYS.EXE	*.frd	Open Project
EASEROOM.EXE	*.frd	Open Project
EASESPKR.EXE	*.spk	Open Speaker Model
EASEWALL.EXE	*.mat	Open Wall Material