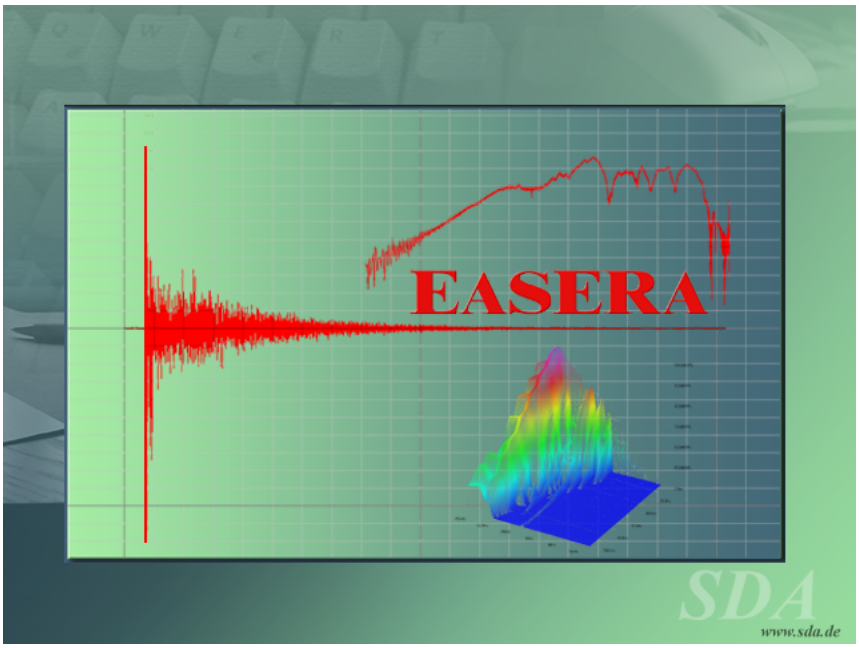
EASERA 1.2

EASERA Users Manual



By AFMG Technologies GmbH, Berlin.

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Chapter 0: Overview

EASERA Introduction

EASERA stands for Electronic & Acoustic System Evaluation & Response Analysis. It is a software program for measuring and evaluating signals, usually in the acoustic or electro-acoustic field.

System Requirements

EASERA runs on computers equipped with Windows 98, Windows 2000, Windows XP, Vista, 7 and 8. CPU should be at least 500 MHz, working memory at least 128 Mbyte (>256 Mbyte recommended), and at least 2 Gbyte free hard-disc space. The graphic resolution should be at least 800 x 600 pixels (1100 x 850 is recommended).

If measurements are to be carried out, a soundcard will be required. EASERA supports all common soundcards, up to 32 input channels, bit-resolutions up to 32 Bit and sampling rates of up to 192 kHz. Regarding drivers, Windows, DirectSound, Wave and ASIO are supported.

If more than two input channels are to be used, ASIO drivers are required. For one or two input channels DirectSound drivers (MS DirectX) can be used as well as Wave/MME drivers (MS Windows Audio-API). Use the *Windows* driver setting to select the default driver that is defined directly by the Windows Sound System. This option should be chosen only if other settings do not work reliably.

If the measurements have to comply with high accuracy standards, not all soundcards will be suitable. You will find a list of the soundcards tested by AFMG under the following link:
http://www.sda.de/EaseraAudioDevices/Viewer.aspx

Excitation Signals

EASERA generates all common stimulus signals, i.e. sweeps, MLS, noise and pure tones. All broad-band signals are able to use the frequency-weighting modes of *white*, *pink* and *weighted*.

External stimulus signals may also be used, if they are available as an audio file.

References and Calibration

EASERA is capable of generating Reference Files, which allow for compensating the frequency responses of the components involved (microphones, loudspeakers).

Along with the input and output signals, the input and output mixers of Windows may also be calibrated, so that EASERA will know the relationship between the steps of the controls and the actual levels.

Live Analysis

A real-time analysis of the signal may take place in a frequency response or spectrogram view. In addition to linear frequency weighting there are also A-, B- or C-filters that may be used.

View & Calc

Using measured data or data loaded from a file, extensive evaluations may be carried out (e.g. impulse response, ETC, Schroeder Plot, reverberation times, frequency response, waterfall diagram, phase response, harmonic distortion spectrum, speech intelligibility, and many other options).

These post-processing operations are provided by EASERA in both the time and the frequency domain, and various mathematical functions can be applied to all of the data or just a part of it.

EASERA Tabs

EASERA uses a number of inter-related windows:

- Start
- Measure
- Live
- View & Calc
- Waterfall
- Results

These windows are accessible via the buttons arranged at the upper margin of the Program Window. Tabs for windows that would not make any sense to show are hidden from view. For instance, before any selections are made, only the first three tabs are shown when EASERA starts.

Each of the windows is described in its own chapter.

Start

From here you prepare for a measurement or open a file for evaluation. Under the navigator button ***Wizard*** you find an assistant, which proposes reasonable parameters for a measurement based on the existing conditions.

Measure

Here you set the parameters for performing a measurement, choose the soundcards to be used, calibrate the setup, select the stimulus signal, and start the measurement.

Live

In this window you find an analyzer displaying the frequency spectrum in real time.

View & Calc

After execution of a measurement or opening of a file you use this window to perform the evaluation: impulse response, ETC, frequency response, phase response, Schroeder Plot, speech intelligibility values, etc.

Waterfall

This window shows you a waterfall diagram or a spectrogram.

Results

Here you will find the results of the calculation in tabular form.

EASERA Quick Start

In this section we want to show you the quickest way to complete a room-acoustical measurement with EASERA.

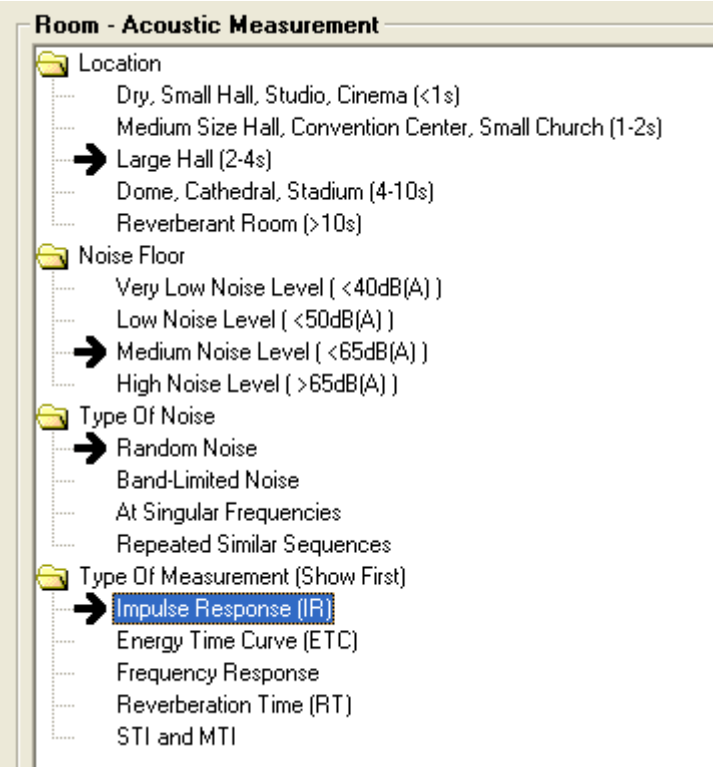
1. Connection of Measurement Microphone and Loudspeaker to the Soundcard

If your soundcard has XLR connectors with phantom powering, you may connect your measurement microphone directly to the soundcard. Otherwise you need a suitable preamplifier.

For exciting the room with the measurement signal, you need a loudspeaker and a suitable power amplifier, which must be connected to the output of the soundcard.

2. Starting EASERA and Using the Wizard

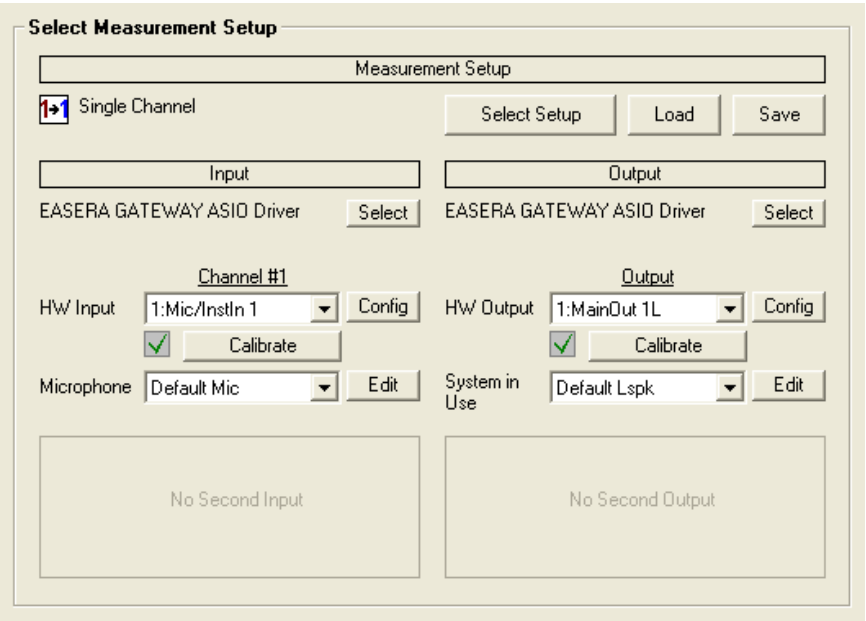
Start EASERA and select the ***Wizard*** button, then select **Room – Acoustic Measurement** from the navigator page that is shown just below the button. Enter the environmental parameters here, i.e. the size of the room, the intensity of ambient noise and its characteristic. From these selections EASERA derives suitable parameters for the measurement.



3. Select Soundcard

EASERA will automatically change to the ***Measure*** tab by clicking on the **Accept** button (bottom right).

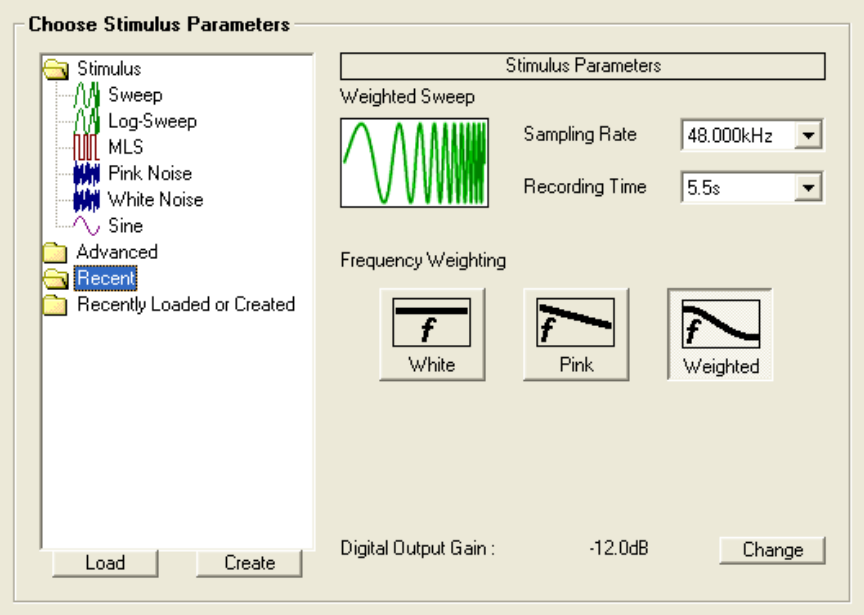
On the page ***Select Measurement Setup*** you find in the sections *Input* and *Output* the soundcards used for the playback and recording of the measurement signals. If necessary, select the soundcard, which the measurement microphone or the power amplifier is connected to.



The default measurement setup is initially *Single Channel* – EASERA then uses only one input channel, but is capable of selecting any one of up to 32 input channels if your hardware supports it.

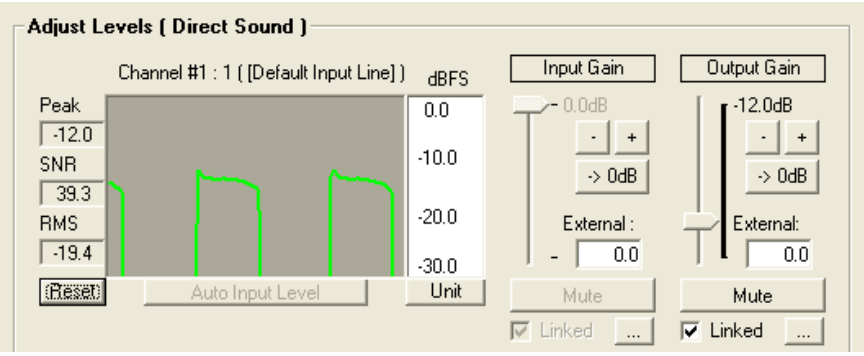
4. Signal Selection

On the page ***Choose Stimulus Parameters*** you may choose the stimulus signal and set its parameters in detail. Generally, the Wizard will already have selected suitable settings.



5. Level Adjustment

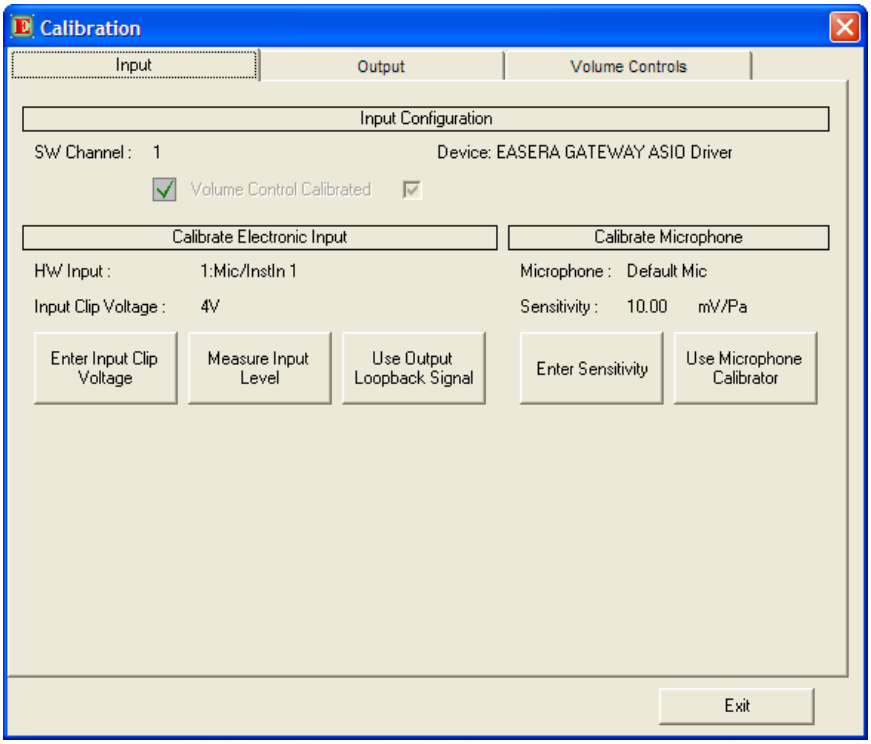
On the page ***Adjust Levels*** we now set the levels so that the input level is approx. 10 dB below the clipping limit. Use the **Play Test Signal** button (bottom right) to send the stimulus signal to the connected power amplifier. The faders below *Input Gain* and *Output Gain* replicate the faders of the Windows mixer. Adjust the output fader so that the output signal has a suitable value, i.e. neither destroys the loudspeakers nor gets lower than the ambient noise (to ensure that the measurement is impaired as little as possible by extraneous noise, you should turn the output signal as loud as the loudspeaker device allows). Then the input fader is adjusted so that the signal lies about 10 dB below the clipping limit.



If an ASIO driver is used, the signal is usually not routed via the Windows mixers and can thus not be directly adjusted by EASERA. If need be, the level adjustments would have to be made using the external ASIO mixer application provided with the driver.

6. System Calibration

The measured level values are correct only if you calibrate the system. To calibrate the levels, click on one of the **Calibrate** buttons on the ***Select Measurement Setup*** page which presents you with the following ***Calibration*** window:

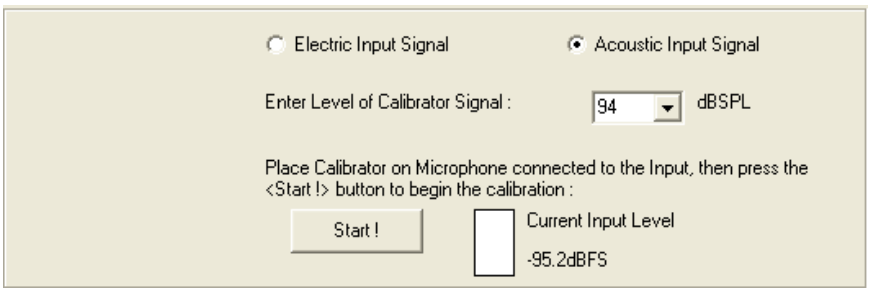


EASERA allows a complete system calibration to be carried out, inclusive of the Windows mixers, for details see Chapter 2. (The room-acoustical parameters, for instance, like the reverberation time, are independent of the absolute level of the measured levels, and are thus also correct with uncalibrated systems).

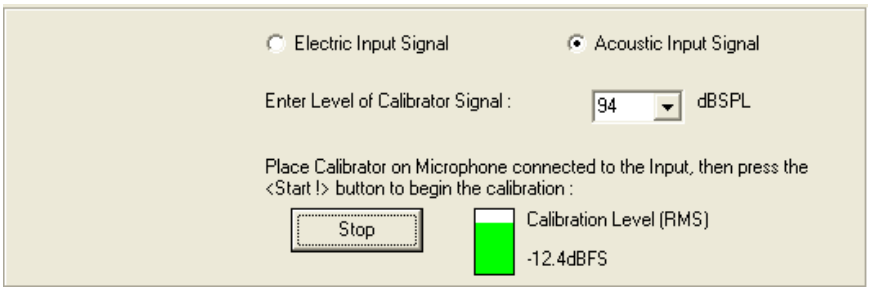
In this instance a simple calibration of the input shall be enough: Select the *Input* tab, then select the *Measure Input Level* button.

On the bottom of the page select the type of input signal to be calibrated. Let us assume that you have an acoustical calibrator. Select the **Acoustic Input Signal** option.

Now enter the level of your acoustical calibrator and you will see the following display.

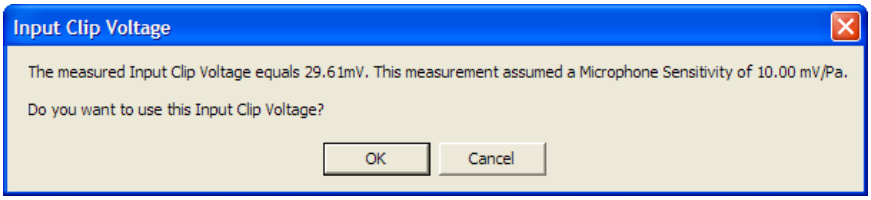


Put the calibrator on the measurement microphone, click on **Start**, then click on **OK** to see the following display.



Now adjust the level to be no greater than about -12dBFS or adjust the level for more headroom if the measurement levels are higher than the calibration level. Then wait until the level indication has stabilized and then click on **Stop**.

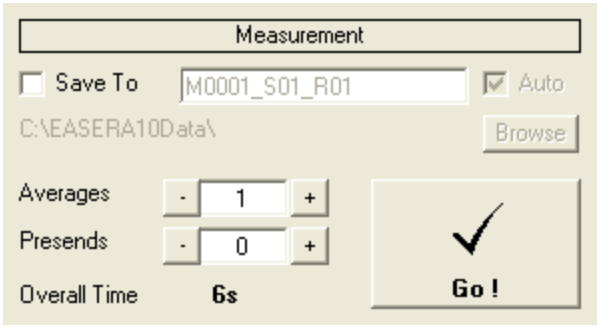
The derived values are now indicated and you may confirm them using the **OK** button. Close the dialog with the **Exit** button.



Hint: The frequency responses of the devices used can be compensated for using reference measurements. For details see Chapter 2: “Measure” of this Manual.

7. Starting the Measurement

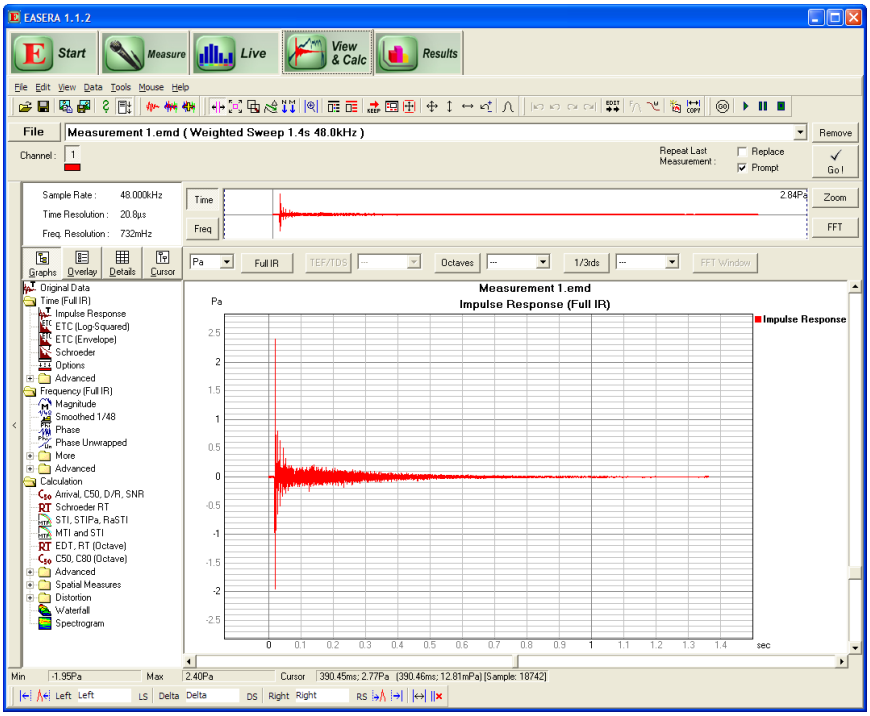
Go to the page ***Start Measurement*** and click on the button **Go**.



The measurement is now executed and afterwards EASERA changes to the ***View & Calc*** tab where the measurement is evaluated.

8. Measurement Evaluation

The first display is generally the unfiltered impulse response. On the navigator page ***Graphs*** you may then choose which evaluation is to be displayed. The individual values, however, are only of actual relevance if measurement microphone and loudspeaker were appropriately located.



Inside EASERA

From the Signal to the Display

EASERA communicates with the drivers provided by the respective soundcard. The driver determines the sampling rates and bit resolutions that are available for use. The sampling rate used normally should be at least 44.1 kHz, with 48 kHz being recommended, and the resolution should be at least 16 Bit. For more sophisticated measurements the sampling rate should be 96 kHz or higher, and the resolution 24 Bit or more. For minimizing the computing inaccuracies, the data delivered by the soundcard to EASERA is immediately converted into 64-Bit floating point values and this resolution is then used for all ensuing processing steps.

Calibration

The values delivered by the soundcard range between the negative and the positive maximum values (“Full Scale”, FS). EASERA can neither recognize which physical quantities these data represent, nor which physical values are used as the reference. In order that the values indicated by EASERA have a relation to reality, the system has to be calibrated by the user. In the calibration an actual physical value is assigned to a digital input value, so that afterwards it becomes possible to infer actual physical values (e.g. the sound pressure) from all input values.

Calibration of the Windows Mixers

With a simple calibration the values obtained are correct only as long as the Windows mixers and any external controls for preamplifiers used remain unchanged. For this reason, EASERA allows calibration of the Windows mixers

so that the calibration of the system remains valid when changes are made in the Windows mixers.

Since the behavior of the Windows mixers is not clearly defined by the operating system, EASERA has to determine the behavior of the mixer for every position of an input or output fader. This is why a full calibration requires some time.

A modification in the external gain adjustment of the preamplifier may be manually entered in EASERA. If the amount of the adjustment, however, cannot be ascertained with sufficient accuracy, then you should recalibrate the hardware.

ASIO drivers usually do not provide any mixers, thus they cannot and need not be calibrated. Level adjustment is in such cases done via external software or at the hardware itself.

Reference Files

The devices connected to the inputs and outputs are mostly subject to certain deficiencies regarding linearity of their frequency responses. Using reference files, where the respective device is measured in a known environment, can compensate such defects. The measurement is then stored as a reference file.

Impulse Response

Every system response is a combination of the stimulus signal and system behavior. If the stimulus signal is eliminated from the system response, then the result is the system behavior.

A “neutral” stimulus signal is one that does not need to be eliminated from the system response, because it does not alter the latter. Such a “neutral” stimulus signal is an impulse of minimum length (Dirac) and the response to which represents per se the system behavior.

As the impulse response represents the complete system behavior, it can be used as a basis for computing all the other quantities (frequency response, phase response, reverberation time and many more).

The Fourier-transformed impulse response in the frequency range we call the (complex) transfer function. This complex transfer function can be represented by a real and an imaginary part, but they may also be represented by magnitude (frequency response) and phase angle.

Time Correction

With *DirectSound* and *Wave* drivers there always occurs an offset between the playback buffers (output buffers) and the recording buffers (input buffers), which may vary from measurement to measurement and the size of which is unfortunately unknown. To overcome this problem, EASERA first starts the recording and then initiates the playback. Additionally there are more data recorded at the end of the measurement (this is necessary anyway simply to capture the sound decay behavior of the room).

Based on a special algorithm, this time offset is approximately determined by EASERA. In the following operation the recorded raw data are shifted and shortened in accordance with this delay. In this way the additional record sections required due to the above-mentioned technical reasons in front of and behind the signal proper, are removed again.

Raw Data and Primary Data

In EASERA the data directly supplied by the input of the soundcard is called the Raw Data. This data is then corrected according to the calibration and the reference files used and subsequently the stimulus signal is eliminated so as to obtain the impulse response.

The system behavior, however, is not only represented by the impulse response, but also by the combination of frequency response and phase response as well as by the complex transfer function (i.e. the real and imaginary parts). These three "quantities" (in one case the combination of frequency response and phase response) can be converted one into the other without loss of information.

The combination of these three quantities is called in EASERA the Primary Data. All further information is derived from this Primary Data. EASERA always uses the quantity allowing the operation to be carried out the most quickly.

Processing

EASERA enables a great variety of Primary Data processing. The data can for instance be filtered and windowed, for sub-areas of the data, different values may be set, and the relevant mathematical operations (addition, subtraction, multiplication, division, exponentiation and root extraction) can be carried out with all data or just a part.

It is also possible to combine the Primary Data of various data sets, e.g. by division or averaging.

With all processing steps EASERA keeps the Primary Data consistent: a variation in the impulse response always triggers corresponding changes in the frequency response and vice versa. All processing steps may be undone individually or totally.

Frequency Limits

EASERA computes frequency responses from 0Hz upwards to half the sampling rate. How exact these are at the limits of the transmission range depends on the transmission behavior of the soundcard. A reference file may compensate inaccuracies in the frequency response. But where no transmission takes place at all, EASERA cannot compensate any errors either.

The smallest frequency to be displayed can be preset in the ***Options (F9)*** dialog box (VIEW & CALC|OPTIONS|LOWEST FREQUENCY TO DRAW). The frequency limits also depend on the bandwidth of the signal!

Excitation signals

EASERA accepts all usual stimulus signals and leaves it to its users' choice to measure with those signals they prefer for the desired purpose.

Frequency Weighting

Signals with a white spectrum have the same energy in every frequency span (1 – 2kHz, 2 – 3kHz, 3 – 4kHz) and have a band energy that increases linearly with the frequency in every octave band (1 – 2kHz, 2 – 4kHz, 4 – 8kHz). The energy density of such signals is constant over frequency.

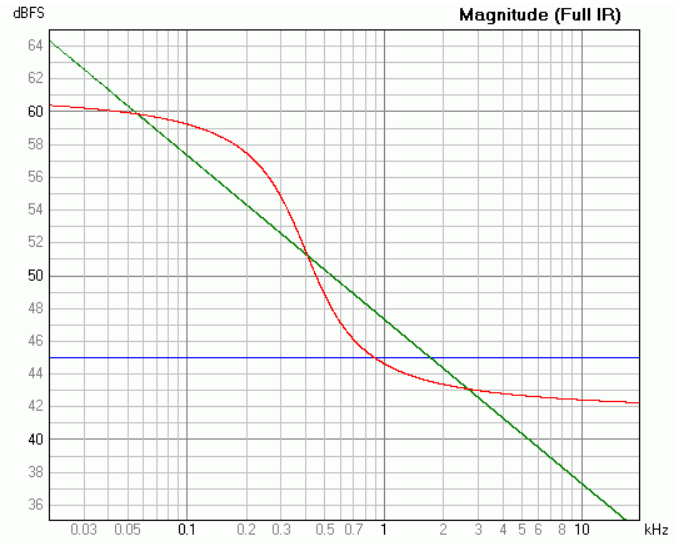
Since the power-handling capacity of multi-way loudspeaker systems is usually less in the treble range, it is not possible to safely measure with such signals. To avoid damaging the tweeters it follows that the overall level has to be reduced accordingly. (In the case of a two-way box with a cross-over frequency of 1 kHz and modulated with a white spectrum signal (spectrum 20 Hz to 20 kHz) the

tweeter would be impacted with 95% of the overall energy, and the woofer with only 5%.)

Pink spectrum signals have the same energy in every octave band (1 – 2kHz, 2 – 4kHz, 4 – 8kHz) and therefore have an energy that decreases linearly with the frequency in every frequency span (1 – 2kHz, 2 – 3kHz, 3 – 4kHz). The energy density of such signals decreases linearly over frequency.

Thus the tweeter is stressed much less so that a higher overall level can be used. (In the case of a two-way box with a cross-over frequency of 1 kHz and modulated with a pink spectrum signal (spectrum 20 Hz to 20 kHz) the tweeter would be impacted with 45% of the overall energy, and the woofer with 55%.).

In the following diagram the *weighted* curve is shown in red. The blue curve shows the White noise response, and the green curve shows the Pink noise response.



Signal Types

EASERA offers Noise, MLS and Sweeps, which may each be weighted using *white*, *pink* or *weighted* pre-emphasis. Moreover, it is possible to generate individual sine tones for which weighting does not make sense and is thus not available.

Note that MLS signals are only available when using EASERA Pro or the MLS module.

MLS

MLS stands for *maximum length sequence* and is a pseudorandom binary sequence that is easily defined using simple shift registers. MLS is in effect a deterministic signal offering the advantage of enabling direct computing of the impulse response by means of a *Fast Hadamard Transformation*, FHT.

Another advantage of the MLS is the comparatively low computation effort, although with the calculation performance of modern computers, this is no longer the most convincing argument for its use. Since the procedure works with essentially square-wave signals between the minimum full-scale and the maximum full-scale, the crest factor is approx. 1 (0 dB). MLS is a stimulus signal of high energy density.

Unfortunately the low crest factor cannot always be realized in practice since any filtering of the sequence increases the crest factor. In an oversampling audio DA

converter the anti-aliasing filter may induce a large overshoot (5-8 dB) of the MLS output. To avoid the risk of distortion, the level needs to be reduced by 5 to 10 dB so that the crest factor advantage is no longer useful.

Moreover, measurements with MLS are sensitive to distortions and temporal variances occurring for instance with analog tape devices, but also open-air measurements in windy conditions or when feedback suppressors are used.

When measuring with MLS a so-called *Presend* is required, i.e. a stimulation of the room with the measurement signal before performing the actual measurement.

Sweep

A sweep is a sine signal with continuously increasing frequency. If the frequency varies linearly per time interval, we call this a white sweep, and if the frequency doubles per time interval, it is called a pink sweep.

A sine signal sweep has a crest factor of 1.41 (3 dB), which is higher than with MLS, but can always be fully used, since clipping in the DA converter is usually not to be expected.

A sweep is rather insensitive to temporal variances. In contrast to MLS or Noise the distortion components are not distributed over the whole impulse response, but accrue at its end where they may easily be "windowed out". With a pink sweep the distortion components of all frequencies are located at the same position so that the spectral components of the distortions can be easily determined.

A *Presend* as with MLS or Noise is not required when working with Sweeps.

Noise

Noise is generated by EASERA as a pseudorandom noise,using a digital procedure and is therefore a deterministic signal.

Thus Noise has the same disadvantages as MLS, and it needs longer measurement periods and averaging over more measurements to attain the same accuracy as MLS.

EASERA implements the Noise stimulus signal mainly for reasons of comparability with other measurement systems. If such comparability is of no importance, then it is preferable to use Sweeps or in case of some special need, MLS.

Sinus

Using sine signals it is not possible to measure frequency responses or impulse responses, but the spectrum of harmonics and their level-dependence can easily be observed in the live window.

Sine signals are generated by EASERA in such a way that an integer number of full oscillations is used over the chosen excitation time period. This requires an insignificant frequency shift, but eliminates the disturbance effects at the window margins because the signal is no longer truncated.

Conclusion

From a technical point of view, the Pink or Weighted Sweep in most cases should be the most appropriate stimulus signal. Nevertheless, one can imagine situations, in which sweeps are more disturbing than noise, e.g. measurements in the presence of an audience. In another case, comparisons need to be made with

existing measurements done using other stimulus signals (MLS, Pink Noise). Finally, conditions may exist in measurement specifications or standards, which have to be honored.

Installing EASERA

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

Note that for Windows operating systems 2000, XP and following, Microsoft has established security guidelines. EASERA 1.2 fully complies with these guidelines when installed on a new computer or when the folder structure is updated during the installation of the v1.2 program upgrade.

In particular, administrator privileges are required only for the installation of the program. During the installation process, shared folders are created for EASERA measurement data as well as for machine-related application settings including the license files. Read and write permissions for every user of the computer are assigned to these folders.

This procedure enables the user of the computer to work with standard user access rights while being allowed to share files with other user accounts on the computer and also to use the same license.

If you have a licensed version of the program installed it will be necessary to upload the license before the update installation. Otherwise you will lose your license. Your license will be uploaded to the AFMG secure server. After the update installation is completed succesfully you will be able to download it again to your machine. To install and license EASERA proceed as follows.

To install EASERA:

1. Extract the EASERA setup archive and run the setup.exe file to start the installation. You can also burn the contents of the setup archive on a CD-ROM. Then, after inserting the CD-ROM into your CD drive, the setup should launch automatically. If not, open Add/Remove Pro-grams applet from the Control Panel and click on the Install push button. Follow the installation instructions as prompted.
2. Continue with the Registration Instruction below.

NOTE: You will not be able to use the program, until you have registered as a user with AFMG and obtained a License. Your EASERA License allows you to install and run the program on the number of machines equal to the number of user keys that you have purchased. Evaluation licenses generally expire after 30 days.

Registration Instructions

To license EASERA:

1. After you have finished with the main installation, extract the EASERA Guard setup archive and run setup.exe to install the EASERA Guard program.
2. After you have finished with the EASERA Guard installation, start EASERA by double clicking the EASERA icon.
3. This will open the EASERA Guard program.
4. Click on the Download License Button if your computer has internet access. This will download an EASERA license from our web server. If the "license successfully installed" message appears EASERA is unlocked with all purchased features.
5. If your computer doesn't have internet access click the "Licencing by File" button and following the instructions in the EASERA Online Help to unlock EASERA by file.
6. In cases of EASERA licensing problems contact the EASERA license support under E-Mail: mailto:support@afmg.eu

License Policy

User ID

The User ID is a number supplied to you by your EASERA distributor. This number is necessary to confirm your previous license and / or your purchase of the new program. You cannot download a license key, receive a license file or request license support (support@afmg.eu) without it.

Online Licencing

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

By accepting the license agreement you are entitled to install the program on the number of computers equal to the number of user keys that you have purchased. After those installations, additional licenses must be purchased. Please see your distributor for prices.

If you intend to uninstall EASERA from any 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 license again and then unlock EASERA on a different computer.

Licencing by File

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

Reference File

The **Reference File** is a file generated by the EASERA Guard program and placed in the EASERA *LicenceFiles* folder. This file is different for each installation. If you have more than one computer each will have its own **Reference File.** To order a license the user must send the **Reference File** to AFMG (support@afmg.eu) by E-Mail or regular Mail.

License File

The **License File** is a 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. Loading this file into the EASERA Guard with *Install Licence* unlocks the particular EASERA version purchased.

If you intend to uninstall EASERA from either of the original computers you need to remove the license information from that computer before doing so using *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 to replace the terminated one and unlock EASERA on a different computer or computers. There can be only two operational programs at the same time without additional licenses!

EASERA Versions

EASERA can be purchased in two versions, namely as the standard version EASERA and the professional version EASERA Pro. Compared to the standard version the professional version contains an extended set of functions that simplifies the evaluation of more complex measurements and allows advanced measuring methods to be used.

Also, EASERA / EASERA Pro can be extended by several modules, namely the TDS module, which adds Time Delay Spectrometry measuring and processing capabilities, the MLS module, which enables Maximum Length Sequence measurements, and the Polars module, which adds functions for automated measurements. (Note that EASERA Pro also includes the MLS module.)

Please note, the following Manual has been written with both the EASERA and the EASERA Pro user in mind. However, in several places functions are introduced which are only available in EASERA Pro. Even if you do not own EASERA Pro we encourage you to read these sections for a better understanding. If the feature set of EASERA does not seem to meet your needs, please consider licensing EASERA Pro instead.

The following list gives an overview of all functions that EASERA Pro or the additional program modules add to the standard EASERA version (This list is based on software version 1.2. It is subject to change.).

Measuring Functions

EASERA Pro adds:

- Sample rates higher than 48kHz

- Measurement configurations using more than 2 channels
- Creating and loading customized excitation signals
- Editing sequences for automated processing of measurements

TDS Module adds:

- TDS sweep signals and measurements

EASERA Pro or MLS Module add:

- MLS excitation signals, MLS measurements and Hadamard transform

Polar Module adds:

- Automated measurements for sequential or balloon measurements
- Remote control of supported external devices, such as turntables

Real Time Analysis (Live)

EASERA Pro adds:

- Tolerance mode to detect sound events and save them to a file automatically
- Sample rates higher than 48kHz

Post-Processing (View & Calc)

EASERA Pro adds:

- Editing functions, such as
    - Remove DC, Set To Value
    - Add Value, Subtract Value, Multiply By Value, Divide By Value, Scale To
    - Square, Square Root, Inverse, Power
    - Custom Smoothing, Expand/Shrink, Change Length
    - Divide, Subtract, Multiply Measurement Files
    - Remove Air Absorption, Change Sample Rate
- Distortion Analysis
    - Harmonics
    - Relative Spectra (K2 to K7)
    - THD

TDS Module adds:

- Software-based TDS post-processing and frequency response analysis

Note:

The following Editing functions are available in the standard version of EASERA:

- Filtering
- Windowing
- Averaging Measurement Files
- Adding Measurement Files
- Cyclic Move
- Undo / Redo
- Copy / Paste

File Formats and Command line Calls

EASERA File Formats

File Format	File Type
*.bir	EASE binaural impulse response file
*.dat	Monkey Forest time data file
*.efr	EASERA frequency data file
*.ehs	EASERA hardware setup file
*.eif	EASERA license import reference file
*.elf	EASERA license file
*.els	EASERA live spectrum file
*.elt	EASERA transfer function file
*.emc	EASERA measurement calibration file
*.emd	EASERA time data measurement file (*.etm file content but also including raw data)
*.ems	EASERA measurement setup file
*.erf	EASERA reference file
*.etc	TEF ETC data file
*.etf	EASERA license termination file
*.etm	EASERA time data file
*.etx	EASERA text file
*.exf	EASERA license export file
*.frq	MLSSA frequency data file
*.spk	Monkey Forest frequency data file
*.tds	TEF frequency data file

*.tim	MLSSA time data file
*.tim	TEF time data file
*.tid	NX time data file
*.wav	Wave sound file

EASERA Command Line Calls

Program	File	Option	Action
EASERA.EXE	*.efr	-	open EASERA frequency data file
EASERA.EXE	*.emd	-	open EASERA time data measurement file
EASERA.EXE	*.etm	-	open EASERA time data file
EASERAEditEMC.exe	*.emc	-	open EASERA calibration file in editor
EASERA.exe		/d	run EASERA with Windows default audio device
EASERA.exe		/n	run EASERA with Windows default audio device and with default settings (deletes user's settings)
EASERA.exe		/p	run EASERA in post processing mode
EASERA.exe		/l	run EASERA with error logging turned on from the start (assists in solving errors on startup)

EASERA Executable Files

File	Location	Description
EASERA.exe	EASERA100	main program
EASERAGuard.exe	EASERA100	License administration tool
CheckEasera.exe	EASERA100	Components and registration check tool
DigiWMix.exe	EASERA100	Digigram PCMCIA audio device mixer
EASERA10InfoSampler.exe	EASERAPATH	Status report creation tool
EASERAEditEMC.exe	EASERAPATH	Calibration file editor
i_view32.exe	EASERAPATH	Graphic file format converter
D-AudioMixer7.exe	EASERA100\ D-AudioMixer	D-Audio audio device mixer Windows Vista/7/8
D-AudioMixerXP.exe	EASERA100\ D-AudioMixer	D-Audio audio device mixer Windows XP

Chapter I: Start

EASERA Start Tab

Key Conventions

F1	Help
F9	Options
Ctrl+F1	Select the ***Start*** tab
Ctrl+F2	Select the ***Measure*** tab (If it is visible)
Ctrl+F3	Select the ***Live*** tab (If it is visible)
Ctrl+F4	Select the ***View & Calc*** tab (If it is visible)
Ctrl+F5	Select the ***Waterfall*** tab (If it is visible)
Ctrl+F6	Select the ***Results*** tab (If it is visible)
Shift+F1	Select the ***Home*** navigator page
Shift+F2	Select the ***Wizard*** navigator page
Shift+F3	Select the ***Files*** navigator page

Mouse Conventions

LMB	Left Mouse Button click
RMB	Right Mouse Button click

Use the LMB to select items.

Use the RMB to open a menu based on the context of the selected item or window location.

EASERA Start Window

File Menu

Open Audio File

Opens an existing audio file, selects the ***View & Calc*** tab and displays the file in the ***View & Calc*** window.

Shortcut: **Ctrl+O**

Options

Choose this command to display the ***Options*** dialog box, which controls various program-wide settings. See Options for more information on the dialog box.

Shortcut: **F9**

Save Files

Saves each of the data sets to a folder chosen by the user. If more than one file is selected, the dialog displays "%All Selected Files% "as a placeholder for the file name and saves each file in turn with its default file name. Saves each active data set in one of the following formats:

Shortcut: **Ctrl+A**

- Time File [SDA] (*.etm)
- Wave File [MICROSOFT] (*.wav)
- Measurement Data Set [SDA] (*.emd) (applicable only if raw data are available)
- EASE BIR File [ADA] (*.bir)
- Text File [SDA] (*.etx)
- Dat File [ITA] (*.dat)
- Tim File [MLSSA] (*.tim)
- Tim File [TEF] (*.tim)
- Tid File (NX) (*.tid)

Exit

Use FILE|EXIT to end the program.

View Menu

Measurement Wizard

Shows the assistant for measurement settings.

Shortcut: **Shift+F2**

Loaded Files

Shows a list of the files that have been created in this measurement session.

Shortcut: **Shift+F3**

Help Menu

Help Topics

Calls up the range of topics available in the Online Help.

Shortcut: **F1**

EASERA Website

Opens the EASERA website which gives access to the latest news, program updates and documentation.

Software Updates

Links to the AFMG Download Portal website where you can access the latest program updates.

Sign Up for News

Opens the registration website for the AFMG newsletter. Here you can enter personal details as needed and make your choice about which news you would like to receive.

Compatible Sound Cards

Opens an AFMG website that displays and evaluates the quality of a number of soundcards tested by AFMG.

Register

Shows the ***EASERA Guard*** window for licencing this copy of the program. To register, EASERA needs to be closed.

Protect Licence

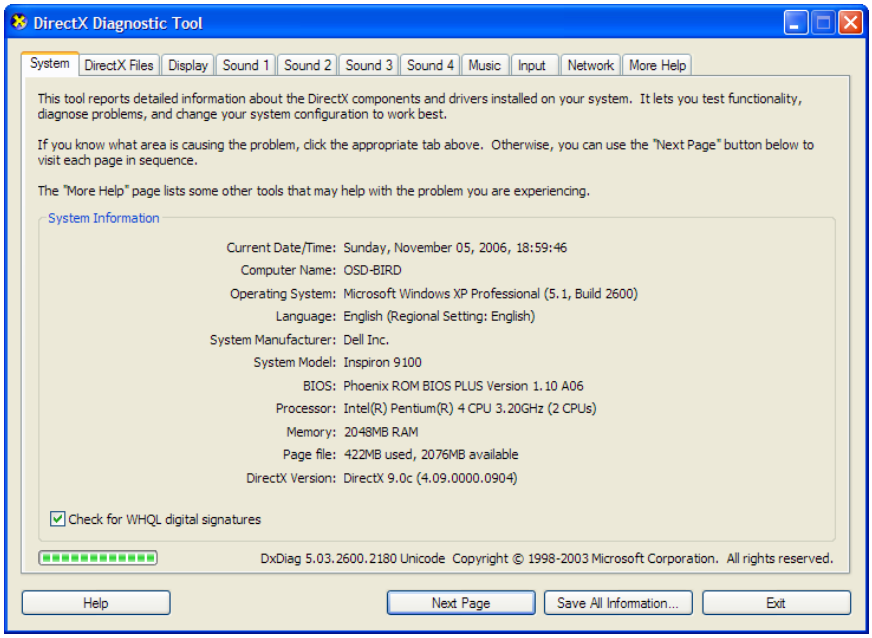
Removes ***EASERA Guard***, thus preventing removal of the licence from the computer. Is recommended for rental computers or for college and university use.

Create Status Report

In case of trouble, produces a report enabling you to inform AFMG quickly and extensively about your system configuration.
The Status-Report receives the file name <*DateTime*>*_EASERA10Info.zip* and is stored in the directory *My Documents/AFMG*. Send this file by e-mail to AFMG.

DirectX-Diagnosis

Calls up the Diagnosis Program of DirectX. The diagnosis results will be displayed after execution of the program.



About

Information on copyright and program version.

Home

Select the *Home* navigator button to see the navigator page that shows buttons for access to the different program segments.

Shortcut: **Shift+F1**

Open Audio File

Opens an existing audio file, selects the *View & Calc* tab and displays the file in the ***View & Calc*** window.

Shortcut: **Ctrl+O**

Measurement

Selects the *Measure* tab and displays the ***Measure*** window, allowing you to specify settings to make a measurement.

Load Measurement Setup

Selects the ***Measure*** tab and displays the ***Measure*** window, loading the settings from a previously saved measurement setup.

Real Time Analysis

Selects the ***Live*** tab and displays the ***Live*** window, allowing you to do Real Time Analysis.

Open File for Waterfall

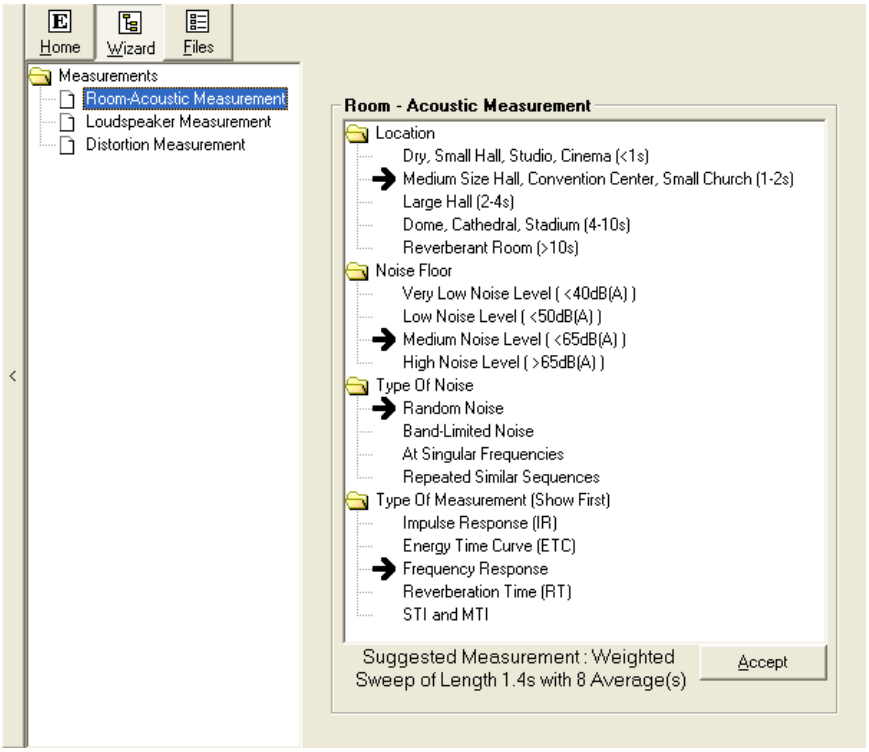
Opens an existing audio file, selects the ***Waterfall*** tab and displays the file as a waterfall diagram in the ***Waterfall*** window.

Wizard

Select the ***Wizard*** navigator button to see the navigator page that selects a measurement type.

For measurement results that are as exact as possible, it is necessary to choose the most appropriate parameters, (duration of measurement, number of repetitions) for the room or the device to be measured. The Measurement Wizard is a convenient accessory that generates appropriate parameter settings from ambient conditions (for acoustical measurements mainly from the properties of the room).

Shortcut: **Shift+F2**



You select what is to be measured: Are room-acoustical measurements planned, loudspeaker data to be ascertained, or distortions to be measured?

Depending on this basic selection, EASERA presents a tree view with various categories of the system to be measured, in which the appropriate value needs to be selected for each category.

Accept

By clicking on the **Accept** button (bottom right) EASERA will automatically change to the ***Measure*** tab and enter the suggested values from any of the three wizards listed below.

Room Acoustic Measurement

For room acoustic measurements, there are four categories available:

- **Location:** What room size is given, which (broad-band) reverberation time is to be expected? (Use the value you estimate from an impulse signal (clapping of hands).
- **Noise Floor:** How loud is the ambient noise?
- **Type of Noise:** What type of noise prevails: is it random noise or is the noise dominated by a certain frequency, e.g. of a ventilating system?

- **Type Of Measurement (Show First):** Which evaluation shall be shown first?

Loudspeaker Measurement

For Loudspeaker measurements, there are four categories available:

- **Frequency Range:** Are frequencies up to 24 kHz or up to 48 kHz to be measured?
- **Loudspeaker Type:** Is it a Tweeter or a Subwoofer?
- **Box Type:** Active or passive?
- **Type Of Measurement (Show First):** Which evaluation shall be shown first?

Distortion Measurement

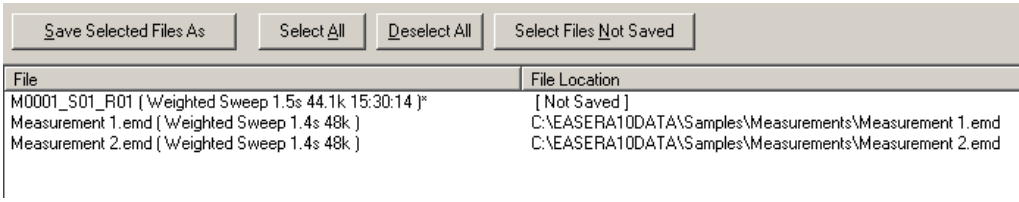
For Distortion measurements, there are three categories available:

- **Frequency Resolution:** How slowly will the sine sweep be carried out? (The longer the measuring duration, the higher the frequency resolution.)
- **Noise Floor:** How intensive is the noise background?
- **Type Of Measurement (Show First):** Which evaluation shall be shown first?

Files

Select the ***Files*** navigator button to see the navigator page that shows you a list of the files used.

Shortcut: **Shift+F3**



- **File:** File name; files not yet saved are marked with an asterisk.
- **File Location:** File paths; files not yet saved show the remark *[Not Saved]* instead of the path.

Save Selected Files As

Saves each of the data sets to a folder chosen by the user. If more than one file is selected, the dialog displays "%All Selected Files% " as a placeholder for the file name and saves each file in turn with its default file name. Saves each active data set in one of the following formats:

Shortcut: **Ctrl+A**

- Time File [SDA] (*.etm)
- Wave File [MICROSOFT] (*.wav)

- Measurement Data Set [SDA] (*.emd) (applicable only if raw data are available)
- EASE BIR File [ADA] (*.bir)
- Text File [SDA] (*.etx)
- Dat File [ITA] (*.dat)
- Tim File [MLSSA] (*.tim)
- Tim File [TEF] (*.tim)
- Tid File [NX] (*.tim)

Select All

Selects all of the files in the list.

Deselect All

Removes all files in the list from the selection.

Select Files Not Saved

Selects all of the files in the list that have not yet been saved.

Chapter II : Measure

EASERA Measure Tab

Key Conventions

F1	Help
F5	Go!
F6	Start Test Signal
F7	Stop Test Signal
F9	Options
Ctrl+F1	Select the ***Start*** tab
Ctrl+F2	Select the ***Measure*** tab (If it is visible)
Ctrl+F3	Select the ***Live*** tab (If it is visible)
Ctrl+F4	Select the ***View & Calc*** tab (If it is visible)
Ctrl+F5	Select the ***Waterfall*** tab (If it is visible)
Ctrl+F6	Select the ***Results*** tab (If it is visible)
Shift+F1	Select the ***Select Measurement Setup*** frame
Shift+F2	Select the ***Choose Stimulus Signal*** frame
Shift+F3	Select the ***Adjust Levels*** frame
Shift+F4	Select the ***Start Measurement*** frame
Ctrl+A	Save Measurement Setup As
Ctrl+O	Load Measurement Setup

Mouse Conventions

LMB	Left Mouse Button click
RMB	Right Mouse Button click

Use the LMB to select items.

Use the RMB to open a menu based on the context of the selected item or window location.

EASERA Measure Window

Prior to starting a measurement, the parameters are adjusted in the ***Measure*** window. There are four frames in which to prepare for measurement:

- ***Select Measurement Setup***
- ***Choose Stimulus Parameters***
- ***Adjust Levels***

- ***Start Measurement***

To display all pages simultaneously, use VIEW|FULL VIEW which requires, a program window resolution of at least 1086 x 864 pixels. To change between the pages by using the buttons **Next** and **Back,** choose VIEW|SINGLE VIEW.

File Menu

Load Measurement Setup

You may save the setup parameters of a measurement. To use a saved setup setting, choose FILE|LOAD MEASUREMENT SETUP (or Ctrl+O), select the corresponding file and acknowledge with OK.

Shortcut: **Ctrl+O**

Open Audio File

If you do not want to begin a new measurement, but to open a file (e g. a measurement that was saved in a Wave File), choose FILE|OPEN AUDIO FILE.

You may open the following file types:

- Time File [SDA] (*.etm)
- Frequency File [SDA] (*.efr)
- Wave File [Microsoft] (*.wav)
- Measurement Data Set [SDA] (*.emd)
- EASE BIR File [ADA] (*.bir)
- Text File [SDA] (*.etx)
- Time Data File [ITA] (*.dat)
- Frequency Response File [ITA] (*.spk)
- Time File [MLSSA] (*.tim)
- Frequency File [MLSSA] (*.frq)
- Impulse Response File [TEF] (*.tef)
- Energy Time Curve File [TEF] (*.etc)
- Time Delay Spectrometry (Frequency Response) File [TEF] (*.tds)
- Time Domain File [NX] (*.tid)

Options

Choose this command to display the ***Options*** dialog box, which controls various program-wide settings. See Options for more information on the dialog box.

Shortcut: **F9**

Save Measurement Setup As

The setup settings can be saved in a file by selecting FILE|SAVE MEASUREMENT SETUP AS. The assigned file extension is *.ems (EASERA Measurement Setup).

Shortcut: **Ctrl+A**

Exit

The program is concluded by selecting FILE|EXIT.

View Menu

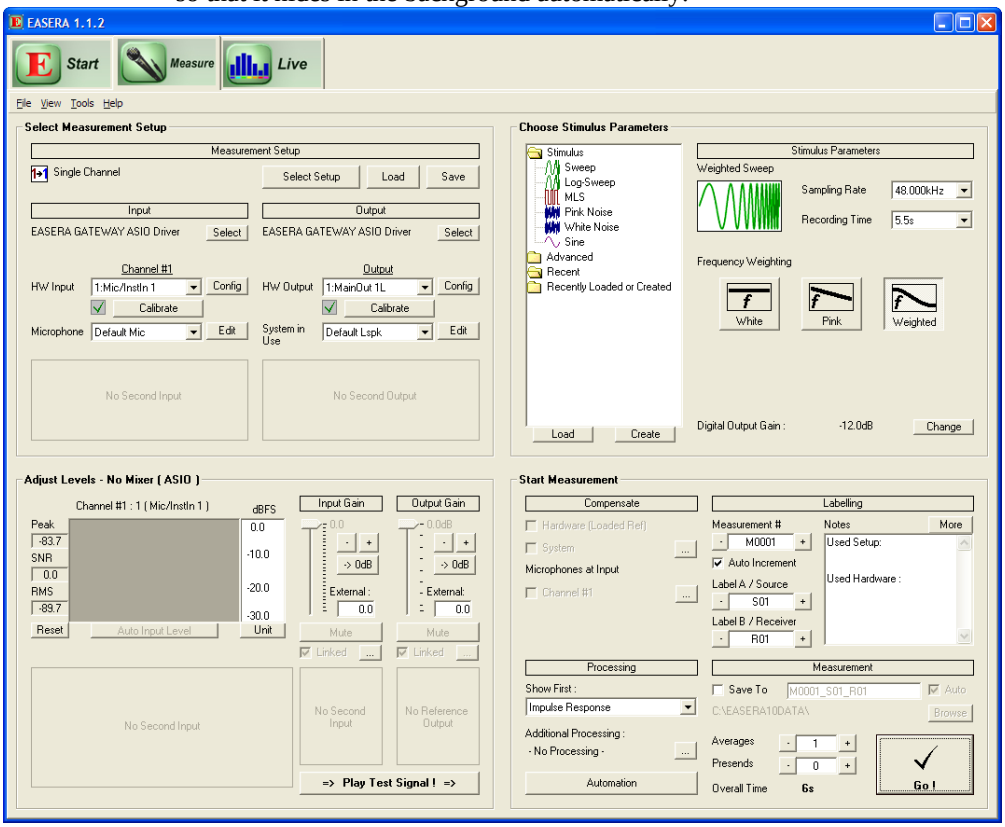
Measurement Wizard

The assistant for setting the measurement settings is displayed by selecting VIEW|MEASUREMENT WIZARD.

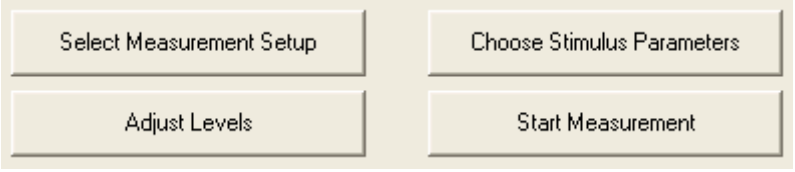
Full View

All four frames are simultaneously displayed by selecting VIEW|FULL VIEW. The screen resolution must be at least 1086 x 864 pixels.

A special display mode also allows a screen resolution of 1024 x 768 pixels to be used with Full View. In the ***Options (F9)*** dialog box use the *Appearance* section on the GENERAL|MISCELLANEOUS page to minimize the size of the window. Additionally, the options for the task bar have to be set so that it hides in the background automatically.

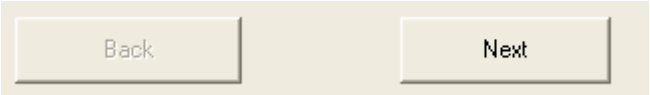


If the screen resolution is insufficient, there is only one frame shown at a time, accompanied by a set of four buttons enabling the four frames to be opened directly.



Single View

When using VIEW|SINGLE VIEW, **Next** and **Back** buttons are available which allow you to navigate through the four frames.



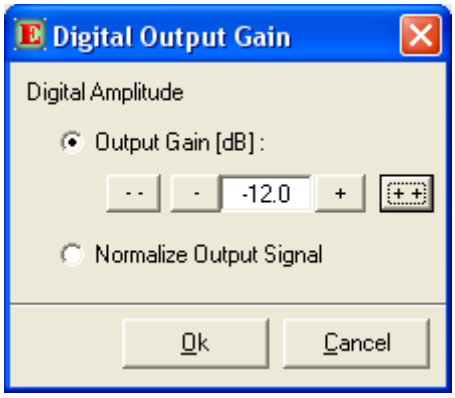
Minimal Window Size for Full

Selecting VIEW|MINIMAL WINDOW SIZE FOR FULL, sets the window size to the smallest possible size for a simultaneous display of all four frames – provided the screen resolution is sufficient.

Tools Menu

This menu allows you to directly select the dialog boxes that are accessed from the ***Select Measurement Setup*** and ***Stimulus Parameters*** frames. You are also able to reset the audio hardware from here.

Digital Output Gain



Sets the level of the measurement signal relative to full scale and the playback level for loaded files. For typical measurements, it is recommended that the **Output Gain [dB]** option be selected and the value set to between –12dB and
–20dB. For playback of a loaded file, it is recommended that the **Normalize Output Signal** option be selected.

Device Options

Choose this command to open the ***Device Options*** dialog box which allows you to select the audio hardware to use for measurement and make changes to its configuration. See

Device Options dialog box for more information on the dialog box.

Input Configuration

Choose this command to open the ***Hardware Input Configuration*** dialog box which allows you to select the external hardware that will be used for each input, adjust the gain and calibrate each input, and select the mapping between the hardware and the software channels. See Hardware Input Configuration dialog box for more information on the dialog box.

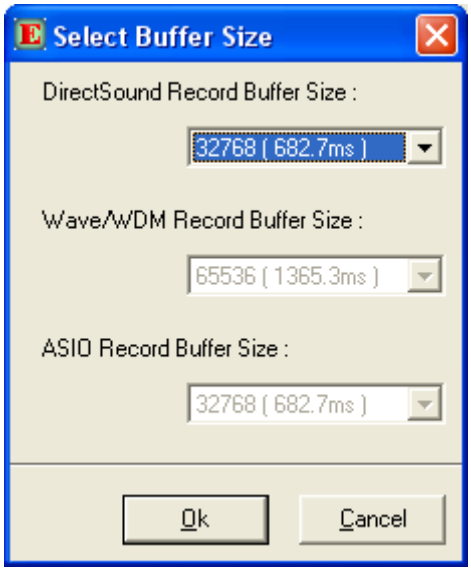
Output Configuration

Choose this command to open the ***Hardware Output Configuration*** dialog box which allows you to select the external hardware that will be used for the main and reference outputs, adjust the gain and calibrate each output, and select the mapping between the hardware and the software channels. See Hardware Output Configuration dialog box for more information on the dialog box.

Reset Driver

If the sound-card driver has crashed, select TOOLS|RESET DRIVER to start a reinitialization of the driver.

Select Buffer Size



By using TOOLS|SELECT BUFFER SIZE, you set the size of the buffer for intermediate storage of the measured values. It must be larger than *Refresh Time* and *Time Needed*. It is recommended that Buffer Size be twice as large as *Time Needed*. See the Navigator Page View in Chapter 3 for a description of *Refresh Time* and *Time Needed*.

Help Menu

Help Topics

With HELP|HELP TOPICS you show the Help file.

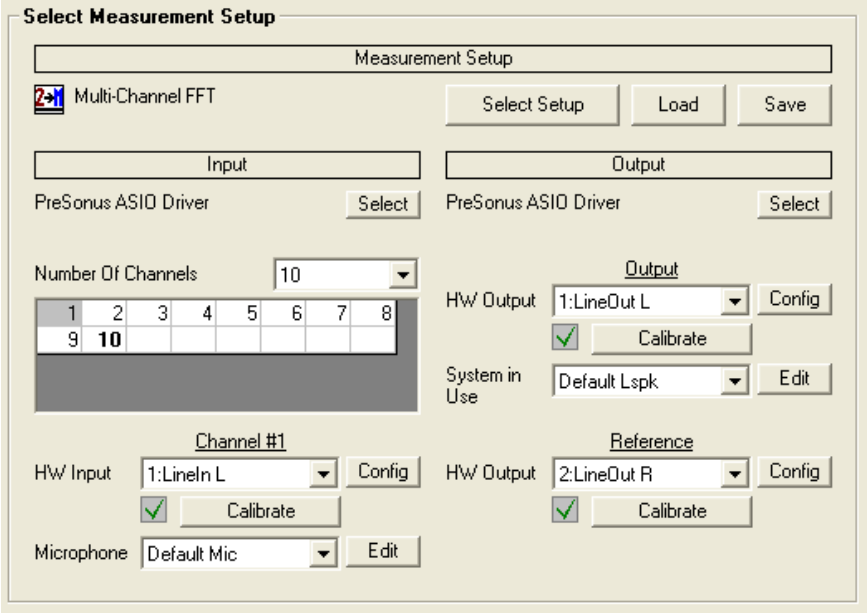
About

Under HELP|ABOUT you find the Copyright reference and other information.

Select Measurement Setup

In the frame ***Select Measurement Setup*** the connection settings for the soundcard are specified.

Shortcut: **Shift+F1**



Select Setup

Use the **Select Setup** button to open the ***Select Measurement Setup*** dialog box.

Load

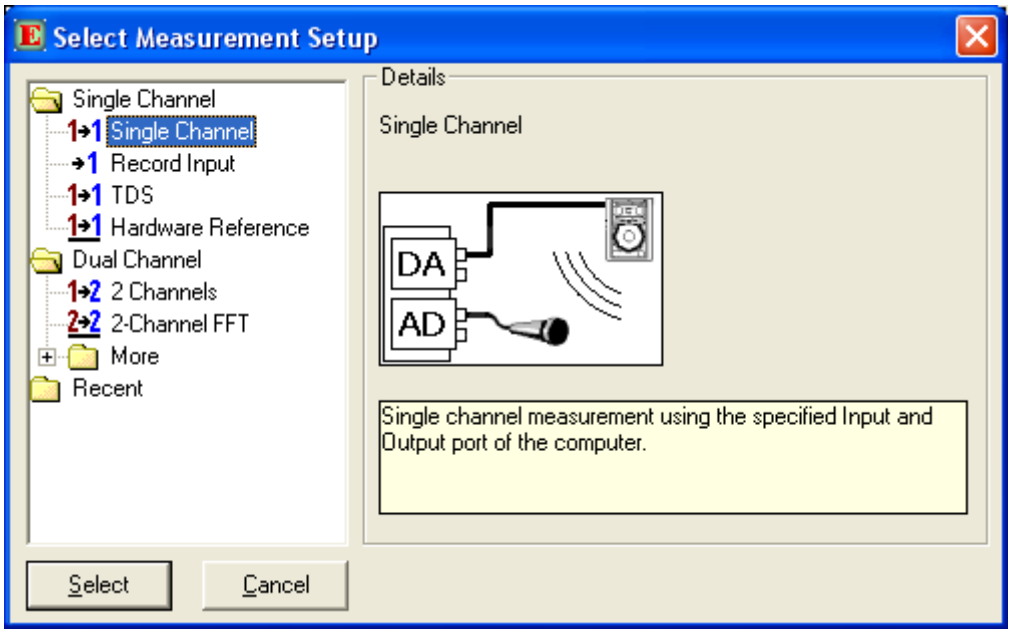
Use the **Load** button to load the setup settings from a file. (The same function can be selected via FILE|OPEN MEASUREMENT SETUP.)

Shortcut: **Ctrl+O**

Save

Use the **Save** button to save the setup settings in a file.

Select Measurement Setup Window

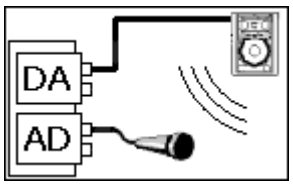


The setup that is currently active is shown in the **Details** area. It displays a sketch depicting the connection setting selected, as well as a description of the setup. To select another setup refer to the tree view at the left edge of the page.

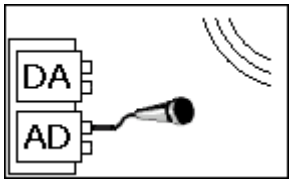
The following setups are available:

Single Channel

- **Single Channel**: The standard setup for the most measurements: signal output on one channel and measurement via one input channel.

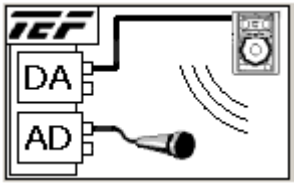


- **Record Input**: For recording a signal from an external source of excitation.

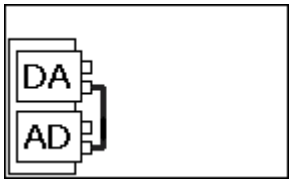


- **TDS:** The setup for Time Delay Spectrometry measurements: signal output on one channel and measurement via one input channel.

  Note that this setup is only available if the current program version includes the TDS module and any ASIO driver is selected. Be aware that for any other setup than the EASERA Gateway or the AUBION X.8 and the corresponding ASIO driver, the latency has to be checked. It should be approximately zero and must not be greater than a few samples.

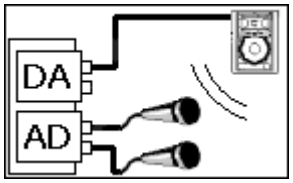


- **Hardware Reference**: Creates a reference file for calibration of the soundcard.

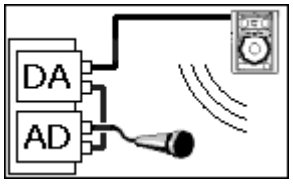


Dual Channel

- **Two Channels**: Allows the connection of two measurement microphones.

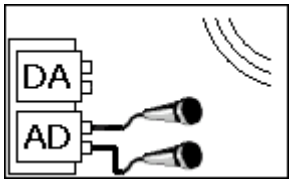


- **Dual Channel FFT**: With a dual channel FFT measurement, the measured signal is compared with the output signal. Thus it is possible to use almost any available measurement signals.

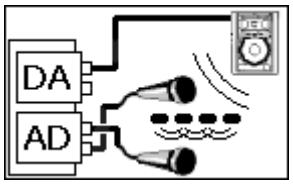


Dual Channel, More

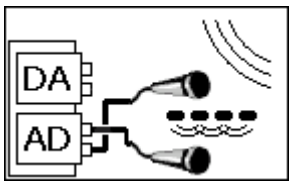
- **Record Two Channels**: For recording a signal using two channels from an external source of excitation.



- **Compare Two Channels**: Comparative measurement between the two channels, e. g. for determining the transmission loss through a wall.



- **Compare Inputs**: Comparison of two signals using an external source of excitation.



Multi-Channel

Shows additional setups identical to those functioning with two channels, but using a greater number of channels.

Recent

Shows the most recent measurement setups that have been used and allows their quick selection.

Select

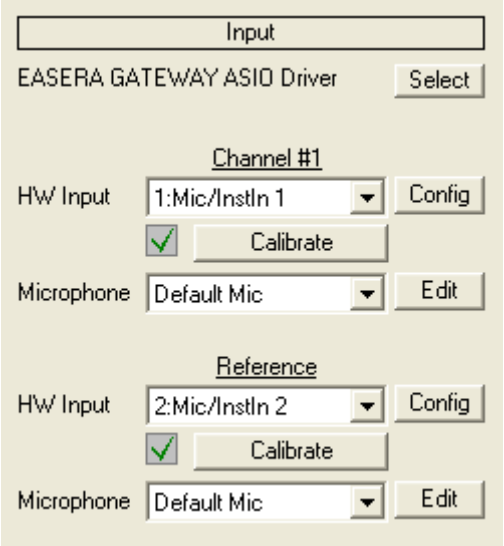
Closes the dialog and selects the measurement setup.

Cancel

Closes the dialog and rejects the changes.

Input

In the **Input** area it is possible to select settings for the input channels or the reference channel.



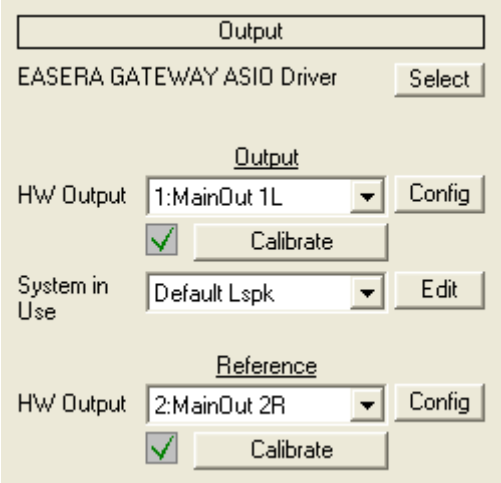
The current soundcard is shown at the top of the input area.

In the next position the active channel(s) or the reference channel is shown. The stimulus signal can be output via a second channel which serves as a reference and is linked to the input. This way it is possible to compensate for errors at the inputs and outputs of the soundcard. The settings selected for the reference channel can be the same as for the output.

- **Select**: This button opens the ***Device Options*** dialog box to select another soundcard or different driver settings.
- **HW Input**: You can choose the input channel to be used for the measurement with single-channel measurements. In the case of two-channel measurements it is possible to assign the soundcard channels to either of the software channels.
- **Calibrate**: The sensitivity of the microphone varies (from the point of view of EASERA) with varying settings of the preamplifier or the soundcard. This is why the setup should be calibrated at the beginning of a measurement by clicking on the button for the desired channel.
  (Changes selected in the soundcard or preamplifier may also be entered directly into EASERA, so that a new calibration is not necessary. This requires, however, that the setting values are known exactly.)
- **Config**: This button opens the ***Hardware Input Configuration*** dialog box for more detailed configuration of all the input channels.
- **Microphone**: EASERA is capable of storing the data (e.g. the sensitivity) for several microphones. Choose the microphone for the current measurement.
- **Edit**: This button opens the ***External Hardware*** dialog box to select a reference file or make other changes to the device selected for this input channel.

Output

In the **Output** area it is possible to change the settings for the output channels.



The current soundcard is shown at the top of the output area. The button on the right side allows calling up the ***Device Options*** dialog box for selecting another soundcard or different adjustments.

- **Select**: This button opens the ***Device Options*** dialog box to select another soundcard or different driver settings.
- **HW Output** : You can determine which output channel will be used for the output signal.
- **Config**: This button opens the ***Hardware Output Configuration*** dialog box for more detailed configuration of all the output channels.
- **Calibrate**: In order to enable defined output levels, it is also possible to calibrate the output levels.
- **System in Use**: Here you can choose which output system (loudspeaker or other transducer) will be used for the measurement. For the output systems it is possible to store frequency responses, which will then be taken into account with the measurement.
- **Edit**: This button opens the ***External Hardware*** dialog box to select a reference file or make other changes to the device selected for this output channel.

Choose Stimulus Parameters

In the frame ***Choose Stimulus Parameters*** you can adjust the stimulus signal.

Shortcut: **Shift+F2**

Load

Using the button **Load** it is possible to load an existing user-defined stimulus signal.

Create

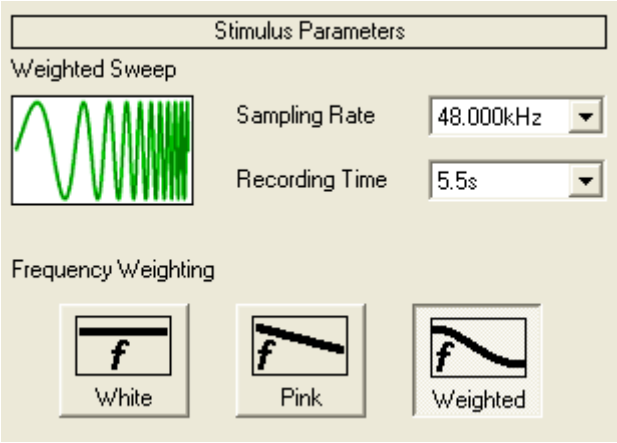
Choose Create for generating a new, user-defined stimulus signal.

Stimulus Parameters

In the **Stimulus Parameters** area, the type of signal is shown in the upper left corner. EASERA implements four types of signals:

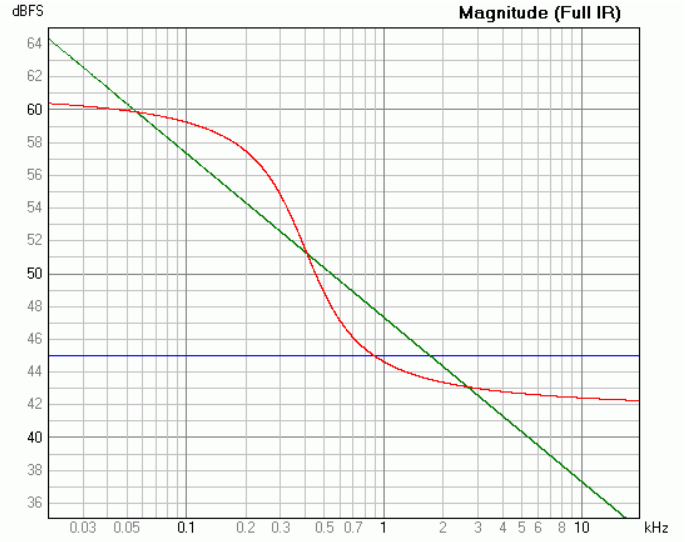
- Sweep
- Maximum Length Sequence (MLS)
- Noise
- Pure Tone

For these types of signals it is possible to adjust different parameters. All signal types can be frequency-weighted. Pure tones can be varied in frequency.

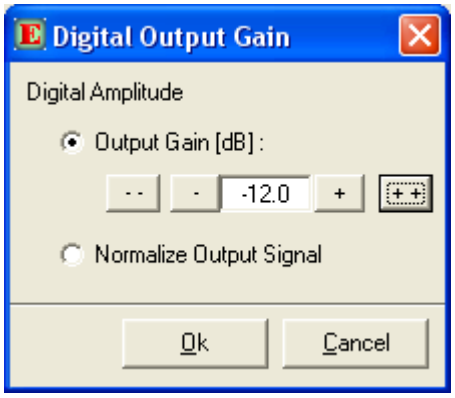


- **Sampling Rate**: Sample rate of the measurement signal
- **Stimulus Length**: Duration of the measurement signal. Keep in mind that measurements with maximum length sequences require a specific defined signal duration.
- **Frequency**: With pure tones only: Frequency of the tone, variable in octave intervals.
- **Frequency Weighting**:
  - **White**: No frequency weighting
  - **Pink**: –3dB/octave

- Weighted: A curve that is 18 dB lower in the high-frequency range (as compared to the level at 0 Hz). (In contrast to the situation with **White**, the tweeters are excited less at the high frequencies with signal, but the roll off is not as much as with **Pink**). See the graph below, where the **White** weighting is shown by the blue trace, the **Pink** weighting is shown by the green trace, and the **Weighted** weighting is shown by the red trace.



- **Digital Output Gain**:



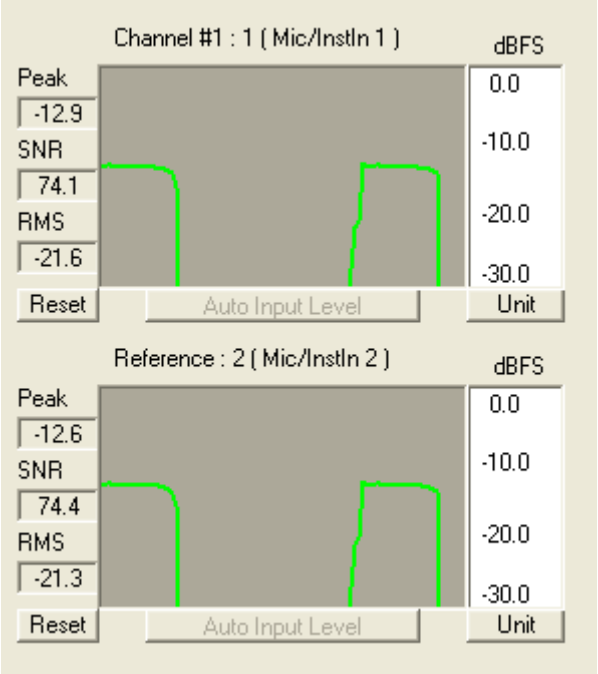
Sets the level of the measurement signal relative to full scale and the playback level for loaded files. For typical measurements, it is recommended that the **Output Gain [dB]** option be selected and the value set to between –12 dB and –20 dB. For playback of a loaded file, it is recommended that the **Normalize Output Signal** option be selected.

Adjust Levels

In the frame ***Adjust Levels*** it is possible to control the input and output levels.

Shortcut: **Shift+F3**

On the left side there is a graphic representation of the input signal.



Peak

Under **Peak** the maximum recorded peak level is displayed. This level must not reach 0 dB, since this would be indicative of a clipping in the input stage. The value can be reset by using the button **Reset**. It is recommended that the maximum level be about 10 to 20 dB below Full-scale.

SNR

Under SNR the signal-to-noise ratio of the input signal is displayed. This value should possibly be maximized.

RMS

The RMS is the current effective value of the input signal.

Reset

This button is used for resetting the Peak display.

Auto Input Level

If the input level exceeds the –6 dB limit, the **Input Gain** is reduced. (This automatic system functions only if the soundcard in use responds to the **Input Gain** setting.)

Unit

Opens the ***Select Unit*** dialog box enabling the unit of the value shown in the display to be set. In order to set the level in relation to the clipping limit, you should generally stay with dBFS for the unit.

Input Gain

Input Gain enables the setting of the input levels. There is a slider control available. Precision adjustments can then be made by using the **[+]** and **[–]** buttons. The **[->0dB]** button will set the volume control to the level to which the input has been calibrated.

The slider control adjusts the corresponding controller for the mixer of the soundcard. This requires a mixer that can be addressed by EASERA, which is often not available, especially with ASIO drivers.

- **External**: If the gain is modified in an external input preamplifier or similar device, this may be entered here to allow EASERA to compensate for the change.
- **Mute**: Mutes the inputs.
- **Linked**: Couples the input level settings of all input channels.

Output Gain

Output Gain enables the setting of the output levels. There is a slider control available. Precision adjustment can then be made by using the **[+]** and **[–]** buttons. The **[->0dB]** button will set the volume control to the level to which the output has been calibrated.

The slider control adjusts the corresponding controller for the mixer of the soundcard. This requires a mixer that can be addressed by EASERA, which is often not available, especially with ASIO drivers.

- **External**: If the gain is modified in an external output amplifier or a similar device, this may be entered here to allow EASERA to compensate for the change.
- **Mute**: Mutes the outputs.
- **Linked**: Couples the output level settings of all output channels.

Play Test Signal ! / Stop Test Signal !

The **Play Test Signal** button starts a continuous output of the measurement signals, so that the input level can be set accordingly. This process is concluded by using the **Stop Test Signal** button.

Shortcut: **F6** (Always Play)

Shortcut: **F7** (Always Stop)

Start Measurement

In the frame ***Start Measurement*** it is possible to make final adjustments how acquired data is labeled, stored and processed.

Shortcut: **Shift+F4**

Compensate

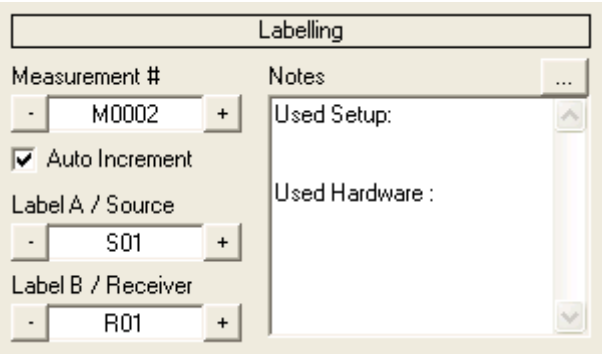
Acoustic measurements are influenced by a range of parameters, which in general are only partly to be reflected in the results. If, for instance, the frequency response of a loudspeaker is to be measured, the frequency response of the hardware and the microphone as well as the transmission behavior of the room should not be taken into consideration.

Since the influence of such undesired parameters on the measurement cannot be avoided, there is a need to eliminate such influences by computation from the results: For this reason it is possible to generate reference files which can then be chosen in this frame.

- **Hardware (Loaded Ref / Measured Ref)**: The reference file already loaded or currently measured for the hardware can be activated or deactivated here. If a new reference is measured, it will be preferred to a stored reference.
- **System**: Here you can select and activate or deactivate a reference file for a system.
- **Microphones at Input**: You can select and activate or deactivate a reference file for a microphone.

Labeling

The individual measurements can be labeled with designations and notes. The data entered here have no technical relevance.



If a designation ends with a number, this can be increased or reduced by using the **[+]** and **[–]** buttons, respectively. If the designation ends without a number, you can add one with these buttons.

- **Measurement #**: The number of the measurement.
- **Auto Increment**: When this option is activated, the number is increased with each measurement.
- **Label A / Source**: Normally used to identify the source of the measurement signal.
- **Label B / Receiver**: Normally used to identify the microphone location.

- **Notes**: Notes can be composed and existing text can be overwritten.

  The button above Notes opens the ***Measurement Notes*** dialog box in which a large input field for the notes as well as other input fields is available.

Processing

- **Show First**: After execution of the measurement, EASERA changes to the ***View & Calc*** tab. This selection will specify which view will be shown first.
- **Additional Processing**: You can choose additional signal processing. A mouse click on the button opens the

Select Editing Sequence dialog box dialog box.

- **Automation**: Opens the Automated Measurements dialog box dialog box for automating measurements, e.g. for recording balloon data.

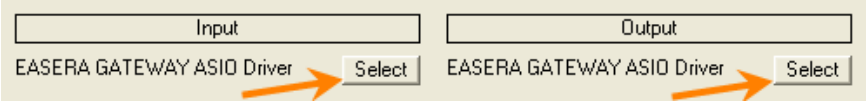
Measurement

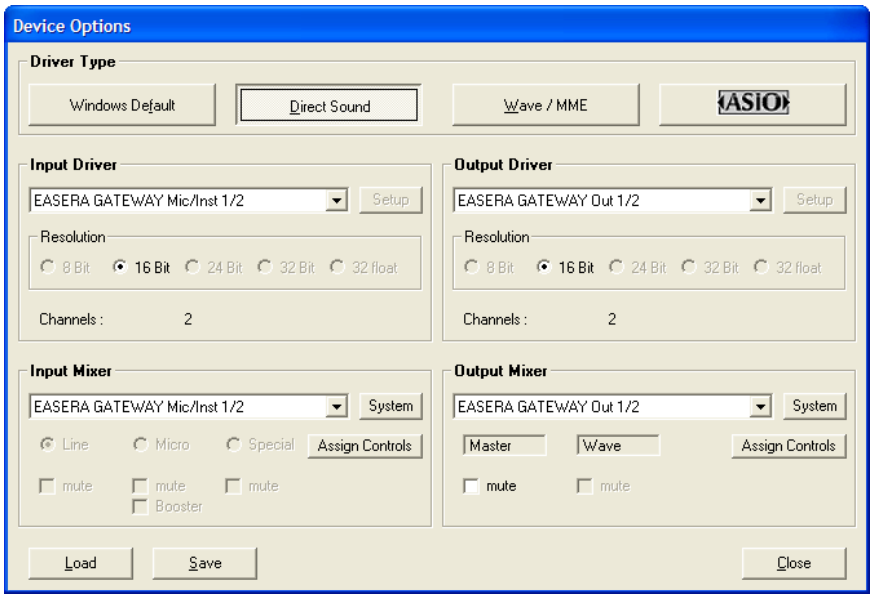
- **Save To**: If this option is selected, the measurement will be saved after execution.
- **Auto**: The file name will be generated from the **Labeling** settings.
- **Browse**: File name and directory can be entered via a standard dialog.
- **Averages**: For minimizing measurement errors (also noise-generated) it is possible to average over various measurements. The desired number of averages can be set here. Doubling the number of measurements reduces the noise by 3 dB.
- **Presends**: For stimulating a room or available dynamic effects, the measurement signal can be sent one or several times prior to beginning the measurement without being included in the measurement.
- **Overall Time**: Indicates the duration of the measurement.
- **Go!**: Starts the measurement.
  Shortcut: **F5**

Device Options dialog box

EASERA supports various drivers for the soundcard or the hardware connected to it.

To open the ***Device Options*** dialog box use the ***Select*** buttons in the **Input** or **Output** areas in the frame ***Select Measurement Setup***.





Driver Type

You may choose among the following drivers:

- **Windows Default**: (Here, access is not given to the soundcard driver, but to the Windows API Routines. Neither the Windows Mixers nor setting options are available, there is no input controller and the output controller functions merely digitally with corresponding reduction of the dynamic range. As a rule, you should avoid **Windows Default** and use it only when other options do not work dependably).
- **Direct Sound**
- **Wave / MME**
- **ASIO**

Input Driver

Choose among the installed drivers and the input hardware to be used.

Setup

If the input driver allows adjustments, you get to the corresponding dialog. If available, you may switch the phantom power supply on or off for the microphone in use.

Resolution

Adjust the resolution (in Bits) of the AD converter (if the input driver supports different resolutions).

Output Driver

Choose among the installed drivers and the output hardware to be used.

Setup

If the output driver allows adjustments, you get to the corresponding dialog.

Resolution

Adjust the resolution (in Bits) of the DA converter (if the output driver supports different resolutions).

Input Mixer

It is possible to make adjustments for the input mixer, if the soundcard provides an inherent mixer for the driver chosen. This is seldom the case with ASIO drivers.

System

Calls up the Windows input mixer.

Line

Selects the Line Input as the current source.

Micro

Selects the Microphone Input as the current source.

Special

Selects the Special Input as the current source.

The ***Assign Controls*** dialog box settings determines which is the Microphone Input, which is the Line Input and which is the Special Input. Most of the time, EASERA assigns sensible values to these settings, but in exceptional cases it is necessary to adapt these manually.

Mute

Mutes the corresponding input (should only be activated temporarily as needed, otherwise it is not possible to make a measurement.)

Booster

If the soundcard provides an increased amplification for the microphone input, it can be activated here.

Assign Controls

You can specify how assignment of the control elements (as described above) to the Windows Mixer is to take place. Usually you do not have to adjust anything here, but if needed, you should adjust something only if you know exactly what to do!

The corresponding Windows Mixer is a program usually supplied by the manufacturer of the soundcard. The manufacturers normally comply with usual arrangements and designations, so that EASERA is able to perform the assignment automatically. In exceptional cases, however, manufacturers deviate from usual standards, so that EASERA cannot establish this assignment or does it incorrectly. The Assign Controls dialog box dialog box enables you to intervene manually.

Output Mixer

Allows adjustments for the output mixer.

System

Calls up the Windows output mixer.

Mute

Mutes the corresponding output (should be activated only temporarily as needed, otherwise the system cannot send any measurement signals.)

Assign Controls

You can specify how assignment of control elements (as described above) to the Windows Mixer is to take place. Usually you do not have to adjust anything here, but if needed, you should adjust something only if you know exactly what to do!

The corresponding Windows Mixer is a program usually supplied by the manufacturer of the soundcard. The manufacturers normally comply with usual arrangements and designations, so that EASERA is able to perform the assignment automatically. In exceptional cases, however, manufacturers deviate from usual standards, so that EASERA cannot establish this assignment or does it incorrectly. The Assign Controls dialog box dialog box enables you to intervene manually.

Load

A saved setting can be reloaded here.

Save

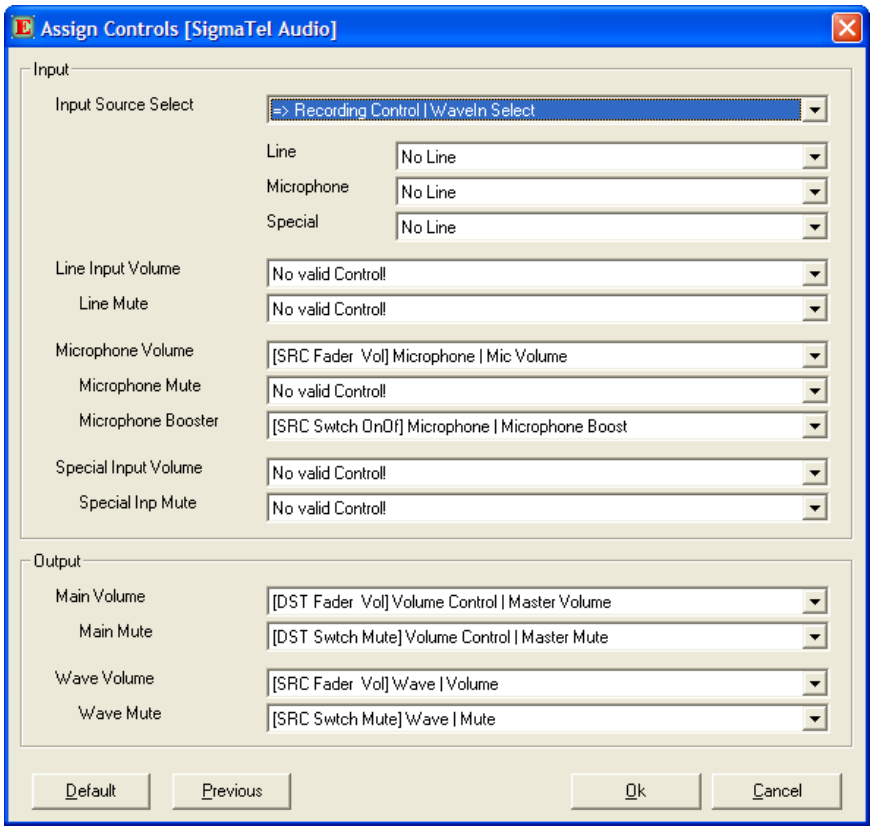
Saves the settings in a file.

Close

Closes the dialog.

Assign Controls dialog box

The Windows Mixer is a program normally supplied by the manufacturer of the soundcard. The manufacturers usually comply with usual arrangements and designations, so that EASERA is able to perform the assignment automatically. In exceptional cases, however, manufacturers deviate from usual standards, so that EASERA cannot establish this assignment or does it incorrectly. The ***Assign Controls*** dialog box enables you to intervene manually.



Input

Input Source Select

For the following input sources of EASERA, you can choose the sources of the Windows Mixer to which they correspond.

- Line
- Microphone
- Special

From a technical point of view, these designations stand for the sources able to be assigned via the Assign Control Dialog box.

Line Input Volume

Volume control for the analog input

Line Mute

Muting the analog input

Microphone Volume

Volume control for the microphone input

Microphone Mute

Muting the microphone input

Microphone Booster

Amplification enhancement in the microphone input

Special Input Volume

Volume control for the special input

Special Input Mute

Muting the special input

Output

Main Volume

Output Volume control

Main Mute

Muting the output

Wave Volume

Wave output control

Wave Mute

Muting Wave

Default

Resets the assignment to default.

Previous

Revokes the changes

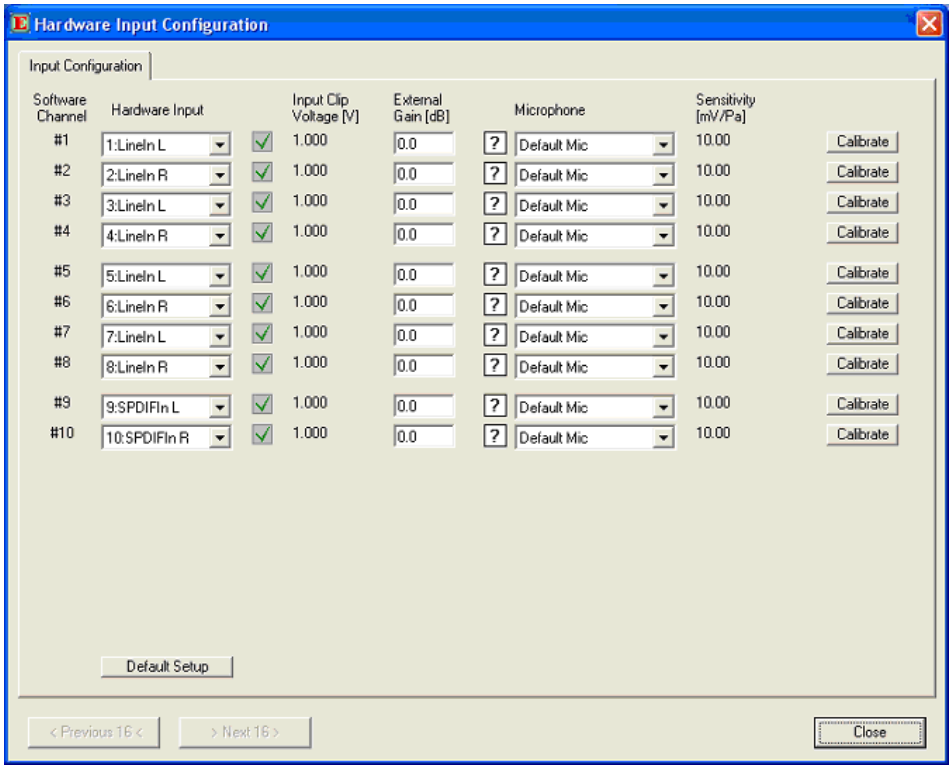
OK

Closes the dialog and confirms the changes

Cancel

Closes the dialog and rejects the changes

Hardware Input Configuration dialog box



The ***Hardware Input Configuration*** dialog box is opened by using the ***Config*** button to the right of **HW Input** in the ***Select Measurement Setup*** area.

EASERA supports up to 32 channels, if the selected soundcard offers a corresponding number of channels. For each of these channels, the following information and adjustment possibilities are available:

- **Hardware Input**: Connected source, possibly with appropriately set parameters.
- **Input Clip Voltage [V]**: The maximum permissible input voltage. At higher voltages the input starts clipping. (The Input Clip Voltage corresponds to the effective value of a fully modulated sine signal. The Peak Clip Limit is exactly a factor of 1.41 higher).
- **External Gain [dB]**: If the gain of the soundcards or preamplifiers gets changed, the (changed) values can be entered here to enable EASERA to take the new values into account with the measurements.

- **Microphone**: If the source in question is a microphone, you can choose one of the predefined microphones which will then be applied with its stored parameters.
- **Sensitivity [mV/Pa]**: This is the input sensitivity of the chosen microphone.
- **Calibrate**: Using this button**,** it is possible to calibrate the input source to be used.

Default Setup

Establishes a 1:1 assignment between hardware and software channels.

Previous 16

EASERA supports up to 32 input channels; 16 are shown on each page. Selecting this button displays the previous 16 channels.

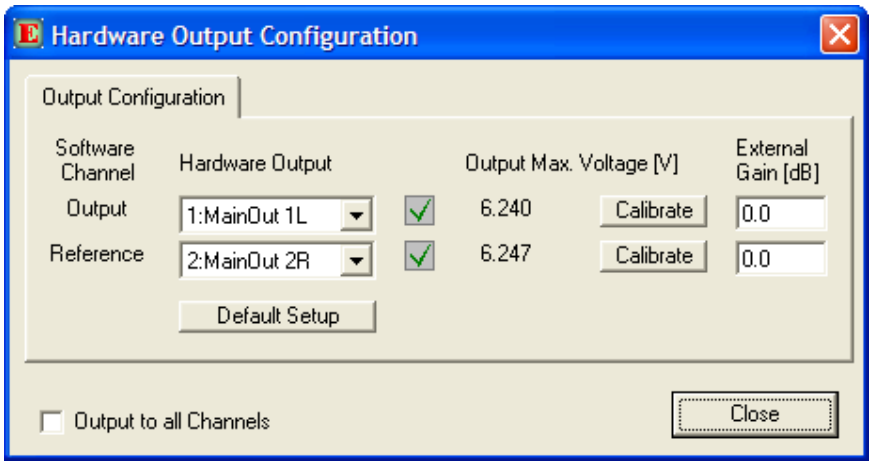
Next 16

Selecting this button displays the next 16 channels.

Close

Closes the dialog.

Hardware Output Configuration dialog box



The ***Hardware Output Configuration*** dialog box is opened by using the ***Config*** button to the right of **HW Output** in the ***Select Measurement Setup*** area.

On this page the following information and adjustment possibilities are available:

- **Hardware Output:** Choose the output channel, where the signal is to be sent.
- **Output Max Voltage [V]:** The maximum output voltage. (The Output Clip Voltage corresponds to the effective value of a fully

modulated sine signal. The Peak Clip Limit is exactly a factor of 1.41 higher).

- **Calibrate:** Using this button, it is possible to calibrate the output.
- **External Gain [dB]**: If the gain of the soundcards or output amplifiers gets changed, the (changed) values can be entered here to enable EASERA to take the new values into account with the measurements.

Default Setup

Establishes a 1:1 assignment between hardware and software channels.

Output to all Channels

Sends the output signal simultaneously to all channels.

Close

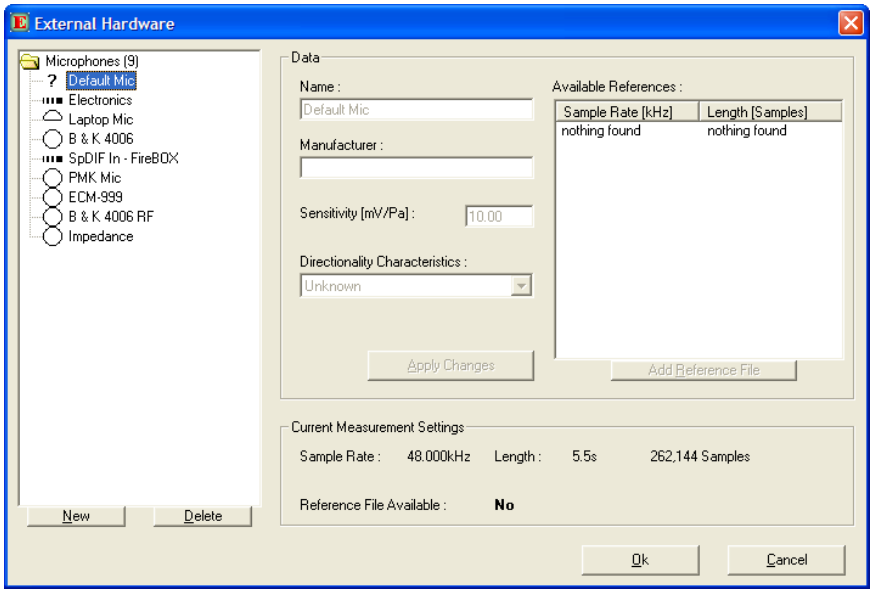
Closes the dialog.

External Hardware dialog box

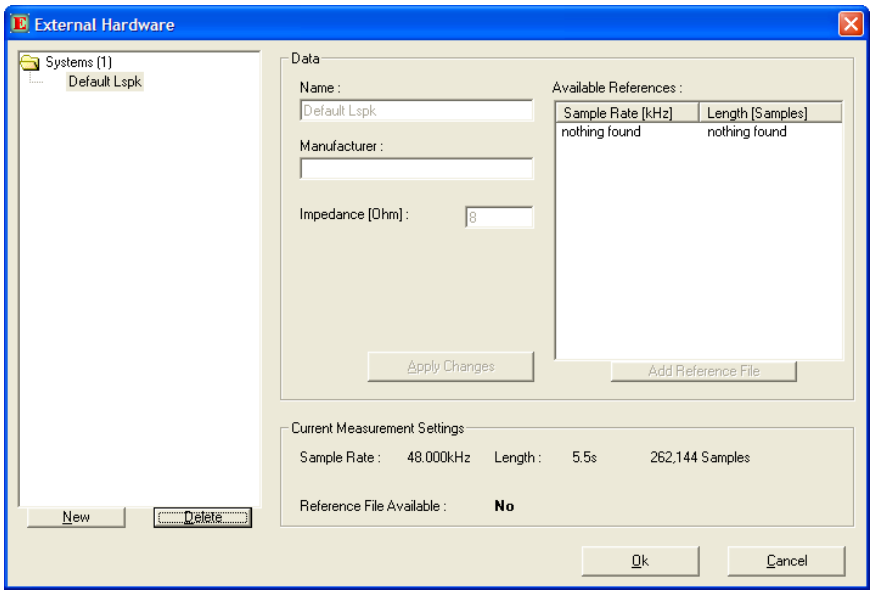
For acoustic measurements, EASERA requires not only AD and DA converters, but also acoustic transducers, such as microphones and loudspeakers.

The properties of these acoustic transducers can be specified in the ***External Hardware*** dialog box, so that EASERA can take them into account.

External Hardware – Microphones



External Hardware – Systems



New

Creates a new microphone or a new system (As a rule, a system is a loudspeaker, but may also be a room, for instance.)

Delete

Deletes a user-defined microphone or a user-defined system.

Data

Name

Name of the microphone or loudspeaker.

Manufacturer

Manufacturer of the microphone or loudspeaker.

Sensitivity (Microphone)

Sensitivity of the microphone, on the basis of which the sound pressure is calculated from the measured voltage.

If no microphone is connected, you may enter a 0, in which case there will no acoustical units (e.g. SPL) available for selection.

Directionality Characteristics (Microphone)

Directionality characteristics of the microphone. If no microphone is connected, one may enter *Electronic*.

Impedance (Systems)

Impedance of the loudspeaker, currently no more than an informative value.

Apply Changes

Use this button to save changes. This button is marked as being available as soon as changes are defined.

Available References

The existing reference files are listed.

Add Reference File

Select this button to add a new Reference file.

Current Measurement Settings

The current measurement adjustments are indicated here for your information:

- Sample Rate
- Length of the file
- Number of samples
- Reference File Available

OK

Closes the dialog, acknowledges the changes and chooses the appropriate hardware.

Cancel

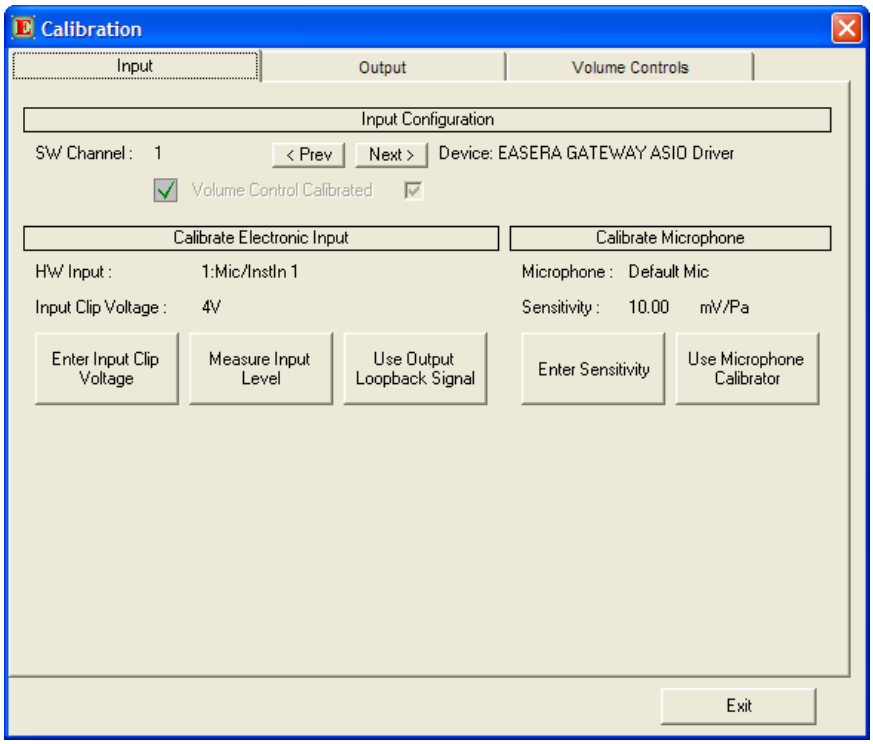
Closes the dialog and rejects the changes.

Calibration dialog box

To ensure that the values measured by EASERA correspond to actual levels, exact values of parameters like microphone sensitivity, preamplifier gain or input sensitivity of the AD converter must be available.

Such values are generally not available with the required precision. To enable exact measurements to be made, a signal of known level is used to calibrate EASERA.

Input tab



Input Configuration

At the top of this tab is the current calibration of the software input channels. The ***< Prev*** and ***Next >*** buttons are visible if more than a single channel is chosen as the measurement setup.

- **SW Channel**: The selected input channel.
- **Volume Control Calibrated**: A check mark indicates the calibration of the selected channel. Click on the icon to the left to get a message about the calibration status.

< Prev

Selects the previous software input channel to be used for the calibration.

Next >

Selects the next software input channel to be used for the calibration.

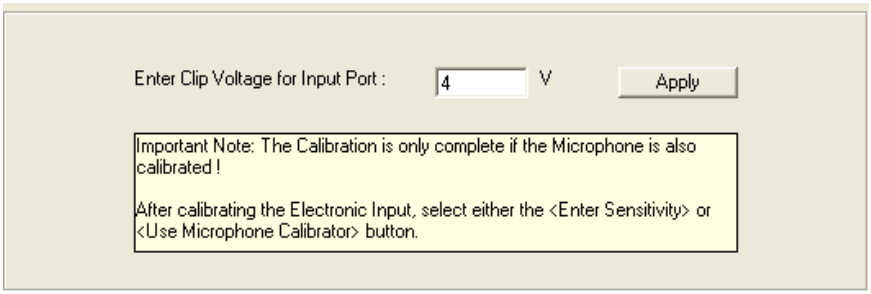
Calibrate Electronic Input

This area shows the status for the hardware input channel used for the current software input channel as selected above.

- **HW Input**: The selected hardware input channel.
- **Input Clip Voltage**: The RMS value of sine voltage which corresponds to 0 dBFS.

Enter Input Clip Voltage

This button displays the following information in the area below the buttons:



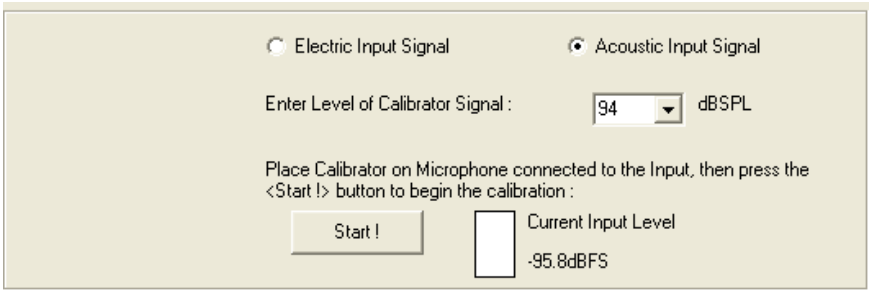
- **Enter Clip Voltage for Input Port**: Type the RMS value of sine voltage which corresponds to 0 dBFS into the textbox.

Apply

Use this button to enter the value in the textbox into EASERA.

Measure Input Level (Acoustic)

To calibrate the acoustic input signal level this button displays the following information in the area below the buttons:

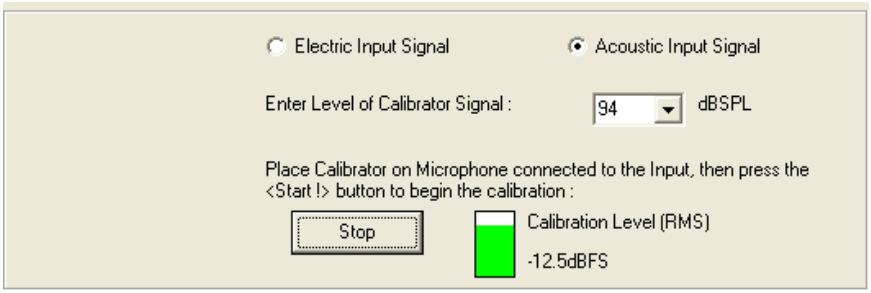


- **Enter Level of Calibrator Signal**: Select or type the level in dBSPL for the calibrator to be used into the drop-down textbox.
- **Current Input Level**: Shows the signal level that appears at this hardware input port in dBFS.

Start !

Use this button to start the calibration. A message indicates the next step.

After pressing **OK** the following information is displayed:



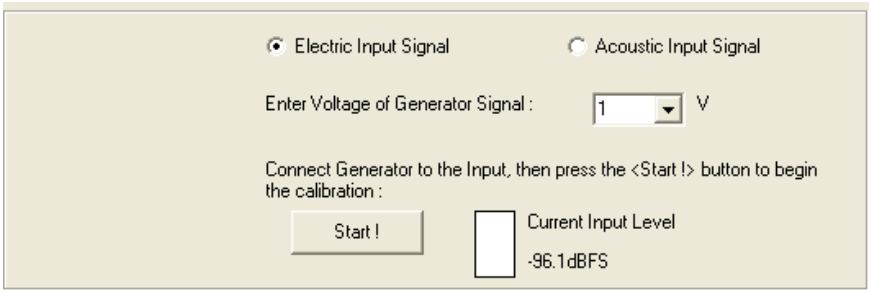
- **Calibration Level (RMS)**: Shows the RMS signal level that appears at this hardware input port in dBFS.

Stop

Wait for the input level to stabilize, then use this button to stop the calibration. A message shows the values determined by the calibration, select **OK** to enter the values into EASERA.

Measure Input Level (Electric)

To calibrate the electric input signal level this button displays the following information in the area below the buttons:

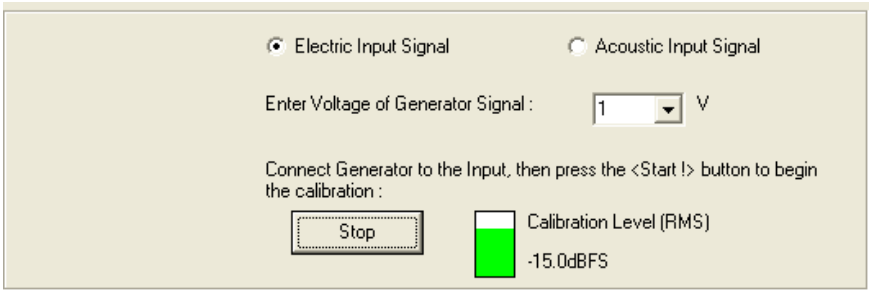


- **Enter Voltage of Generator Signal**: Select or type the level in volts for the generator to be used into the drop-down textbox.
- **Current Input Level**: Shows the signal level that appears at this hardware input port in dBFS.

Start !

Use this button to start the calibration. A message indicates the next step.

After pressing **OK** the following information is displayed:



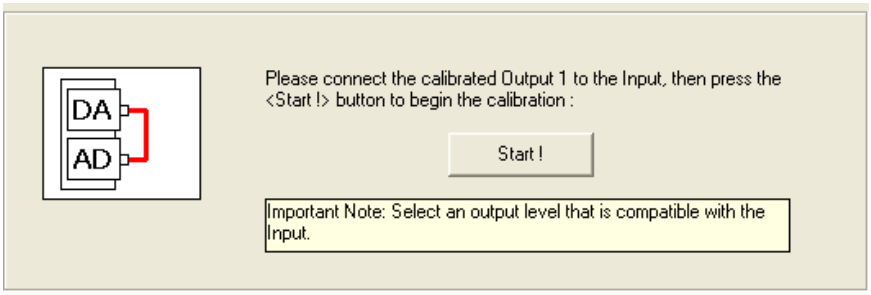
- **Calibration Level (RMS)**: Shows the RMS signal level that appears at this hardware input port in dBFS.

Stop

Wait for the input level to stabilize, then use this button to stop the calibration. A message shows the values determined by the calibration, select **OK** to enter the values into EASERA.

Use Output Loopback Signal

This button displays the following information in the area below the buttons:



Connect the calibrated output to the input using a short cable.

Start !

Use this button to start the calibration. As a result the input clip voltage is measured and automatically entered into EASERA.

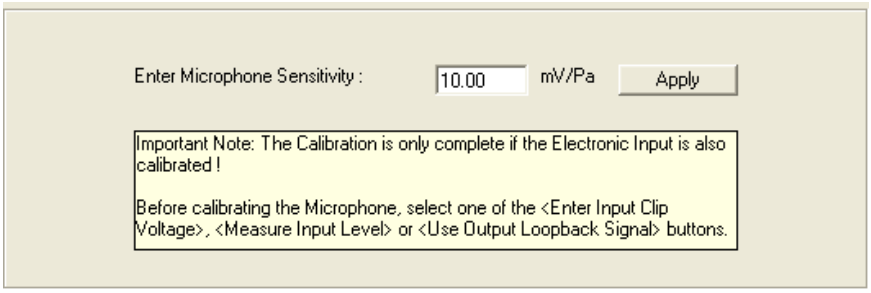
Calibrate Microphone

This area shows the status for the microphone used with the current hardware input channel.

- **Microphone**: The label for this microphone.
- **Sensitivity**: The sensitivity in mV/Pa for the microphone.

Enter Sensitivity

This button displays the following information in the area below the buttons:



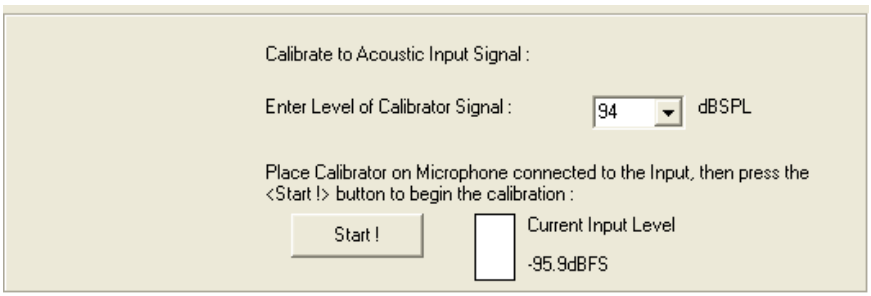
- **Enter Microphone Sensitivity**: Type the microphone sensitivity into the textbox.

Apply

Use this button to enter the value in the textbox into EASERA.

Use Microphone Calibrator

This button displays the following information in the area below the buttons:

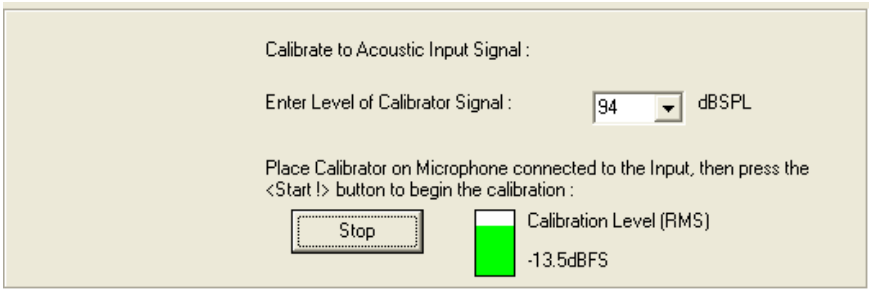


- **Enter Level of Calibrator Signal**: Select or type the level in dBSPL for the calibrator to be used into the drop-down textbox.
- **Current Input Level**: Shows the signal level that appears at this hardware input port in dBFS.

Start !

Use this button to start the calibration. A message indicates the next step.

After pressing **OK** the following information is displayed:

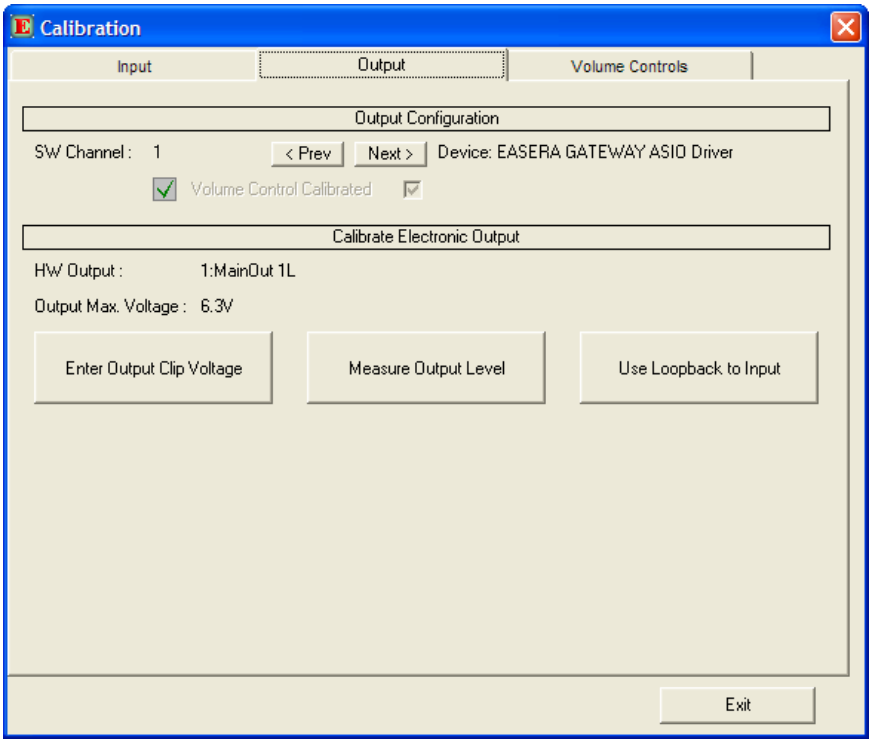


- **Calibration Level (RMS)**: Shows the RMS signal level that appears at this hardware input port in dBFS.

Stop

Wait for the input level to stabilize, then use this button to stop the calibration. A message shows the values determined by the calibration, select **OK** to enter the values into EASERA.

Output tab



Output Configuration

At the top of this tab is the current calibration of the software output channels. The ***< Prev*** and ***Next >*** buttons are visible if a reference channel is used for the measurement setup.

- **SW Channel**: The selected output channel.
- **Volume Control Calibrated**: A check mark indicates the calibration of the selected channel. Click on the icon to the left to get a message about the calibration status.

< Prev

Selects the previous software output channel to be used for the calibration.

Next >

Selects the next software output channel to be used for the calibration.

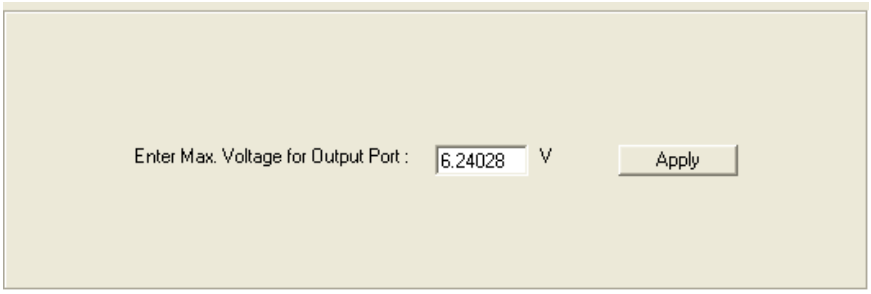
Calibrate Electronic Output

This area shows the status for the hardware output channel used for the current software output channel as selected above.

- **HW Output**: The selected hardware output channel.
- **Output Max. Voltage**: The RMS value of sine voltage which corresponds to 0 dBFS.

Enter Output Clip Voltage

This button displays the following information in the area below the buttons:



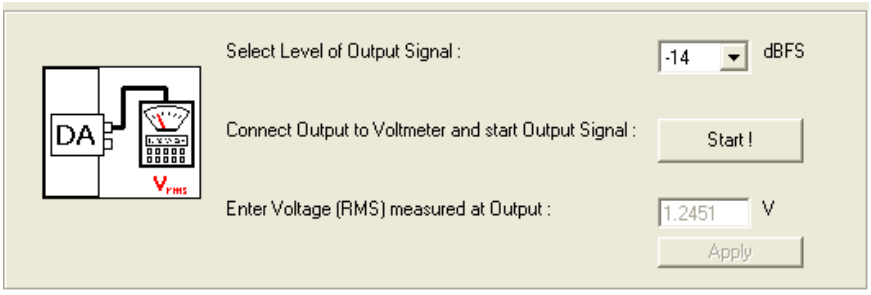
- **Enter Max. Voltage for Output Port**: Type the measured RMS value of sine voltage for the output into the textbox.

Apply

Use this button to enter the value in the textbox into EASERA.

Measure Output Level

This button displays the following information in the area below the buttons:



- **Select Level of Output Signal**: Select the level in dBFS for the output from the drop-down box.

Start !

Use this button to start the calibration. A message indicates the next step.

- After pressing **OK** the **Start !** button changes it's label to **Stop**. Measure the output voltage with a RMS meter.

Stop

Use this button to stop the calibration.

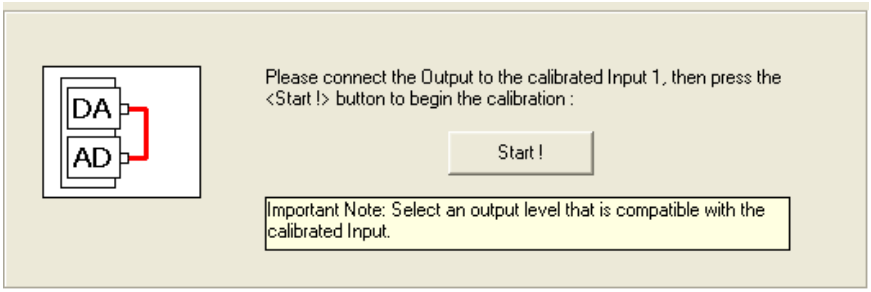
- **Enter Voltage (RMS) measured at Output**: Type the measured RMS value of sine voltage for the output into the textbox.

Apply

Use this button to enter the value in the textbox into EASERA.

Use Loopback to Input

This button displays the following information in the area below the buttons:

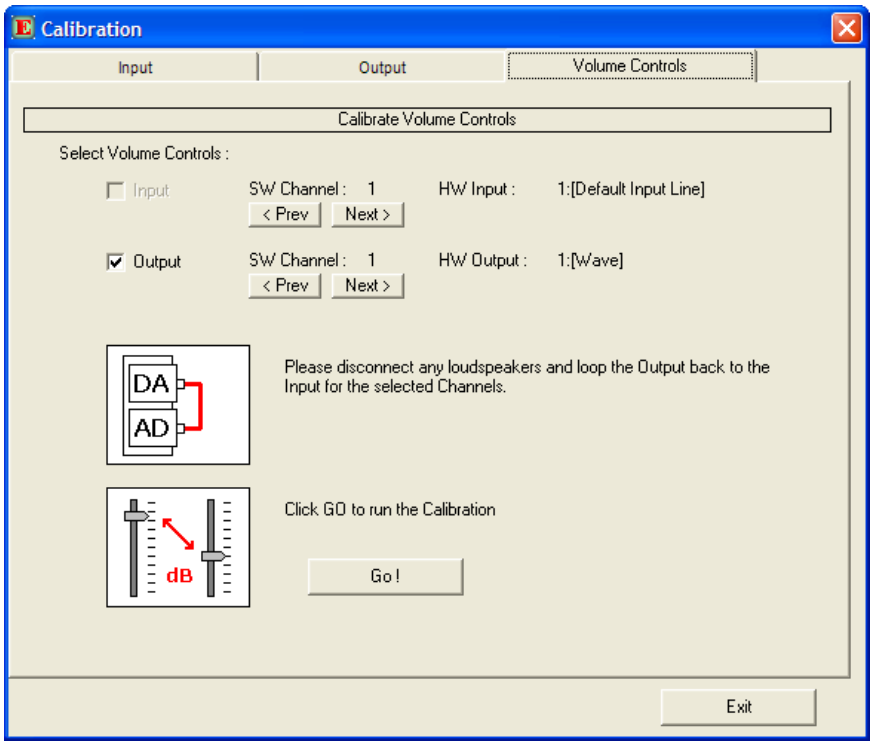


Connect the output to the calibrated input using a short cable.

Start !

Use this button to start the calibration. As a result the maximum output voltage is measured and automatically entered into EASERA.

Volume Controls tab



At the top of this tab is the current calibration of the Windows volume controls. The **< *Prev*** and ***Next* >** buttons are visible if multiple channels are used for either the software input or output channels.

- **Select Volume Controls**: A check mark indicates the calibration of the selected software channel for the input and output.
- **SW Channel**: The selected input or output channel.
- **HW Input**: The selected hardware input used for this software input channel.
- **HW Output**: The selected hardware output used for this software output channel.

< Prev

Selects the previous software input or output channel to be used for the calibration.

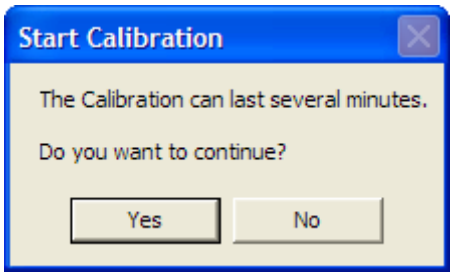
Next >

Selects the next software input or output channel to be used for the calibration.

Calibrate Volume Controls

Start !

Use this button to start the calibration. The following message is displayed.

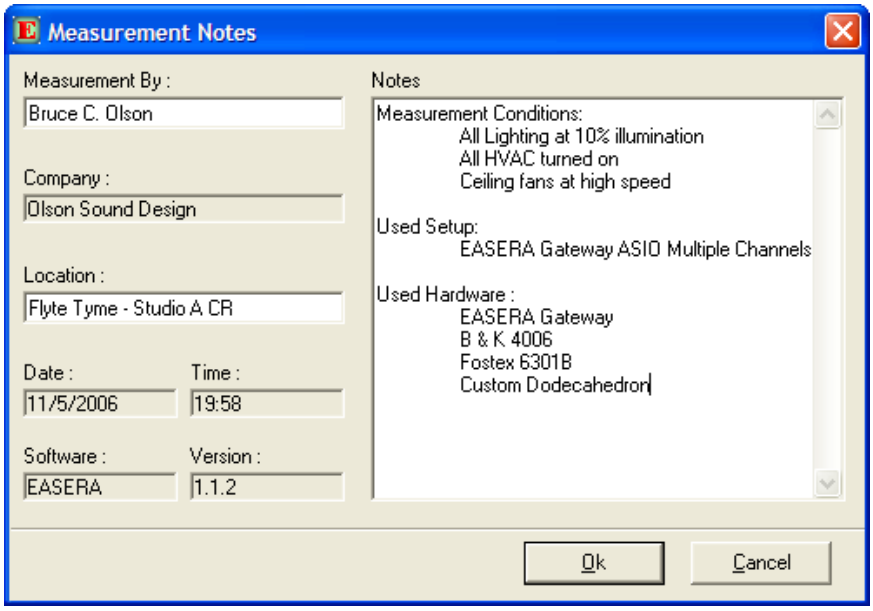


After pressing **Yes** an **Abort** button is displayed at the bottom of the dialog box along with a progress indicator for the calibration.

Measurement Notes dialog box

The ***Measurement Notes*** dialog box is called up from the frame ***Start Measurement*** by using the ***More*** button on the right above **Notes**.

Entries in this area have no technical relevance.



Measurement By

The person carrying out the measurement.

Company

The company for which the EASERA version is licensed.

Location

The location at which the measurement is carried out.

Date

The date on which the measurement is carried out.

Time

The hour at which the measurement is carried out.

Software

The software used for the measurement.

Version

Version of the software

Notes

Notes may be entered as needed. "Used Setup" and "Used Hardware" offer predefined texts, which can be completed, changed or deleted.

For producing fixed line skips please use Ctrl+Enter, since the Enter button alone would close the dialog.

OK

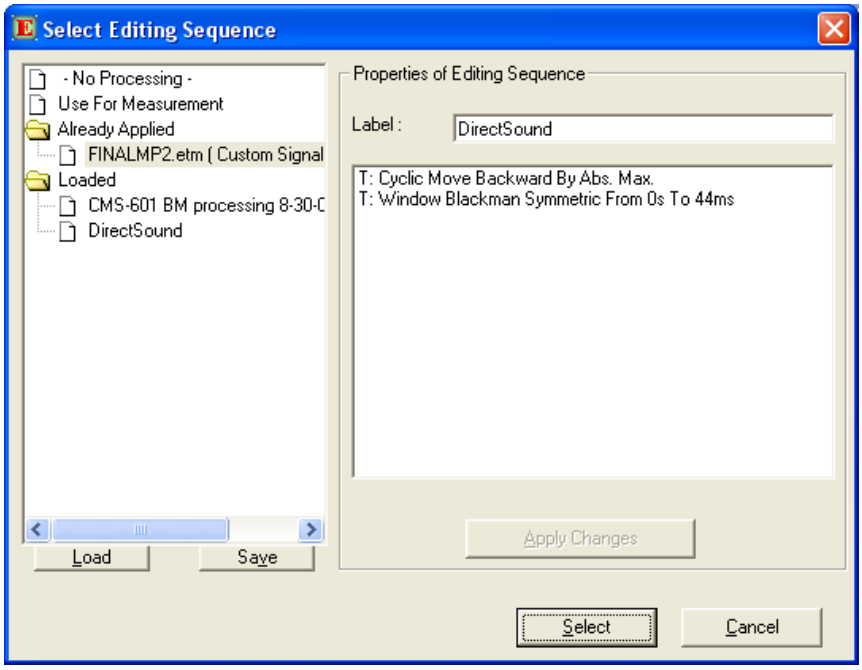
Closes the dialog and confirms the changes.

Cancel

Closes the dialog and rejects the changes.

Select Editing Sequence dialog box

The ***Select Editing Sequence*** dialog box is called up from the frame ***Start Measurement*** by using the **Additional Processing** button.



In the *View & Calc* window the measured signals can be processed. It is, for instance, possible to place the zero point of the time axis on the arrival of the signal as well as to smooth the signal. The Processing, as it is called by EASERA, does not alter the original data, but influences only the representation of the data. The processing can thus be undone ad lib.

If a greater number of similar measurements are carried out, it would be time consuming to perform the processing separately for each measurement. This is why EASERA allows in the ***Select Editing Sequence*** dialog box to create a preadjustment: All measurements carried out with this preadjustment will use this processing. It is also true that the original data remain unchanged and only the representation is varied according to the processing. A processing created in this way can also be undone.

On the left-hand side of the dialog box you find a tree view in which you can select the processing to be applied. Under **Already Applied** you can see the processing that was used with previous measurements, and under **Loaded** you find the processing that was explicitly saved (and then reloaded).

On the right-hand side you see how the processing is structured. Here you can also define a useful name for the processing.

Load

Loads a saved processing adjustment.

Save

Saves a processing adjustment.

Apply Changes

Applies the changes.

Select

Closes the dialog and selects the processing.

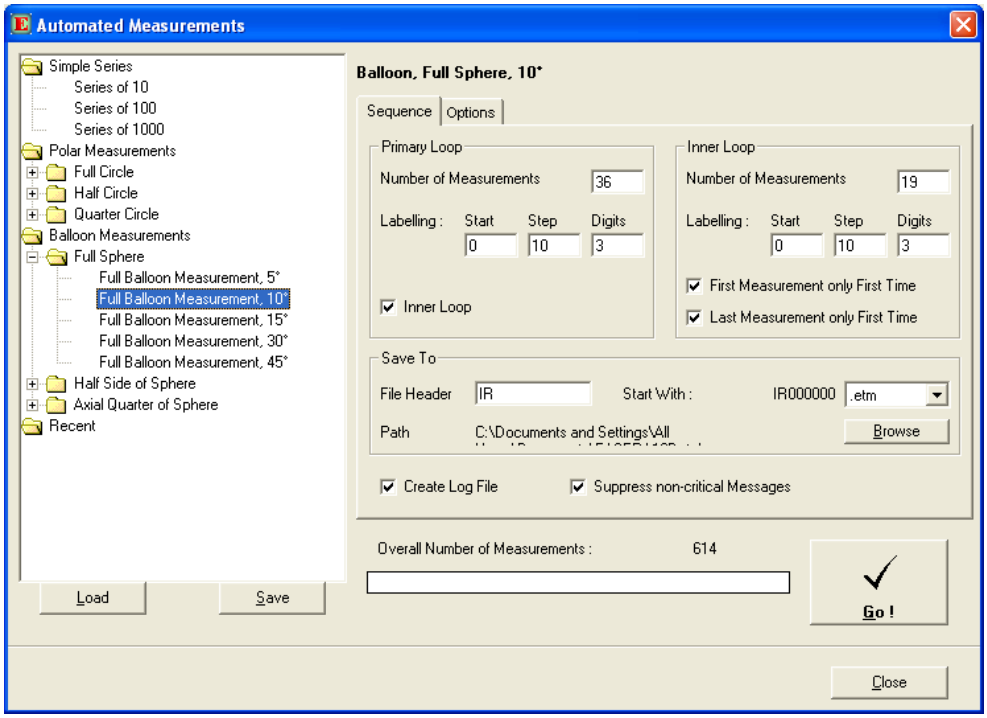
Cancel

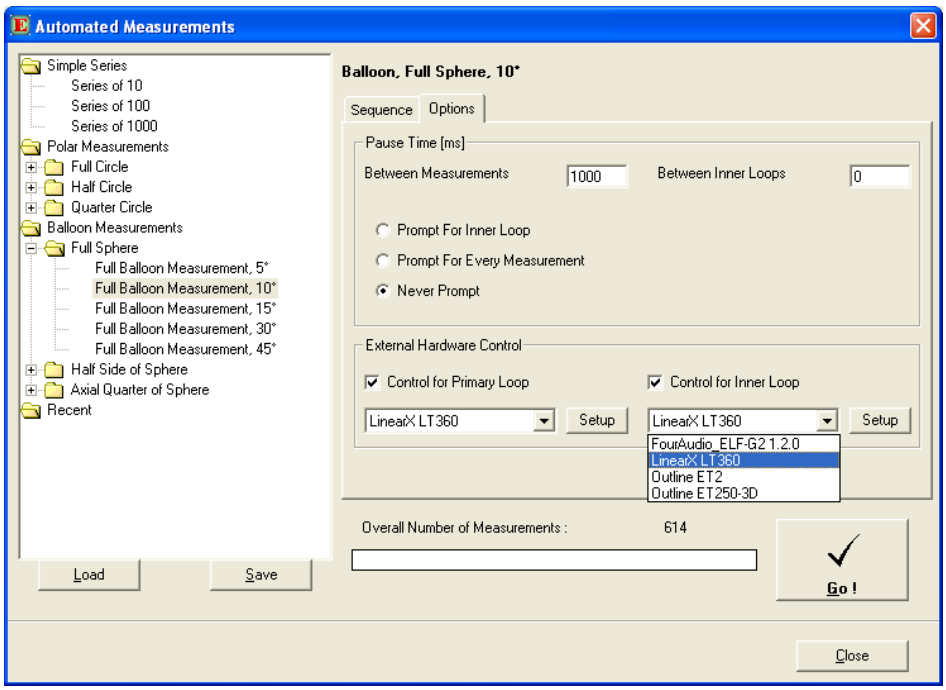
Closes the dialog and rejects the changes.

Automated Measurements dialog box

Automated measurements serve mainly for recording the balloon data of loudspeakers, microphones or even scattering structures. For a full balloon to record impulse responses in 10° steps requires a total of 614 measurements to be performed. You would not want to do these each by hand.

On the left-hand side of the dialog box you see an assortment of usual measurements, when selected, the corresponding parameters are automatically set on the right-hand side of the dialog box.





Load

For loading saved automation files, click on **Load** and then on the corresponding file.

Save

The settings can be saved as an automation file for reutilization at a later date.

Overall Number of Measurements

The overall number of measurements and a progress bar that is updated during the processing.

Go

Start the measurements.

Close

Closes the window.

Sequence Tab

Primary Loop

If measurements are made for two rotation directions, (recording of balloon data), there results one direction that is rotated in an outer loop, and another direction which is rotated for every position of the outer loop ("inner loop"). The outer loop is called the Primary Loop. For a single series of measurements only the primary loop is used.

Number of Measurements

The number of measurements in the outer loop.

Start

Starting value or starting angle for the first measurement, used only for generating the file name.

Step

Differential step or angle by which the direction is rotated for every subsequent measurement, used only for generating the file name.

Digits

Number of digits reserved in the file name for the outer loop.

Inner Loop

Each of the measurements in this loop will be made at each step of the Primary Loop.

Number of Measurements

The number of measurements in the inner loop.

Start

Starting value or starting angle for the first measurement, used only for generating the file name.

Step

Differential step or angle by which the direction is rotated for every subsequent measurement, used only for generating the file name.

Digits

Number of digits reserved in the file name for the inner loop.

First Measurement only First Time

When recording balloon data, the position would be the same for all the first measurements in the inner loop. If the option First Measurement only First Time is activated, this measurement is made only once.

Last Measurement only First Time

When recording balloon data, the position would be the same for all the last measurements in the inner loop. If the option Last Measurement only First Time is activated, this measurement is made only once.

Save To

The measurements are automatically saved. You must specify how the data names are to be created.

File Header

The first part of the file name.

Start With

The first file name, which is automatically extrapolated from the File Header and the Start values from above. You may select the file extension of the saved files.

Path

The directory in which the measurements will be saved.

Browse

Opens a dialog box for defining the path.

Create Log File

Writes all messages into a text file, using the file name from Start With with a file extension of ".log". This file can be shown when all of the measurements have finished.

Suppress non-critical Messages

Suppresses all reports which do not contain error messages.

Options Tab

Pause Time

Moving, rotating or tilting devices physically requires a certain time for arriving at the desired position. Therefore it is possible to set pause times to be observed before continuation of the measurement.

Between Measurements

Pause time between the individual measurements.

Between Inner Loops

Pause times between the inner loops and also between the individual measurements on the outer loop.

Prompt For Inner Loop

An inner loop is started only by demand of the user. This is desirable, for instance, when the measurement object is aimed only in one direction automatically and in other direction by hand or if EASERA should be synchronized with a turntable by using Script control.

Prompt For Every Measurement

Every measurement is started only after prompting by the user. This is desirable, for example, if the measurement object is completely aimed by hand.

Never Prompt

The whole measurement completely runs automatically.

External Hardware Control

This will allow control of external measurement robots and turntables based on a DLL plug-in for the particular product and manufacturer. Automatically rotating the loudspeaker with each measurement step makes the acquisition of polar and balloon data much easier.

Currently, the following external hardware is supported:

- Outline ET2 and ET250-3D turntables
- Four Audio ELF robot
- LinearX LT 360 turntable

For configuration purposes, each device provides its own dialog window that can be accessed using the Setup button. Normally these dialog boxes allow making a number of different adjustments with respect to settings for communication and physical movement. They also allow moving the device independently from any measurement. Additionally you may define the step size of the device that corresponds to the step size used by EASERA in determining the filename of each measurement.

Control for Primary Loop

Select a device from the list that is used for the primary loop.

Setup

Opens the product-specific configuration window for the device that is used for the primary loop.

Control for Inner Loop

Select a device from the list that is used for the inner loop.

Setup

Opens the product-specific configuration window for the device that is used for the inner loop.

Load Stimulus Signal dialog box

OK

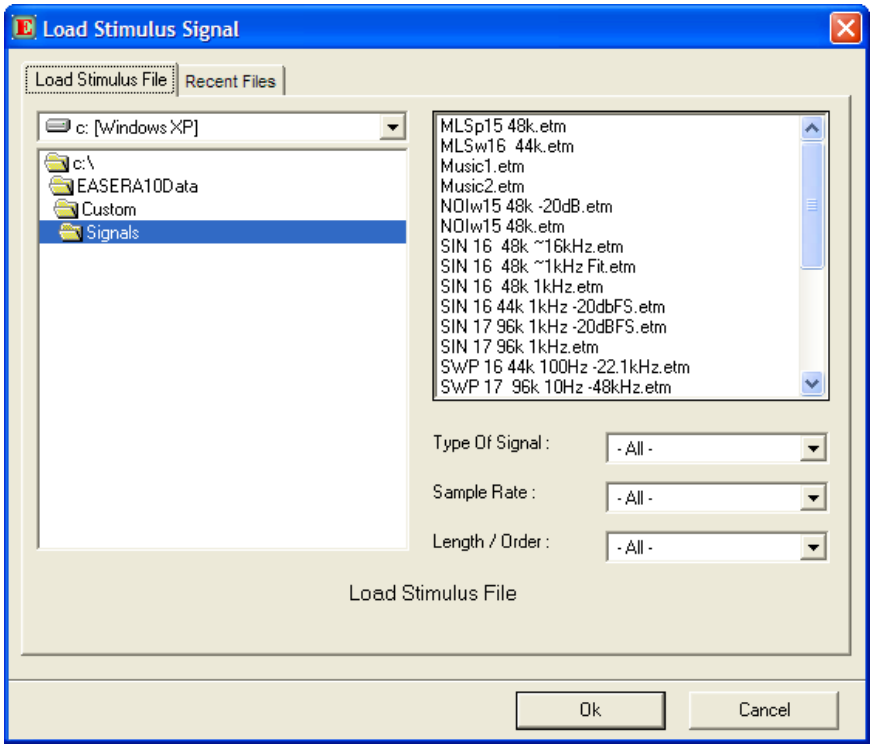
Closes the dialog and selects the stimulus signal.

Cancel

Closes the dialog without selecting a stimulus signal.

Load Stimulus File

On this page you can select a custom stimulus signal or choose from signals that were already generated by EASERA. Based on the naming of the latter you may use filters to display only a subset of stimulus files for selection.



Type Of Signal

Use this drop-down selection list to select a filter to display only signal files of a particular type in the file list.

Sample Rate

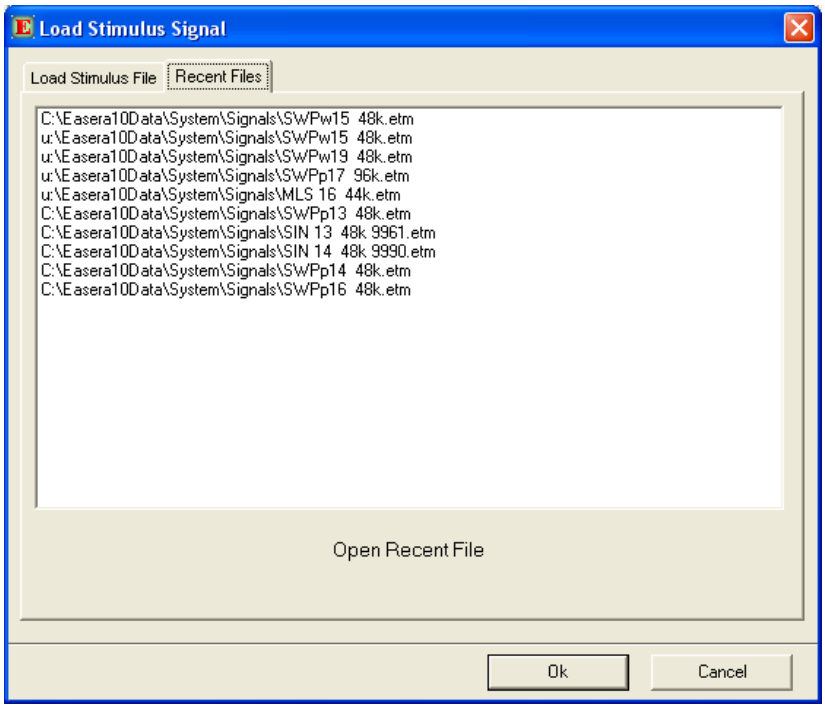
Use this drop-down selection list to select a filter to display only signal files of a particular sample rate in the file list.

Length / Order

Use this drop-down selection list to select a filter to display only signal files of a particular recording time in the file list.

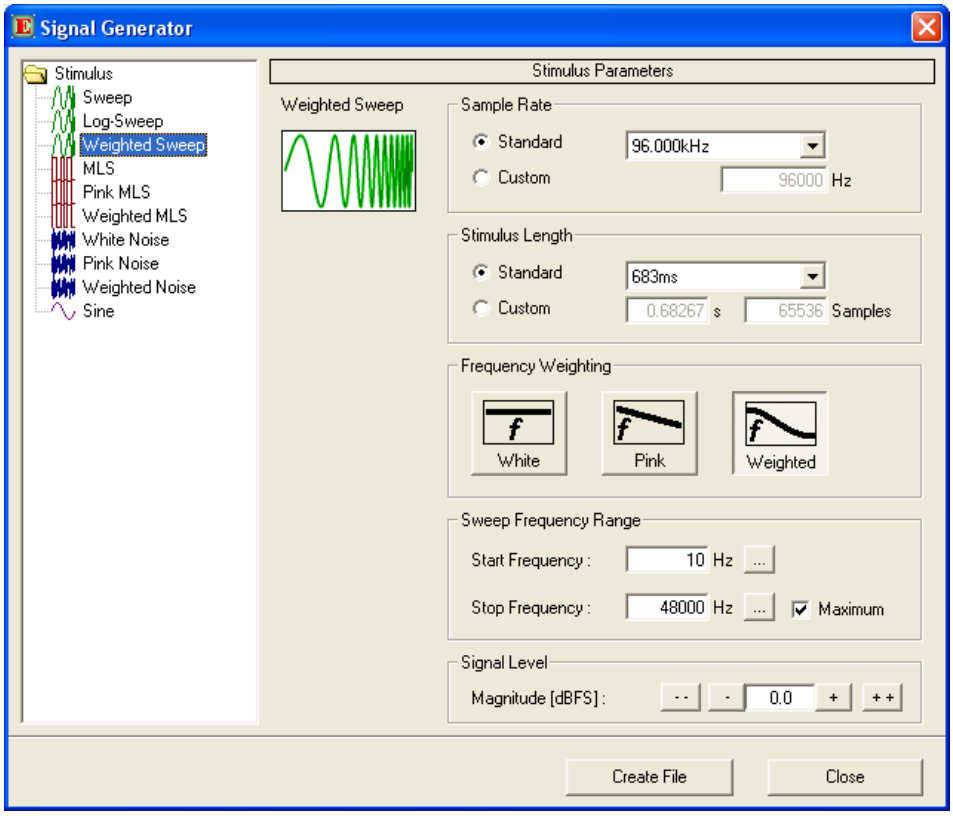
Recent Files

On this page you can select recently loaded signal files.



Generate Signal dialog box

In this window stimulus signals can be customized. Sweeps, MLS, Noise and Sinusoidal signals allow additional parameters to be set.



Create File

Creates a file for the currently selected stimulus signal.

Close

Closes the window.

Stimulus

This tree view on the left side contains a list of the types of stimuls signals that are available.

Sweep

Selects a *Sweep* as the general type of stimulus signal. Preselects *White* as the frequency weighting.

Log Sweep

Selects a *Sweep* as the general type of stimulus signal. Preselects *Pink* as the frequency weighting.

Weighted Sweep

Selects a *Sweep* as the general type of stimulus signal. Preselects *Weighted* as the frequency weighting.

MLS

Selects *MLS* as the general type of stimulus signal. Preselects *White* as the frequency weighting.

Pink MLS

Selects *MLS* as the general type of stimulus signal. Preselects *Pink* as the frequency weighting.

Weighted MLS

Selects *MLS* as the general type of stimulus signal. Preselects *Weighted* as the frequency weighting.

White Noise

Selects *Noise* as the general type of stimulus signal. Preselects *White* as the frequency weighting.

Pink Noise

Selects *Noise* as the general type of stimulus signal. Preselects *Pink* as the frequency weighting.

Weighted Noise

Selects *Noise* as the general type of stimulus signal. Preselects *Weighted* as the frequency weighting.

Sine

Selects a sinusoidal signal as the general type of stimulus signal.

Stimulus Parameters

Sample Rate

Standard

Select one of the standard sample rates. The stimulus signal will be created for that sample rate. To use this signal with EASERA, make sure your soundcard supports the selected sample rate.

Custom

Enter a custom sample rate. The stimulus signal will be created for that sample rate. To use this signal with EASERA, make sure your soundcard supports the selected sample rate.

Stimulus Length

Standard

Select one of the standard lengths for the signal. The number of samples is a power of 2.

Custom

Enter a custom length for the stimulus signal.

Frequency Weighting

White

A white frequency weighting will distribute the output energy equally over the entire frequency span. The energy density of the spectrum is constant.

Pink

A pink frequency weighting will distribute the output energy equally in all fractional-octave frequency bands. The energy density of the spectrum decays by 3dB per octave.

Weighted

A weighted frequency weighting will distribute the output energy in a predefined way. The energy density of the lower part of the spectrum is constant, as well as the higher part. Between these two frequency ranges there is a crossover area around 500Hz where the magnitude is decreased by approximately 20dB in order to reduce the output at the high frequencies.

Sweep Frequency Range

In this area you may customize the start and stop frequency for a sweep. Note that the sweep signal must be broad enough in the frequency domain in order to obtain useful results from a measurement.

Start Frequency

Enter the start frequency for the sweep. The **[…]** button on the right side opens the ***EASERA – Entry Data*** dialog box to select a frequency using actual or ISO values for 1/1, 1/3, or 1/6 octave centers.

Stop Frequency

Enter the stop frequency for the sweep. The **[…]** button on the right side opens the ***EASERA – Entry Data*** dialog box to select a frequency using actual or ISO values for 1/1, 1/3, or 1/6 octave centers.

Signal Level

Magnitude

The magnitude of predefined signals is generally scaled to Full Scale, e.g. between –1 and 1. Here you may enter a different scaling in order to reduce the maximal magnitude reached by the stimulus. The maximum value of 0dBFS is equivalent to Full Scale. The **[-]** and **[+]** buttons decrement or increment the magnitude values by 1dB. The **[- -]** and **[+ +]** buttons decrement or increment the magnitude values by 6dB.

Chapter III : Live

EASERA Live Tab

Key Conventions

F1	Help
F9	Options
Ctrl+F1	Select the ***Start*** tab
Ctrl+F2	Select the ***Measure*** tab (If it is visible)
Ctrl+F3	Select the ***Live*** tab (If it is visible)
Ctrl+F4	Select the ***View & Calc*** tab (If it is visible)
Ctrl+F5	Select the ***Waterfall*** tab (If it is visible)
Ctrl+F6	Select the ***Results*** tab (If it is visible)
Shift+F1	Select the ***Graphs*** navigator page
Shift+F2	Select the ***Axes*** navigator page
Shift+F3	Select the ***View*** navigator page
Shift+F4	Select the ***Overlay*** navigator page
Ctrl+B	Send Picture To Clipboard
Ctrl+F	Send Picture To File

Mouse Conventions

LMB	Left Mouse Button click
RMB	Right Mouse Button click

Use the LMB to select items.

Use the RMB to open a menu based on the context of the selected item or window location.

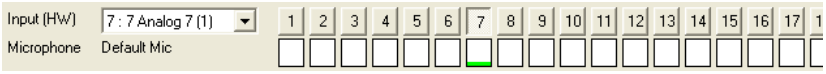
EASERA Live Window

In the ***Live*** window you find a Real-time Analyzer as well as an optional Spectrogram view.

Input (HW)

Using **Input (HW)**, you may choose the channel of the soundcard on which the measurement is to be carried out. Choose the channel from the pull down menu or by using the buttons beside it.

The level on the selected channel is shown below the buttons; it should be easy to see where the signal to be measured can be found.



If the display turns yellow (between –6 and –3 dBFS) or even red (between –3 and 0 dBFS), you should lower the level accordingly so as to avoid getting into the clipping zone for the signal peaks.

Microphone

Under **Microphone**, the current microphone calibration file is shown. For modifying the calibration file, change to the ***Measure*** tab.

Reference

If a **Transfer Function** is selected (on the ***Graphs*** navigator page), it is possible to choose the channel for the reference signal.

File Menu

Load Live Spectrum

Here you may load saved spectrum files stored for comparison in the ***Overlay*** navigator page.

Shortcut: **Ctrl+O**

Options

Choose this command to display the ***Options*** dialog box, which controls various program-wide settings. See Options for more information on the dialog box.

Shortcut: **F9**

Send Picture To

The current measurement diagram can be saved to the clipboard or to a file.

File

By using FILE|SEND PICTURE TO|FILE you save the measurement diagram graphically in a file. EASERA supports the following file formats:

- Windows Bitmap (bmp)
- JPEG (jpg)
- Compuserve GIF (gif)
- Portable Network Graphics (png)
- Tagged Image File Format (tif)
- LuRa Tech Wavelet (lwf)
- Zsoft Paintbrush (pcx)
- Windows Icon (ico)
- Enhanced Windows Metafile (emf)
- Truevision Targa (tga)
- Paint Shop Pro Image (psp)

Shortcut: **Ctrl+F**

Clipboard

By using FILE|SEND PICTURE TO|CLIPBOARD you save the measurement diagram to the clipboard.

Shortcut: **Ctrl+B**

Save Live Spectrum As

Allows you to save measured live data in the EASERA Live Spectrum (els) format to be loaded back for comparison purposes.

Shortcut: **Ctrl+A**

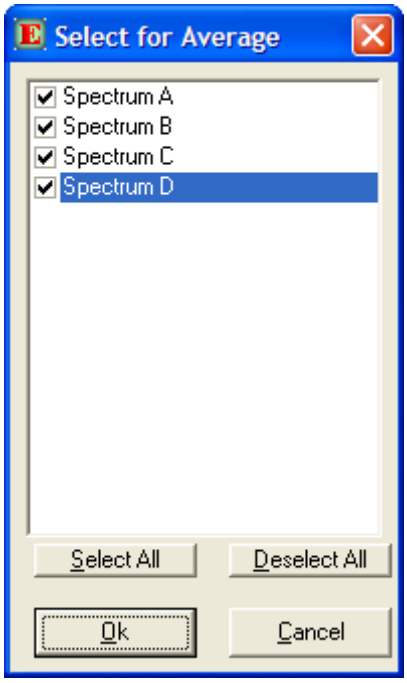
Exit

By using FILE|EXIT, you end the program.

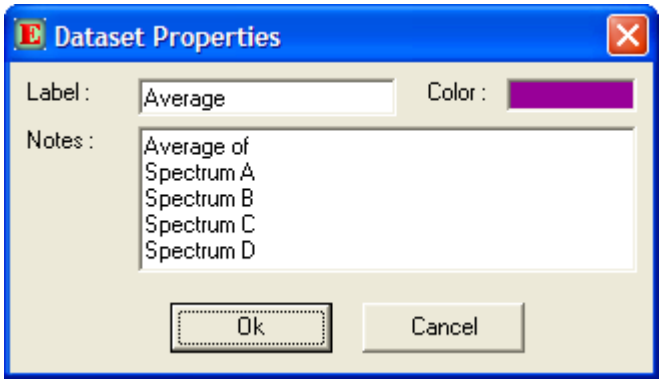
Edit Menu

Average Channels

Use EDIT|AVERAGE CHANNELS to average multiple saved overlay spectrums and add the resulting spectrum to the ***Overlay*** navigator page. The following dialog box is then displayed:



The dialog is loaded with all spectrums that are in the list on the ***Overlay*** navigator page. Use the check boxes to select the spectrums to be averaged and then press the **OK** button to open the following dialog box:



This dialog box allows a label to be defined along with a color to be used for its display. Press the **OK** button to add the average spectrum to the ***Overlay*** navigator page and close the dialog box.

View Menu

The functions of the VIEW menu can also be called up via the Toolbar icons or the ***View*** navigator page.

Live Spectrum

By using VIEW|LIVE SPECTRUM it is possible to switch the display of the current spectrum on and off.

Shortcut: **Ctrl+L**

Peak Hold

By using VIEW|PEAK HOLD it is possible to switch the display of the peak spectrum on and off. The number of measurements over which integration is done can be set in the ***Options (F9)*** dialog box under LIVE|LIVE.

Shortcut: **Ctrl+H**

Show Lines

By using VIEW|SHOW LINES, the frequency spectrum is represented as a monochrome line, which is blue with standard settings.

Show Colored Lines

By using VIEW|SHOW COLORED LINES, the frequency spectrum is represented as a polychrome line. The colors correspond to the scale shown below the diagram.

Bars

By using VIEW|BARS, the frequency spectrum is represented by monochrome bars (blue with standard settings).

Colored Bars

By using VIEW| COLORED BARS, the frequency spectrum is represented by polychrome bars. The colors correspond to the scale shown below the diagram.

Reset Peak

By using VIEW|RESET PEAK, the button **Reset**, or the keyboard shortcut, it is possible to reset the memory for Peak-Hold.

Shortcut: **Ctrl+R**

Broadband

By using VIEW|BROADBAND or the display shows the frequency spectrum without dividing it into frequency bands.

1/1 Octave Levels

By using VIEW|OCTAVE LEVELS, the display shows the frequency spectrum using octave bands.

1/3 Octave Levels

By using VIEW|THIRD OCTAVE LEVELS, the display shows the frequency spectrum using third octave bands (major thirds). With this setting the display corresponds to a classical Third-octave Band Analyzer.

1/6 Octave Levels

By using VIEW|1/6 OCTAVE LEVELS, the display shows the frequency spectrum using sixth octaves (major seconds, "whole tones").

1/12 Octave Levels

By using VIEW|1/12 OCTAVE LEVELS, the display shows the frequency spectrum using twelfth octaves (minor seconds, "half-tones").

1/24 Octave Levels

With VIEW|1/24 OCTAVE LEVELS, the display shows the frequency spectrum using twenty fourth octaves ("quarter-tones").

1/48 Octave Levels

By using VIEW|1/48 OCTAVE LEVELS, the display shows the frequency spectrum using forty-eighth octaves ("eighth-tones").

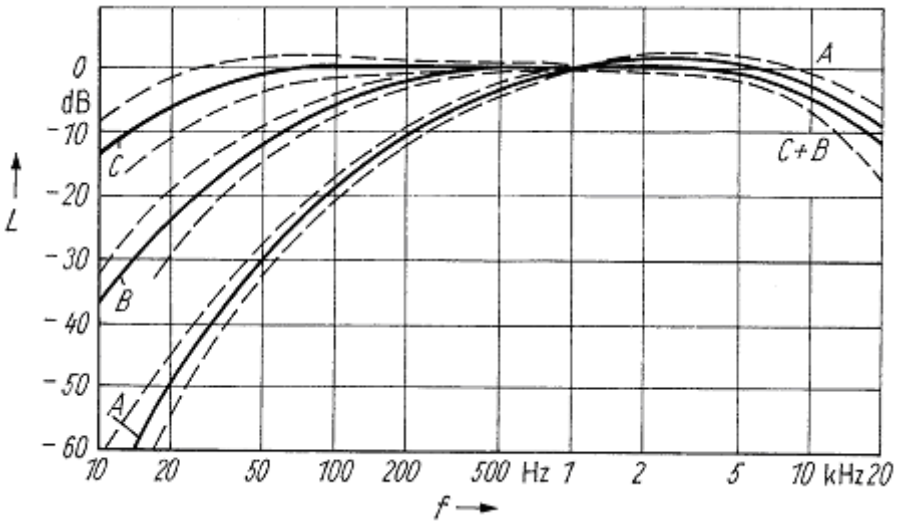
1/96 Octave Levels

With VIEW|1/96 OCTAVE LEVELS, the display shows the frequency spectrum using ninety sixth octaves ("sixteenth-tones").

Frequency Weighting

By using VIEW|FREQUENCY WEIGHTING, you can specify the frequency weighting to be applied to the frequency spectrum display:

- dB unweighted display
- dB(A) weighting according to IEC 651 see graph below
- dB(B) weighting according to IEC 651 see graph below
- dB(C) weighting according to IEC 651 see graph below



Mouse Menu

The functions of the MOUSE menu can also be selected by the tool bar.

Peek

By using PEEK, a cursor is used to indicate the actual level and frequency values. This cursor follows the location of the mouse while it is over the spectrum display. Pressing the RMB will keep the cursor on the selected frequency.

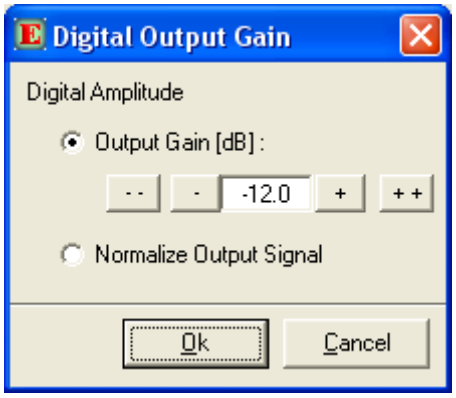
Tools Menu

In the Tools menu, you find additional functions.

Input Levels

By using Tools|Input Levels, you call up a window showing controllers for the Windows input mixer as well as VU meters.

Digital Output Gain



Select TOOLS|DIGITAL OUTPUT GAIN to set the level of the of the measurement signal relative to full scale and the playback level for loaded files. For typical measurements, it is recommended that the **Output Gain**

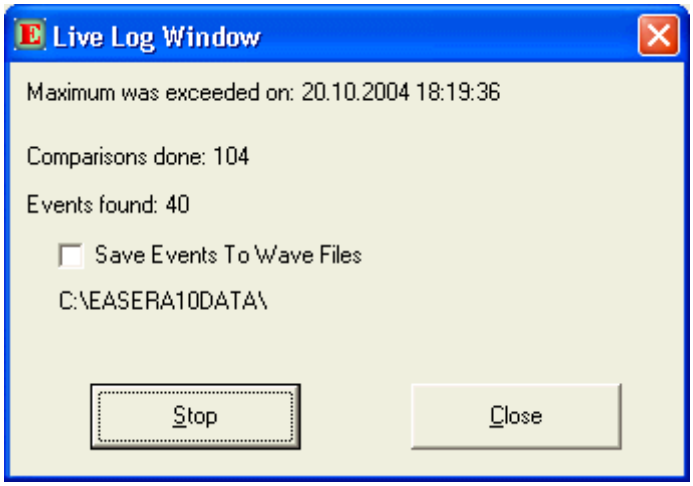
[dB] option be selected and the value set to between –12dB and –20dB. For playback of a loaded file, it is recommended that the **Normalize Output Signal** option be selected.

The maximum value of 0dB is equivalent to Full Scale. The **[-]** and **[+]** buttons decrement or increment the magnitude values by 1dB. The **[- -]** and **[+ +]** buttons decrement or increment the magnitude values by 6dB.

Tolerance Mode

Before selecting the Tolerance Mode, you need to choose and activate a tolerance curve.

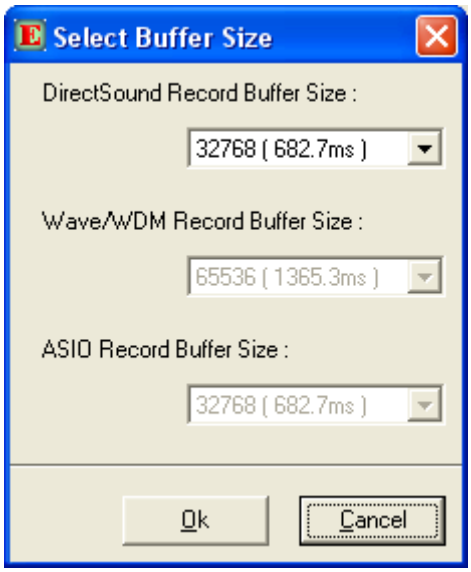
Then select TOOLS|TOLERANCE MODE and click on START.



Then EASERA counts the number of measurement operations in total as well as the number of measurement operations lying within the tolerance (if you define a maximum level, for instance, this is the number of measurement operations where the signal has exceeded this level.).

If you choose the Option **Save Events To Wave Files**, the events corresponding to the tolerance criterion will be saved as a wave file in the defined directory.

Select Buffer Size



- By using TOOLS|SELECT BUFFER SIZE, you set the size of the buffer for intermediate storage of the measured values. It must be larger than *Refresh Time* and *Time Needed*. It is recommended that Buffer Size be twice as large as *Time Needed*. See the View Navigator Page below for a description of *Refresh Time* and *Time Needed*.

Help Menu

Help Topics

By using HELP|HELP TOPICS, you show the help file.

Shortcut: **F1**

About

Under HELP|ABOUT, you find the Copyright reference and other information.

Graphs

Select the ***Graphs*** navigator button to see the navigator page that selects how a measurement is to be viewed.

Shortcut: **Shift+F1**

Input Spectrum

If you choose **Input Spectrum**, the input signal is subject to a frequency analysis and its result shown one of two ways:

- Spectrum Only
- Spectrum and Spectrograph

Transfer Function

If you choose **Transfer Function**, the difference between the input channel and the reference channel is subject to a frequency analysis and its result shown one of two ways:

- Spectrum Only
- Spectrum and Spectrograph

Axes

Select the ***Axes*** navigator button to see the navigator page that allows you to set the axis scalings and the averaging period of the display. The ***Axes*** navigator page is automatically selected also by clicking the X-axis or the Y-axis in the graph using the LMB or RMB.

Shortcut: **Shift+F2**

Time

In the section **Time**, you set the averaging period and the FFT window.

- **Window**: Here it is possible to set the FFT window type. Such a window reduces a measurement value misrepresentation by side spectra due to the discrepancy between measurement interval and period duration.
- **Averages**: For obtaining a steadier indication, the average value can be calculated over an adjustable number of measuring periods. One measurement period corresponds e.g. to 4096 samples. With a sampling rate of 48 kHz this amounts to 85.3 ms.
- **1** Sets the averaging interval to one measurement period.
- **[–]** Halves the averaging interval
- **[+]** Doubles the averaging interval.
- →| Sets the averaging interval to maximum value.

Frequency

In the section **Frequency**, you set the frequency scaling and the FFT size.

- **Start:** Sets the starting point of the frequency scale.
- **Stop:** Sets the final point of the frequency scale.
- **Logarithmic:** Sets a logarithmic frequency scaling.
- **Linear:** Sets a linear frequency scaling.
- **FFT Size:** Sets the FFT size. The FFT size is always a power of two (2^{10} = 1024, 2^{12} = 4096...). It determines the measurement interval and the frequency resolution. The measurement interval is the product of FFT size and sampling rate; the frequency resolution is the quotient of sampling rate and FFT size. (This implies that the frequency resolution is the reciprocate value of the measurement interval.)

Magnitude

In the section **Magnitude**, you set the scaling of the level axis:

- **Max**: top display limit
- **Min**: bottom display limit
- **Unit**: Opens the ***Select Unit*** window to allow the selection of the unit to be used for the level axis. This window can also be opened by clicking on the unit label in the upper left of the graph with the LMB or RMB. Depending on whether an acoustic or an electronic measurement is being made, the following units are available:
    - Value
    - Rel
    - Volt
    - Pa
    - %FS
    - %
    - Watt

- Ws
- dB
- dB FS
- dB SPL
- dBV
- dBu
- dBm
- dBp

Default

By using the **Default** button, it is possible to reset all settings of the *Axes* navigator page to standard values.

Apply

Values entered in edit windows are applied as soon as the ENTER key is hit. (or you may use the **Apply** button).

View

Select the ***View*** navigator button to see the navigator page that allows you to adjust all settings concerning frequency bands, frequency weighting and the refresh period of the display.

Shortcut: **Shift+F3**

Graph

- **Frequency Bands:** Setting of the frequency bands also may be done in the menu VIEW and is described there.
- **Frequency Weighting:** Setting of the frequency weighting may be done in the menu VIEW and is described there.
- **Show Meters:** A check mark allows the display of two level meters (unweighted and weighted broadband displays) on the right side of the screen. The weighted broadband display uses the frequency weighting selected above.

Refresh Rate

- **Refresh Time:** The interval of time between updates of the display. If *Refresh Time* is shorter than *Time Needed*, EASERA refreshes the display as often as possible.
- **Time Needed:** The time required for calculating the data to be displayed in the graph.
- **Time Displayed:** The time required for an FFT calculation operation, and it should be longer than *Refresh Time* and longer than *Time Needed*.

- **Buffer Size:** Size of the buffer for intermediate storage of the measured values. It must be larger than *Refresh Time* and *Time Needed*. It is recommended that Buffer Size be twice as large as *Time Needed*.

Overlay

Select the ***Overlay*** navigator button to see the navigator page that allows you to adjust the properties of overlaid curves and allows the selection of Background and Tolerance curves.

Several curves may be stored and shown in parallel by adding the spectrum data to one of 16 storage locations provided for your use. To store the current measurement, click on *Set* in a row that does not yet contain data. By using **Add** on a row that already contains data, you will overwrite the stored measurement with the current one.)

Shortcut: **Shift+F4**

- **C:** Shows the color of the curve.
- **A:** Indicates the active curve and it's color.
- **V:** An **X** indicates the curve is visible.
- **Spectrum:** Shows the frequency band resolution of the curve.
- **Add/Set:** Average or add curve.

By clicking with the right mouse key you can remove the respective curve.

The curves can be saved by using the **Save** button and loaded by using the **Load** button. With the **Export** button, it is possible to export the curves as a list in ASCII format.

Clicking in a Spectrum column cell opens the Dataset Properties Dialog Box.

Background Curve

A background curve is a curve or a set of curves which can be overlaid in a display. With the **[…]** button, you may load a new background curve and in the pull down menu you choose between the loaded curves.

See also: Edit Curve Set Dialog Box

Tolerance Curve

A tolerance curve is a curve or a pair of curves which define a tolerance range and like background curves, can be overlaid in a display. If you want to use the tolerance mode, you must first activate such a tolerance curve. With the **[…]** button, you may load a new tolerance curve and in the pull down menu you choose between the loaded curves.

See also: Edit Curve Set Dialog Box

Freeze

Activating this button will stop the measuring mode and freeze the last display.

Play Test Signal ! / Stop Test Signal !

The **Play Test Signal** button starts a continuous output of the measurement signals selected on the ***Measure*** tab. This test signal is muted by using the **Stop Test Signal** button.

Shortcut: **F6** (Always Play)

Shortcut: **F7** (Always Stop)

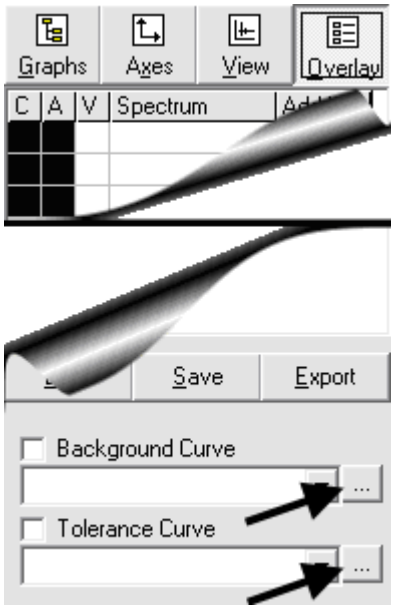
Reset

By using the button **Reset**, VIEW|RESET PEAK, or the keyboard shortcut, it is possible to reset the memory for Peak-Hold.

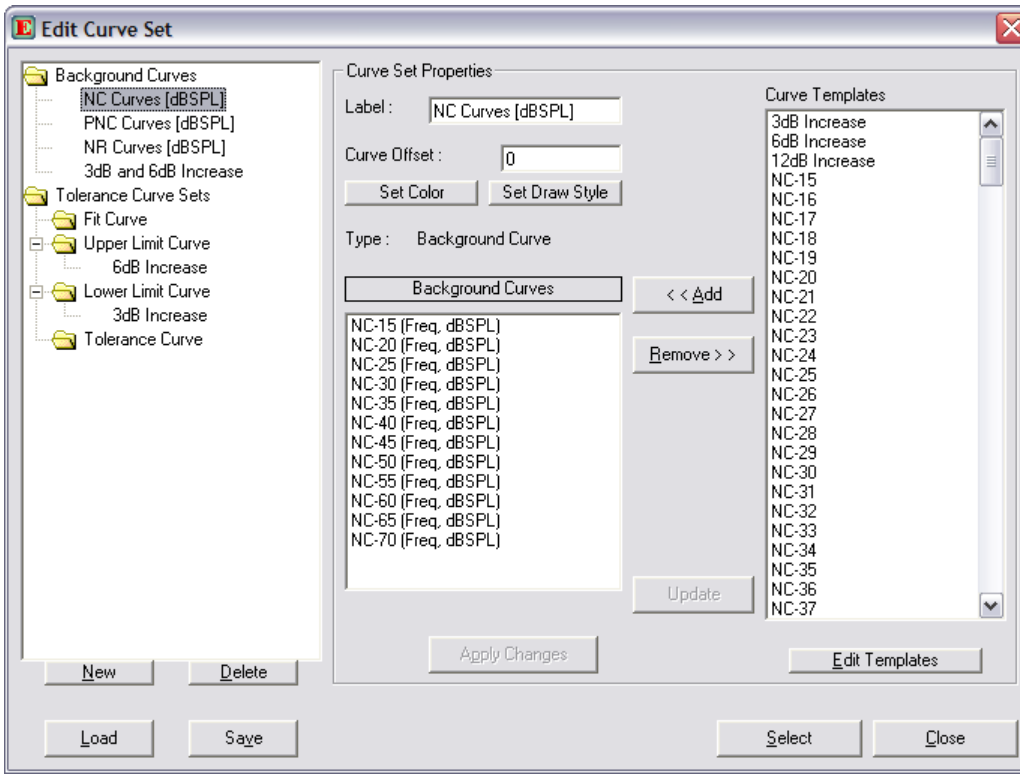
Shortcut: **Ctrl+R**

Edit Curve Set Dialog Box

To open the ***Edit Curve Set*** dialog box select the ***Overlay*** navigator page, then click the **[…]** button to the right of the **Background Curve** or **Tolerance Curve** at the bottom of the page.



The ***Edit Curve Set*** dialog box enables you to create sets of Curve Templates to be used as Background or Tolerance Curves. A Curve Template is an individual curve in the time or frequency domain. Background Curves can include a virtually unlimited number of Curve Templates in each set. Tolerance Curves include one or two Curve Templates in each set. Each of these Curve Sets can be saved to the disk and transferred to another computer where they can be loaded into this dialog box.



New

Choose this button to create a new Curve Set. The curve label will be based on the current Curve Set that is selected with a number added to the end of the label that will be incremented by one.

Delete

Choose this button to delete the selected Curve Set from the tree list.

Load

Choose this button to load a Curve Set from the disk and add it to the tree list.

Save

Choose this button to save the selected Curve Set to the disk.

Select

Choose this button to close the ***Edit Curve Set*** dialog box and add the Curve Set to the Background or Tolerance Curve drop-down list and select it.

Close

Choose this button to close the ***Edit Curve Set*** dialog box.

Curve Set Properties

This frame shows the Curve Set that is currently selected in the tree list.

Label

Enter a name for the Curve Set here. It will be displayed in the Background or Tolerance Curve drop-down list on the ***Overlays*** navigator page on the ***Live*** tab.

Curve Offset

Enter a level offset for the display of the Curve Set. This is normally used for single curves to reduce the need to create separate Curve Templates.

Set Color

Choose this button to open the standard Windows Color dialog box to select a display color for the Curve Set.

Set Draw Style

Choose this button to open the ***Select*** dialog box to select a line draw style for the Curve Set. The possible choices are:

- Dots
- Line
- Line, 2 Pixels
- Line, 3 Pixels
- Line, 4 Pixels
- Line, 5 Pixels

Type

See the section Tolerance Curve Sets further below for details about which types of curve sets can be selected.

<<Add

Choose this button to add the selected Curve Templates to the Background Curves list.

Remove>>

Choose this button to delete the selected Background Curve Templates from the Background Curves list.

Update

Choose this button to update the selected Curve Templates in the Background Curves list after a Curve Template has been edited.

Edit Templates

Choose this button to open the ***Edit Curve Templates*** dialog box. See Edit Curve Templates Dialog Box for more information on the dialog box.

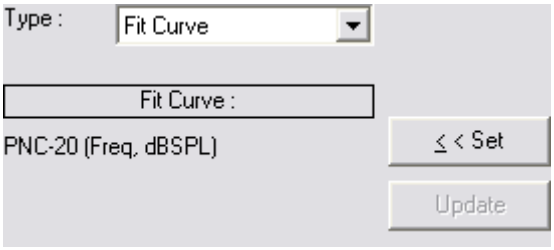
Apply Changes

Choose this button to update the Curve Set or add it to the tree list.

Tolerance Curve Sets

Fit Curve

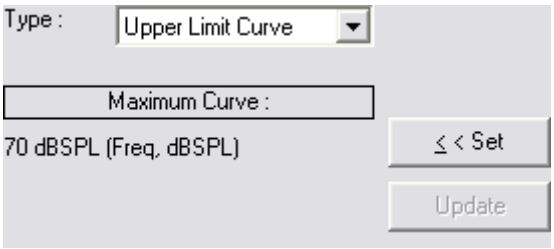
A Fit Curve Set includes a single Curve Template that allows the tolerance to follow the curve.



- **Type:** This drop-down list selects the type of Tolerance Curve Set.
- **<<Set:** Choose this button to set the Fit Curve to the selected Curve Template.
- **Update:** Choose this button to update the Fit Curve after a Curve Template has been edited.

Upper Limit Curve

An Upper Limit Curve Set includes a single Curve Template that sets the maximum level allowed.

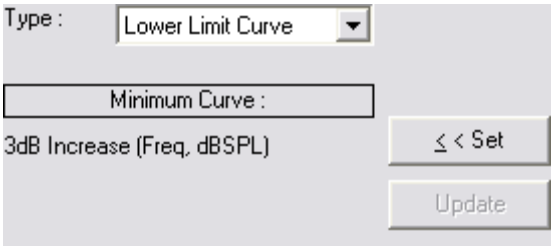


- **Type:** This drop-down list selects the type of Tolerance Curve Set.
- **<<Set:** Choose this button to set the Maximum Curve to the selected Curve Template.

- **Update:** Choose this button to update the Maximum Curve after a Curve Template has been edited.

Lower Limit Curve

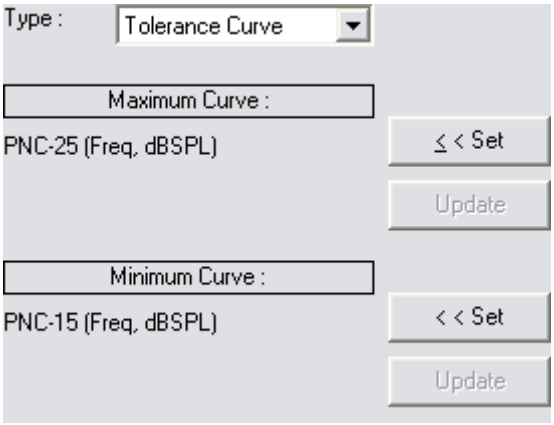
A Lower Limit Curve Set includes a single Curve Template that sets the minimum level allowed.



- **Type:** This drop-down list selects the type of Tolerance Curve Set.
- **<<Set:** Choose this button to set the Minimum Curve to the selected Curve Template.
- **Update:** Choose this button to update the Minimum Curve after a Curve Template has been edited.

Tolerance Curve

An Tolerance Curve Set includes two Curve Templates that set the minimum and maximum levels allowed.



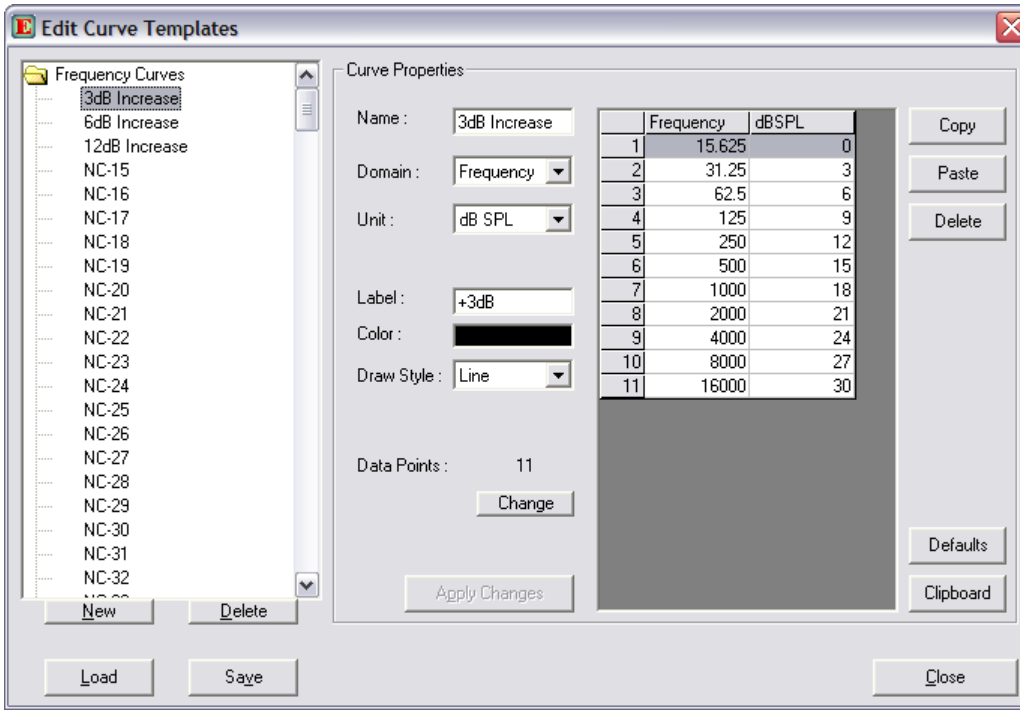
- **Type:** This drop-down list selects the type of Tolerance Curve Set.
- **<<Set:** Choose this button to set the Maximum or Minimum Curve to the selected Curve Template.
- **Update:** Choose this button to update the Maximum or Minimum Curve after a Curve Template has been edited.

Edit Curve Templates Dialog Box

To open the ***Edit Curve Templates*** dialog box press the **Edit Templates** button from the ***Edit Curve Set*** dialog box.

The ***Edit Curve Templates*** dialog box enables you to create Curve Templates to be used in a Background or Tolerance Curve Set. A Curve Template is an individual curve in the time or frequency domain. Each of

these Curve Templates can be saved to the disk and transferred to another computer where they can be loaded into this dialog box.



New

Choose this button to create a new Curve Template. The curve name will be based on the current Curve that is selected with a number added to the end of the name that will be incremented by one.

Delete

Choose this button to delete the selected Curve Template from the tree list.

Load

Choose this button to load a Curve Template from the disk and add it to the tree list.

Save

Choose this button to save the selected Curve Template to the disk.

Close

Choose this button to close the ***Edit Curve Templates*** dialog box.

Curve Properties

This frame shows the Curve that is currently selected in the tree list.

Name

Enter a name for the Curve here. It will be displayed in the Curve Templates list in the ***Edit Curve Set*** dialog box.

Domain

This drop-down list selects whether the curve is for the *Time* or *Frequency* domain.

Unit

This drop-down list selects the unit to be used for the level axis. Depending on whether an acoustic or an electronic measurement is being made, the following units are available:

- Value
- Rel
- Volt
- Pa
- %FS
- %
- Watt
- Ws
- dB
- dB FS
- dB SPL
- dBV
- dBu
- dBm
- dBp

Label

Enter a name for the Curve here. It will be displayed to the right of the curve in the graph on the ***Live*** tab.

Color

Click on the colored box to open the standard Windows Color dialog box to select a display color for the Curve.

Draw Style

This drop-down list selects a line draw style for the Curve. The possible choices are:

- Dots
- Line
- Line, 2 Pixels
- Line, 3 Pixels
- Line, 4 Pixels
- Line, 5 Pixels

Change

Choose this button to open a dialog box that allows you enter the number of data points in the curve. Click **OK** to enter a new value and **Cancel** to leave the existing value.

Copy

Choose this button to copy the selected rows.

Paste

Choose this button to paste the copied rows starting at the next row. The copied data can either be inserted before the next row, or it can overwrite the data starting with the next row.

Delete

Choose this button to delete the selected rows.

Defaults

Choose this button to select from a list of predefined values for either the time or frequency domain. The choices in the time domain are: 20 Steps of 100ms ▪ 20 Steps of 500ms. The choices in the frequency domain are: Octave Frequencies ▪ 1/3 Octave Frequencies.

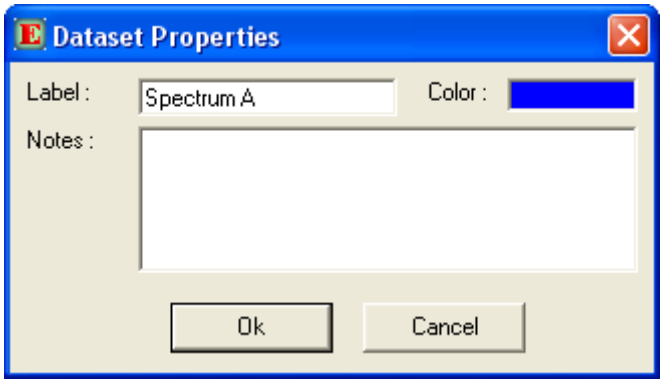
Clipboard

Choose this button, then select **Paste from Clipboard** to paste two rows or columns of data from the Windows Clipboard starting at the next row. The copied data can either be inserted before the next row, or it can overwrite the data starting with the next row.

Apply Changes

Choose this button to update the Curve or add it to the tree list.

Dataset Properties Dialog Box



Label

Enter a name for the Spectrum here. It will be displayed in the list on the ***Overlays*** navigator page on the ***Live*** tab.

Color

Click on the colored box to open the standard Windows Color dialog box to select a display color for the Spectrum.

Notes

Notes may be entered as needed.

Ok

Confirms the changes and closes the window.

Cancel

Rejects the changes and closes the window.

Chapter IV : View & Calc

EASERA View & Calc Tab

Key Conventions

F1	Help
F9	Options
Ctrl+F1	Select the ***Start*** tab
Ctrl+F2	Select the ***Measure*** tab (If it is visible)
Ctrl+F3	Select the ***Live*** tab (If it is visible)
Ctrl+F4	Select the ***View & Calc*** tab (If it is visible)
Ctrl+F5	Select the ***Waterfall*** tab (If it is visible)
Ctrl+F6	Select the ***Results*** tab (If it is visible)
Shift+F1	Select the ***Graphs*** navigator page
Shift+F2	Select the ***Overlay*** navigator page
Shift+F3	Select the ***Details*** navigator page
Shift+F4	Select the ***Cursor*** navigator page
Ctrl+B	Send Picture To Clipboard
Ctrl+F	Send Picture To File
Ctrl+Shift+R	Opens ***Remove Air Absorption*** window
Ctrl+Shift+S	Opens ***Change Sample Rate*** window

Mouse Conventions

LMB	Left Mouse Button click
RMB	Right Mouse Button click

Use the LMB to select items.

Use the RMB to open a menu based on the context of the selected item or window location.

EASERA View & Calc Terms

Data set

A data set is a collection of data held at disposal by EASERA in its memory. The data set concerned can be created in two ways.

- By a measurement carried out using of EASERA.
- By opening a file on a data medium (hard disc).

Such a data set normally contains at least the unfiltered impulse response. It may additionally contain the unprocessed raw data. For special files that can be loaded the data set may be more restricted. (e.g. TEF20 ETC file.)

All calculations are derived in EASERA from the impulse response. For saving calculation time the results obtained by the first calculation are stored in the data set.

The results may also consist of the impulse responses obtained by means of either an octave or third-octave filter or a window: When octave-filtered values are required for the first time, EASERA stores a set of octave-filtered impulse responses in the recorded data set. From these octave-filtered impulse responses it is then possible to calculate further results. By the same procedure it is also possible to include third-octave-filtered or windowed impulse responses in the data set.

From the complete, filtered or windowed impulse responses there may then be derived further results, for instance the frequency and phase responses, the energy curves or the room-acoustical quantities. These values are also included in the data set after having been calculated for the first time.

Raw Data

Raw data are the data in the condition in which EASERA receives them via the sound card. They still contain the excitation signal, but the influences of the sound card have not yet been eliminated.

Primary Data

The impulse response, the combination of frequency and phase responses as well as the complex frequency response can be mutually converted without any loss of information. Jointly, these three data form the primary data from which all the other computation results are derived.

Free Editing

As a rule, EASERA keeps the primary data consistent: A processing of the frequency response takes place via an FFT by recalculation of the impulse response, thus processing the impulse response alters the frequency response.

With some processing steps (e. g. insertion of sub steps via the clipboard) it is, however, not possible to keep the primary data consistent. EASERA does not allow this kind of processing to be done with the original data, but only with copies created for *free editing*. With such *free editing* copies EASERA no longer keeps the primary data consistent, so that modifying the impulse response does not influence the frequency response and vice versa. A frequency response is calculated again only after the edited impulse response has been saved.

Filters

A filter enables influencing the data in the frequency domain (with corresponding repercussion on the time domain (generally the impulse response)). EASERA includes octave and third-octave filters as well as freely definable filters (EDIT|FILTER).

Windows

A window enables influencing the data in the time domain (generally in the impulse response) (with corresponding repercussion on the data in the frequency domain). For defining a window it is necessary to determine the window width by means of the markers.

Samples

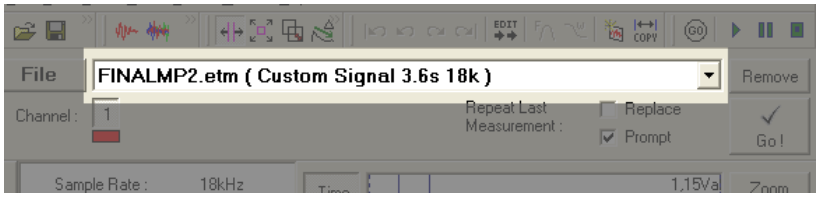
A sample is an individual data value. It represents an amplitude value corresponding to a time or frequency value.

Processing

EASERA enables data to be modified in the most varied fashion. They may for instance be scaled, filtered and "windowed". These editing steps are subsumed under the term *Processing*. All *Processing* steps can also be undone.

Active Data Set

The active data set is the one shown in the file selection list (and can also be modified there):



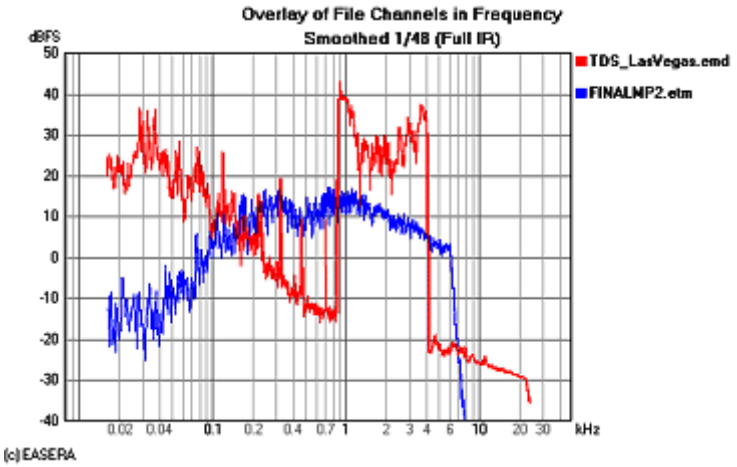
By means of an overlay it is possible to visualize various data sets in one diagram. All cursors, markers and editing sequences then refer to the active data set.

Curve

A curve is a visualized part of a data set, e.g. the frequency response or the impulse response. The *Active Curve* corresponds to the *Active Data Set*.

Diagram

A diagram is the representation of one or various curves.



X-axis

The-X axis (abscissa) runs from left to right. It is used for plotting times or frequencies.

Y-axis

The Y-axis (ordinate) runs from bottom to top. It is used for plotting e. g. amplitudes, levels, phases, reverberation times or harmonic distortion coefficients.

Abs Max

The absolute maximum is the highest value by magnitude of the active curve in the current diagram.

Cursor

A Cursor is a position in the diagram. EASERA distinguishes various types of cursors:

- A stored cursor is permanently shown in the diagram and listed in the navigator page *Cursor*.
- A mouse cursor is the actual mouse position in the diagram; it is shown below the diagram in the status bar area.
- A curve cursor consists of the actual X-position of the mouse and the pertaining Y-position of the active curve; it is also shown below the diagram in the status bar area in parentheses.

Markers

Markers are used for setting limits on the X-axis for calculations, for setting the edges of windows in the time domain, and for setting the band limits or centers for filters in the frequency domain. There is a left marker and a right marker.

Properties

The ***Measurement File Properties*** dialog bog is used to view and set the properties of the current file.

Shortcut: **F4**

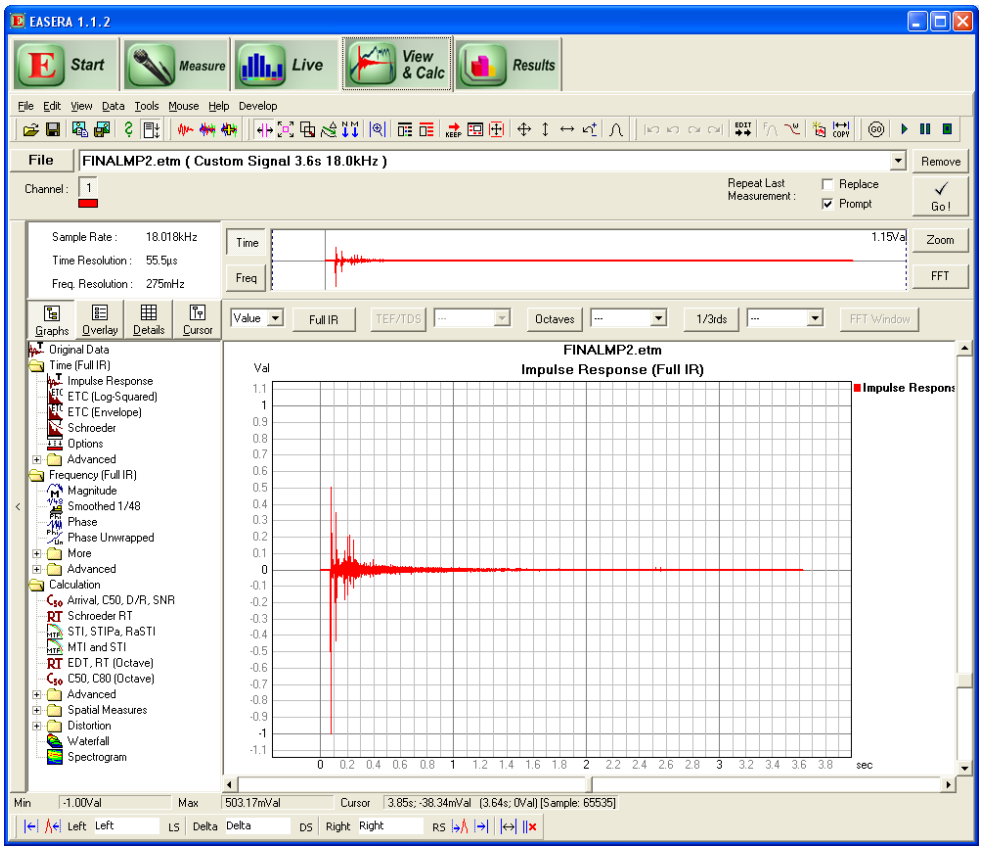
Options

The ***Options*** dialog box is used to adapt the behavior of EASERA in many details to the requirements of the user. Thus it is possible, for instance, to preset the coloring of the diagrams or the resolution of the data to be saved.

Shortcut: **F9**

EASERA View & Calc Window

After completion of a measurement or opening of an audio file you reach the ***View & Calc*** window.

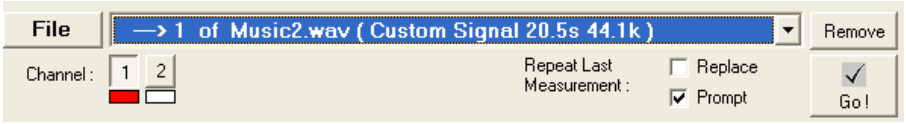


Below the menu and tool bar buttons are the following areas:

- The files area: Here you may choose between the existing files, add new files or initiate a new measurement.
- The survey area: A brief overview of the chosen file is shown here.
- The display area: The chosen file is shown here either as a time or frequency diagram.
- The filter area: Here it is possible to select an octave or a third-octave filter as well as a "windowing" of the data.
- The evaluation area: In the navigator pages on the lower left you may choose which diagram type is to be shown in the display area.

Files area

The core of the files area is the selection list, which allows choosing among the available data sets (loaded and measured) the one that is to be displayed and evaluated (active data set).



File

Opens the file selection dialog for opening new files.

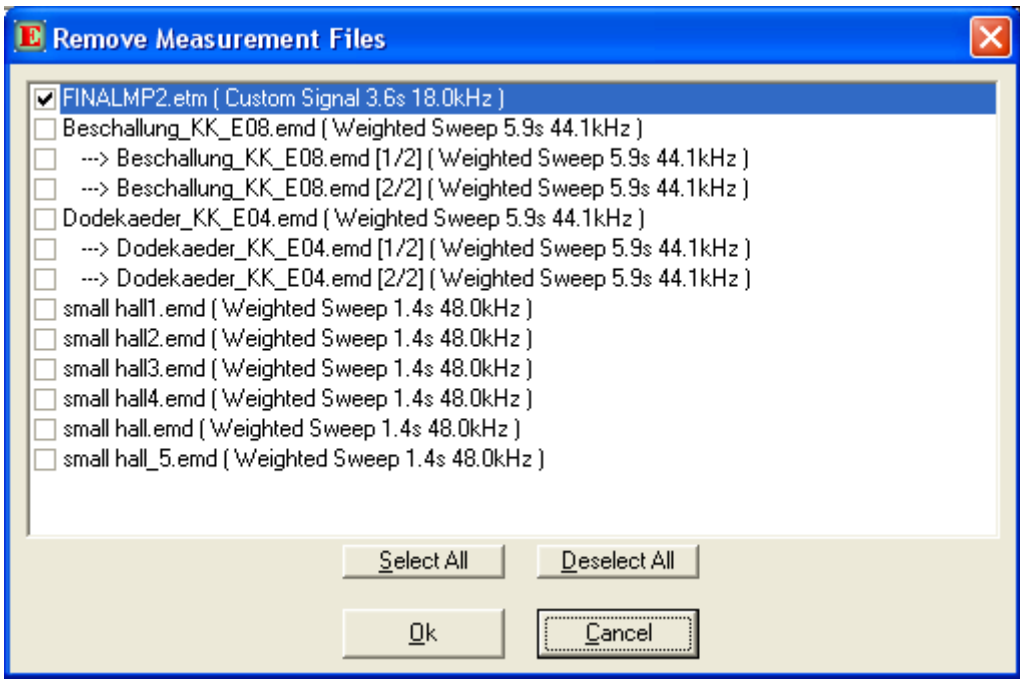
Shortcut: **Ctrl+O**

Channel

For each of the channels used in a measurement or a file there is a button shown here. The individual channels for multi-channel measurements or files are shown more specifically in the file selection list where they are preceded by an arrow and the channel number.

Remove

Opens the ***Remove Measurement Files*** dialog box with the currently selected file checked. Files that are checked will be removed from the data selection list and program memory, but not deleted from the hard disc.



Select All

Selects all of the files in the list.

Deselect All

Removes all files in the list from the selection.

OK

Confirms the removal of all selected measurement files from the memory of the program.

Cancel

Closes the window without changes.

Replace

If the option **Replace** is activated, the currently selected measurement will be replaced when a new measurement is started with **Go**.

Prompt

If the option **Prompt** is activated, a dialog pops up when a new measurement is started, allowing for instance to change the name of the forthcoming measurement.

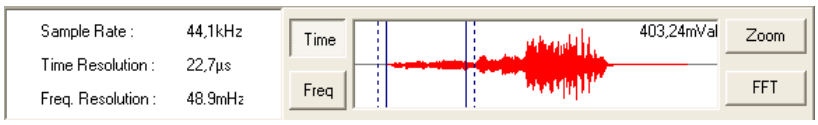
Go!

Starts a new measurement with the preset parameters. If parameters have to be modified, please select the tab ***Measure***.

Survey area

In the survey area the chosen file is shown as either a time or a frequency diagram. Markers set are shown as continuous vertical lines, broken lines visualize the borders of the display area for the lower diagram.

In the upper right corner the maximum amplitude value is shown.



Resolution of the Data Set

On the left side are shown the following quantities:

- Sample Rate: Working rate of the Analog to Digital (AD) conversion.
- Time Resolution: The time resolution as reciprocate value of the converter sampling rate.
- Frequency Resolution: The frequency resolution is calculated by dividing the sample rate through the number of samples.

These quantities refer to the active data set and not to the currently selected settings.

Time

Shows a time diagram in the survey area.

Freq

Shows a frequency diagram in the survey area.

Zoom

Zooms to the full width of the display area the part of the diagram between the left and right markers in the survey area.

FFT

Carries out the FFT calculation for the area delimited by the markers. Thereafter the button **FFT Window** becomes available for visualizing the result of this windowing e.g. in comparison to the FFT of the full IR.

Filter Area

In the filter area it is possible to activate octave and third-octave filters.

Units

In the selection list on the very left one can specify the unit in which the values are to be displayed.

Full IR

Shows the complete unfiltered impulse response which contains all of the processing that has been done (inclusive of the filter and window operations that have been applied), but not the other selections in the filter area.

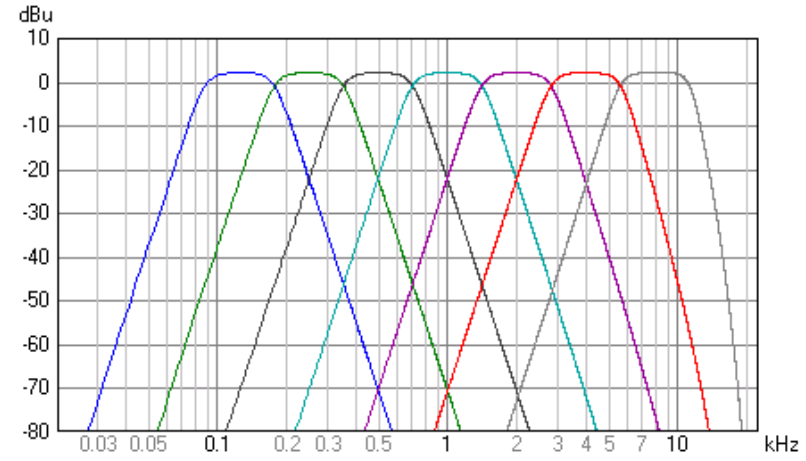
TEF / TDS

Changes the display to *ETC (Log-Squared)* and opens the ***TDS Post Processing*** dialog box. After selecting the parameters for the tracking filter the window is closed, then the frequency response is calculated using those values. Based on this frequency response, the impulse response is then computed and used to derive all the other curves as usual. This button is only enabled if the active curve is a measurement created using an ASIO driver and if the TDS module is available.

See also: TDS Post Processing Window

Octaves

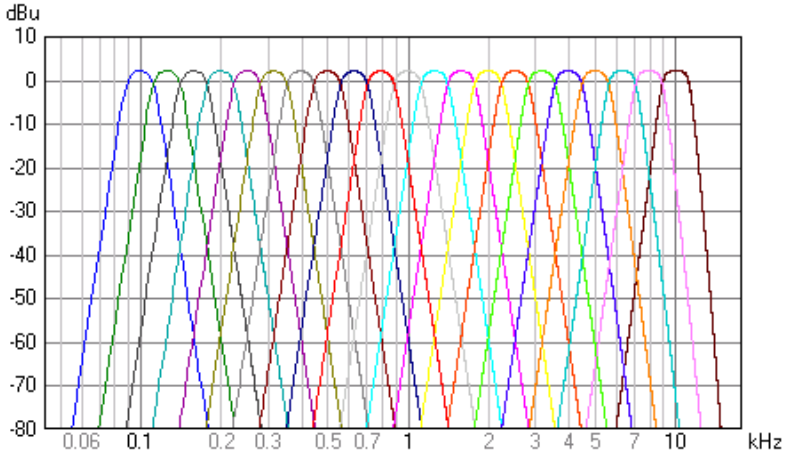
Select the button **Octaves** to produce an overlay display of the values shown by all octave filters.



The pull down list to the right of this button shows a list of all the single octave filters that are available and also allows you to show a single filter in the diagram. The octave filters are of the Butterworth type of the 8th order, thus having a slope steepness of 48 dB / octave.

1/3rds

Select the button **1/3rds** to produce a joint display of the values shown by all third-octave filters.



The pull down list to the right of this button shows a list of all the third-octave filters that are available and also allows you to show a single filter in the diagram. The third-octave filters are of the Butterworth type of the 20th order, thus having a slope steepness of 120 dB / octave.

FFT Window

Select the button **FFT Window** to limit the evaluation to a section of the data set. Choose the desired section by using the markers and press the button **FFT**. Then EASERA performs an FFT calculation for the marked section. Clicking on **FFT Window** displays the results of FFT calculation on the windowed data set.

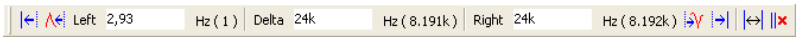
Cursor

The exact position of the cursor pointer in the diagram and other information are shown below the evaluation area diagram in the status bar.

- **Min**: Minimum amplitude of the active curve.
- **Max**: Maximum amplitude of the active curve.
- **Cursor**: The current cursor position. The first two values display the current cursor position given by the X-position and the Y-position of the mouse pointer, then in brackets the current X-position of the cursor and the Y-position on the curve, finally the sample used for the display (in the time or the frequency domains). Use the ***Options (F9)*** dialog box VIEW & CALC|OPTIONS page to adjust the number of decimal places to be used in the display of the cursor positions.

Markers

On the X-axis, a left and a right marker may be set. These markers delimit e. g. the borders for windows or editing.



Left Marker To Left End

Places the left marker on the left margin of the time or frequency axis. On the time axis this would correspond to the moment zero, and on the linear-scaled frequency axis to 0 Hertz.

With a logarithmic scaling of the frequency axis the frequency 0Hz would be positioned ad infinitum to the left and is therefore not shown. In this case the first marker is placed on the position of the first non-zero sample (i.e. the second sample). The frequency of this sample is the sample rate divided by number of samples.

Left Marker To Abs Max

Places the left marker on the absolute maximum of the active curve.

Left

This text box indicates the position of the left marker as a time value or a frequency value. The corresponding sample (position in the FFT) is shown in parentheses after the units for the value. After entering a value and pressing the **Enter** key, the value is rounded to the closest actual value in the data set and the number of that sample is displayed.

Delta

This text box indicates the distance between the right and the left markers. The corresponding number of samples is shown in parentheses after the units for the value. After entering a value and pressing the **Enter** key, the value is rounded to the closest actual value in the data set and that number of samples is displayed.

Right

This text box indicates the position of the right marker as a time value or a frequency value. The corresponding sample (position in the FFT) is shown in parentheses after the units for the value. After entering a value and pressing

the **Enter** key, the value is rounded to the closest actual value in the data set and the number of that sample is displayed.

Right Marker To Abs Max

Places the right marker on the absolute maximum of the active curve.

Right Marker To Right End

Places the right marker on the right margin of the time or frequency axis. On the time axis this would be the measurement duration, and on the frequency axis it is set to one-half the sample rate.

Show Markers

Shows the markers at the beginning and end position of the time or frequency curve.

Remove Markers

Removes the markers from the diagram.

File Menu

Open Audio File

Opens one or more existing audio files for evaluation.

Shortcut: **Ctrl+O**

See also: EASERA Open Audio File Window

Options

Choose this command to display the ***Options*** dialog box, which controls various program-wide settings. See Options for more information on the dialog box.

Shortcut: **F9**

Send Picture To

Enables you to store the current diagram in the clipboard or in a file.

File

Select FILE|SEND PICTURE TO|FILE to save the measurement diagram as a graphic in a file. EASERA supports the following file formats:

- Windows-Bitmap (bmp)
- JPEG (jpg)
- CompuServe GIF (gif)
- Portable Network Graphics (png)
- Tagged Image File Format (tif)
- LuRa Tech Wavelet (lwf)

- Zsoft Paintbrush (pcx)
- Windows Icon (ico)
- Enhanced Windows Metafile (emf)
- Truevision Targa (tga)
- Paint Shop Pro Image (psp)

Shortcut: **Ctrl+F**

Clipboard

Select FILE|SEND PICTURE TO|FILE to save the measurement diagram as a picture in the clipboard.

Shortcut: **Ctrl+B**

Create Print Version

Saves the current diagram together with some additional information in Rich Text Format (rtf), so that it can be opened and printed for instance by Microsoft Word.

Shortcut: **Ctrl+P**

Save File as

Saves the active data set in one of the following formats:

Shortcut: **Ctrl+A**

In case of Diagrams with Time Axis

- Time File [SDA] (*.etm)
- Wave File [MICROSOFT] (*.wav)
- Measurement Data Set [SDA] (*.emd) (applicable only if raw data are available)
- Text File [SDA] (*.etx)
- EASE BIR File [ADA] (*.bir)
- Dat File [ITA] (*.dat)
- Tim File [MLSSA] (*.tim)
- Tim File [TEF] (*.tim)
- Tid File [NX] (*.tid)

In case of Diagrams with Frequency Axis

- Freq File [SDA] (*.efr)
- Text File [SDA] (*.etx)
- Frq File [ITA] (*.spk)
- Frq File [MLSSA] (*.frq)

Save Overlay Files to File

Saves several files combined in the present overlay in a shared file. Each curve in the overlay is saved as a channel in the file.

Export Spectrum

Saves one or multiple files displayed in the Frequency domain as 1/n fractional Octave spectrums. Opens the ***Export Spectrum*** dialog box. After selecting the parameters for the spectrum files the window is closed and the spectrums are saved in a single file.

See also: Export Spectrum Window

Save as Reference File

Saves the current data set as a reference file.

Reference files are created to enable compensation for hardware influences. The object to be compensated (soundcard, microphone, loudspeaker, room ...) needs to be measured as exactly as possible and the results saved as a reference file. With future measurements it will then be possible to use this reference file to compensate for the corresponding frequency responses.

Shortcut: **Ctrl+R**

See also: Save Reference File Window

Exit

Select FILE|EXIT to end the program.

Shortcut: **Alt+F4**

Edit Menu

Editing sequences are done in EASERA for the primary data. They are carried out using the linear data values (e. g. field quantities).

With all editing sequences (unless they are carried out with a *free editing* copy), EASERA keeps the primary data consistent: An alteration of the impulse response, for instance, would thus be converted and applied to the complex frequency response (real and imaginary parts) as well as to the combination of frequency and phase response, so that all three components of the primary data always describe the same system behavior.

See also: Primary Data

Undo

Cancel the effect of the last command or action.

Undo All

Cancel the effect of all editing sequences done after the file was opened (in the case of new measurements, from the moment these were started).

Redo

Do the last command or action again that was canceled by the last undo operation.

Redo All

Do all the commands again that were canceled by all undo operations.

Editing Sequence

Opens the window ***Select Editing Sequence*** so that the currently chosen processing can be stored in a file or a stored processing is loaded and applied to the current data set.

See also: Select Editing Sequence Window

Copy

Copy the marked part of the active curve to the EASERA clipboard. (The EASERA clipboard is internal and independent of the Windows clipboard.)

This function is available only for data sets explicitly created for *free editing*.

See also: Free Editing

Paste

Paste allows the contents of the EASERA clipboard to be inserted into the active curve.

This function is available only for data sets explicitly created for *free editing*.

See also: Free Editing

Filter

Opens the ***Select Filter*** dialog box for setting a freely definable filter in the frequency domain. Before this dialog box can be opened it is necessary to set the limit frequencies of the filter using the left and right markers.

See also: Select Filter Window

Window

Opens the ***Select Window*** dialog box for setting a window in the time domain. Before this dialog box can be opened it is necessary to set the borders of the window using the left and right markers.

See also: Select Window Window

Smooth

To reduce the complexity of a data set, smoothing can be applied. The ***Editing*** window can be opened in the *Smoothing* mode via the menu item EDIT|SMOOTH, so that the smoothing settings can be set.

The desired smoothing operations are done on the primary data. This is why the smoothing of a frequency response alters the impulse response. Smoothing applied using the *Graphs* page, on the contrary, affects only the display.

See also: Smoothing

Set To

Occasionally it is necessary to set a section of the Y-values to a certain level. If the measurement gets distorted by a perceptible peak, for instance, it may be sensible set the values in this area to zero. Select one of the sub-items of the EDIT|SET TO menu to open the ***Editing*** window in the *Set Value* mode.

See also: Set Value

Set To Value

Opens the ***Editing*** window in the *Set Value* mode.

Zero

Opens the ***Editing*** window in the *Set Value* mode and sets the *Set To* input field to the value zero.

Unity

Opens the ***Editing*** window in the *Set Value* mode and sets the *Set To* input field to the value one.

Add and Subtract

Occasionally it is necessary to add to or subtract from the Y-value or a section of them a certain quantity. The data set might be superposed with a DC component, for instance, in which case one could simply deduct the average value of all Y-values and remove this offset.

Select one of the sub-items of the EDIT|ADD AND SUBTRACT menu to open the ***Editing*** window in the *Add Value* mode (or in the *Subtract Value* mode).

See also: Add Value

Add Value

Opens the ***Editing*** window in the *Add Value* mode.

Move Max To Value (By Adding)

Opens the ***Editing*** window in the *Add Value* mode and sets the field *Add* to zero (relative to the negative maximum).

Subtract Value

Opens the ***Editing*** window in the *Subtract Value* mode.

See also: Subtract Value

Remove DC

Opens the ***Editing*** window in the *Subtract Value* mode and sets the field *Subtract* to zero (relative to the average value, whereby a DC component is removed).

Multiply and Divide

For scaling the Y-values or part of them it is possible to open the ***Editing*** window in the *Multiply* mode (or in the *Divide* mode). These operations are used e. g. for data standardizing or calibrating.

See also: Multiply by Value

Multiply by Factor

Opens the ***Editing*** window in the *Multiply* mode.

Scale Max To Value (by Multiplying)

Opens the ***Editing*** window in the *Multiply* mode and sets *Multiply By* to the value one (relative to the reciprocal of the maximum).

Scale Abs Max To Value (by Multiplying)

Opens the *Editing* window in the *Multiply* mode and sets *Multiply By* to the value one (relative to the reciprocal of the absolute maximum - the absolute maximum is a modulus and thus always positive).

Divide By Value

Opens the ***Editing*** window in the *Divide* mode.

Square, Root, Inverse, Power

For squaring, inverting, exponentiation or extracting the root of Y-values or a section of them, the ***Editing*** window may be opened in the *To Power of Value* mode. This is used for describing mathematical formulas for scientific applications.

See also: To Power of Value

Square

Opens the ***Editing*** window in the *To Power of Value* mode and sets *To Power of* to 2.

Square Root

Opens the ***Editing*** window in the *To Power of Value* mode and sets *To Power of* to 0.5.

Inverse

Opens the ***Editing*** window in the *To Power of Value* mode and sets *To Power of* to -1.

Power

Opens the ***Editing*** window in the *To Power of Value* mode.

Advanced

Provides functions for more complex operations on the selected data.

Remove Air Absorption

Opens the Remove Air Absorption Window which allows compensating air attenuation effects in the impulse response based on the model of ISO 9613. This is particularly important for scale model measurements with air being the propagation medium.

Change Sample Rate

Opens the Change Sample Rate Windowwhich allows changing the sample rate to another value. This is particularly important for scale model measurements which are usually performed at a higher sample rate and then scaled down by a factor of e.g. 1:10.

Cyclic Move

Use the *Cyclic Move* functions to move the measurement data or a section of the data to the left or to the right. If the data are moved *Forward*, the values pushed beyond the end of the data set are reintegrated at the beginning of the data set.

If the data are moved *Backward*, the values "pushed beyond" the beginning of the data set are reintegrated at the end of the data set.

The *Cyclic Move* function opens the ***Editing*** window in the *Cyclic Move* mode.

See also: Cyclic Move

Move Abs Max To Zero

Opens the ***Editing*** window in the *Cyclic Move* mode and sets the delta to zero (relative to the absolute maximum). The limits are set to include the entire data set.

Cyclic Move Between Markers

Opens the ***Editing*** window in the *Cyclic Move* mode, with the limits set to the positions of the markers.

Cyclic Move (Right Marker To Left Marker)

Opens the ***Editing*** window in the *Cyclic Move* mode with the delta set to the interval between the two markers and the direction to *Backward*. The limits are set to include the entire data set.

Cyclic Move (Left Marker To Right Marker)

Opens the ***Editing*** window in the *Cyclic Move* mode with the delta set to the interval between the two markers and the direction to *Forward*. The limits are set to include the entire data set.

Move Arrival To Zero

Opens the ***Editing*** window in the *Cyclic Move* mode and sets the delta to zero (relative to the arrival of the first measurement data). The limits are set to include the entire data set.

The arrival of the first measurement data is assumed to be the moment that the signal exceeds the noise by a certain value (by default 35 dB). The threshold can be set in the ***Options (F9)*** dialog box on the PROCESSING|PROCESSING page in the section *Arrival Time*.

Expand / Shrink

Opens the ***Editing*** window in the *Expand Data* mode, in order to expand or shrink the file in time. Please keep in mind that such operations always have repercussions on the frequency response of the file.

Expand To 2^n

Opens the ***Editing*** window in the *Expand Data* mode and selects the option *Expand to 2^n*. If the number of samples is a power of the base 2, it is possible to perform a Fast Fourier Transformation instead of a Discrete Fourier Transformation.

Change Time Length

Opens the ***Editing*** window in the *Expand Data* mode and selects the option *Expand / Shrink to Time Length*. Files are shrunk, for instance, to speed up the execution of computing operations.

Divide Channels

Divides the data of two channels, using the active curve as the numerator and the second overlaid channel as the denominator. The result is the level difference.

Average Channels

Averages the data of the channels shown in the diagram. An average requires at least two channels.

Add Channels

Adds the data of the channels shown in the diagram. This requires at least two channels.

More

Selects advanced actions for multiple channels.

Subtract Channels

Subtracts the data of two channels, using the active curve as the curve to be subtracted from and the second overlaid channel as the curve to subtract. The result is the same as using a differential amplifier.

Multiply Channels

Multiplies the data of the channels shown in the diagram. A multiplication requires at least two channels.

In Situ Measurement Processing

This function is used to determine the absorption coefficient of materials that are installed. Opens the ***Channel Editing*** dialog box using the active curve for the measurement containing both the Direct Sound and the Reflection. A reference channel is used for the measurement containing only the Direct Sound.

See also: In Situ Measurement Processing

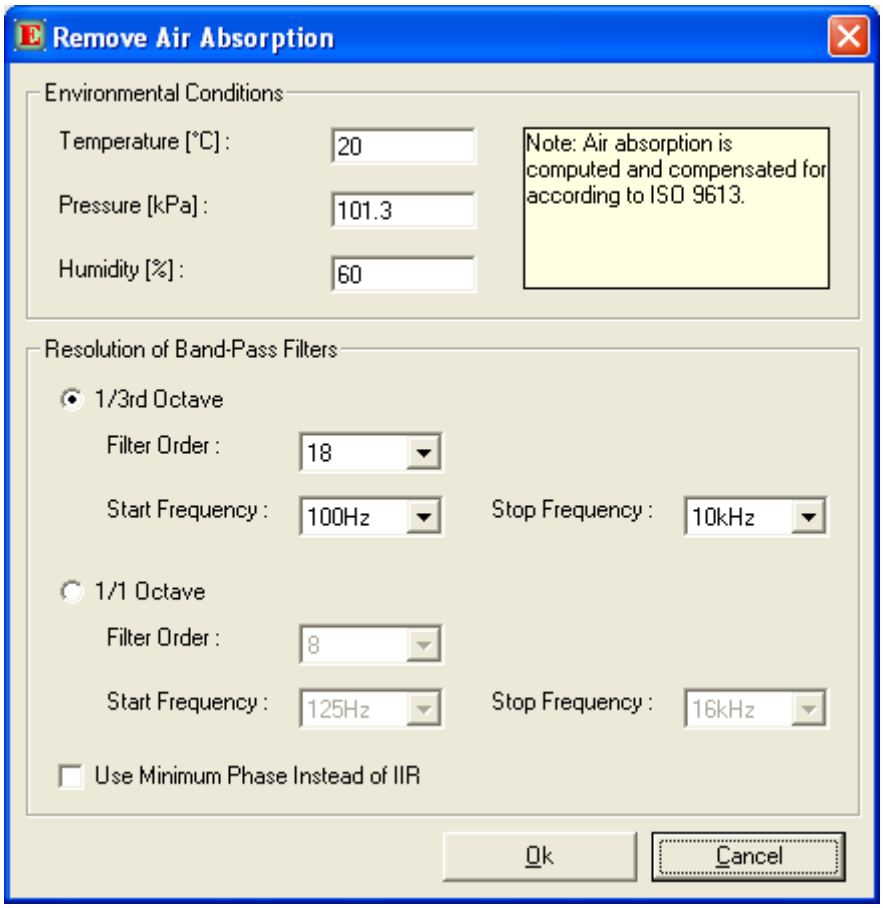
Duplicate File

Opens the **Duplicate Channel** window for duplicating the current data set.

See also: Remove Air Absorption Window

Use the ***Remove Air Absorption*** window to compensate air attenuation effects in the impulse response based on the model of ISO 9613. This is particularly important for scale model measurements with air being the propagation medium.

Notice that air attenuation can assume very high values at high frequencies. If the signal-to-noise ratio of the measurement is too low the noise floor at the end of the impulse response will be amplified dramatically.



Ok

Confirms the settings and closes dialog window.

Cancel

Rejects the settings and closes dialog window.

Environmental Conditions

In order to compensate for the attenuation of sound waves propagating through air, the parameters of the transmission medium during the measurement have to be specified. These parameters are used to calculate the air absorption as a function of frequency and distance according to ISO 9613 and to remove it from the impulse response for each sample.

Notice that the propagation distance is derived from the time of each sample in the impulse response using a value for the speed of sound that is calculated based on the given temperature.

Temperature [°C]

Air temperature during the measurement.

Pressure [kPa]

Air pressure during the measurement.

Humidity [%]

Air humidity during the measurement.

Resolution of Band-Pass Filters

The effects of air attenuation must be compensated in a manner that is both time-dependent and frequency-dependent. For this reason, the removal of absorption effects is performed for each frequency band individually. In this context the air attenuation is assumed to be constant throughout the frequency band.

1/3rd Octave, 1/1 Octave

Defines the bandwidth of the frequency bands.

Filter Order

Sets the slope of the band-pass filter.

Start Frequency

Sets the first frequency band that is subjected to the compensation routine.

Stop Frequency

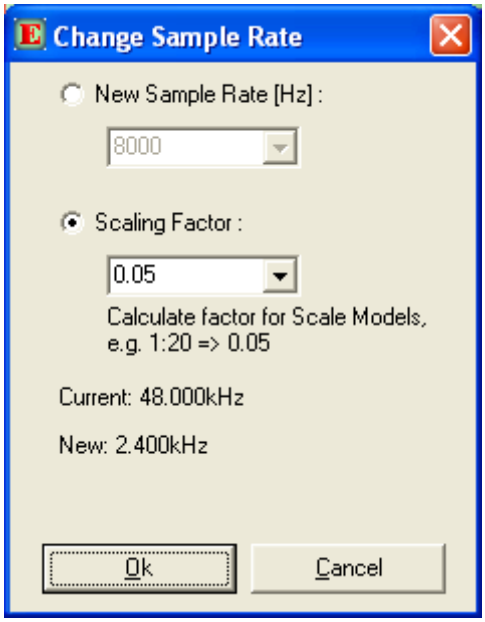
Sets the last frequency band that is subjected to the compensation routine.

Use Minimum Phase Instead of IIR

Instead of standard Butterworth IIR band-pass filters, minimum phase filters can be used as well.

Change Sample Rate Window

Use the ***Change Sample Rate*** window in order to change the sample rate of the measurement to another value. This is particularly important for scale model measurements which are usually performed at a higher sample rate and then scaled down by a factor of e.g. 1:10.



Ok

Confirms the settings and closes dialog window.

Cancel

Rejects the settings and closes dialog window.

New Sample Rate [Hz]

Select the new sample rate from a list of predefined values or enter a user-defined value in Hz.

Scaling Factor

Enter a scaling factor in order to apply it to the current sample rate of the measurement. For example, applying a factor of 0.1 to a measurement performed at 96 kHz will change the sample rate to 9600 Hz.

Duplicate Channel Window

Create New File From Marker Area

Copies the area between the two markers as a new file.

View Menu

Display Active Only

Limits the display to the active curve and removes all the other curves from the diagram.

Select Overlay

Opens the ***Overlay Graphs*** dialog box for selection and/or definition of an Overlay, i.e. the simultaneous display of various curves.

Add To Overlay

Adds the next data set to the diagram as an overlay.

X Log

Switches the X-axis from logarithmic to linear display and vice versa.

Display Last Window / Filter

After selecting EDIT|FILTER to define lowpass, highpass and bandpass filters, or using EDIT|WINDOW to select the window needed for processing data sets, select VIEW|DISPLAY LAST WINDOW / FILTER to show the most recent filter or window curve in the diagram.

Change Legend

Open the ***Change Legend*** dialog box to define the labels, colors and curve level offsets to be used in the diagram.

See also: Change Legend Window

Apply Last Legend

The legend that has been last used will be applied by selecting VIEW|APPLY LAST LEGEND. If there is no previous legend for this type of diagram, a message box will ask if you want to select an existing legend or define a new legend. Select the **Yes** button to open the ***Change Legend*** dialog box.

Store Current View Limits

The area to be displayed can be selected using the mouse pointer *Zoom* and/or *Drag* modes in the diagram. The current diagram view limits may be stored by selecting VIEW|STORE CURRENT VIEW LIMITS.

Recall View Limits

The limits that have been stored by *Store Current View Limits* may be restored by selecting VIEW|RECALL VIEW LIMITS.

Edit View Limits

In EASERA it is possible to store and recall the limits of the diagram using the ***Select View Limits*** dialog box.

See also: Select View Limits Window

Full

Sets the limits of the diagram in both axes in such a way that the active curve is shown fully. Use the ***Options (F9)*** dialog box VIEW & CALC|FULL VIEW page to define what is meant by “fully”.

Full Y

Sets the limits of the diagram on the y-axis in such a way that the active curve is shown fully. Use the ***Options (F9)*** dialog box VIEW & CALC|FULL VIEW page to define what is meant by “fully”.

Full X

Sets the limits of the diagram on the x-axis in such a way that the active curve is shown fully. Use the ***Options (F9)*** dialog box VIEW & CALC|FULL VIEW page to define what is meant by “fully”.

Last Zoom

Reverses the last change of limits.

Redraw

Updates the display. This needs to be used only in exceptional cases, EASERA normally updates the display automatically.

Remove Markers

Removes the markers from the diagram.

Show Markers

Inserts the markers and places them on the beginning and the end of the current curve.

Markers delimit a range on the X-axis to be used for computing operations. The markers are represented by vertical lines (dark blue by default).

The markers can also be placed using the mouse: To place the left marker use the LMB while holding down the *Ctrl* key. For the right marker use the RMB while holding down the *Ctrl* key.

Zoom To Marker Area

Sets the X-limits of the display on the placed markers.

Place Markers

The markers can be placed by means of the following menu sub-items:

Left Marker To Arrival Time

Places the left marker on the time of the signal arrival. This item is only available if the X-axis of the diagram is a time axis.

Left Marker To Max

Places the left marker on the maximum of the data.

Left Marker To Abs Max

Places the left marker on the absolute maximum of the data.

Right Marker To Abs Max

Places the right marker on the absolute maximum of the data.

Right Marker To Min

Places the right marker on the minimum of the data.

Left Marker To Right Marker

Places the left marker on the same position as the right marker.

Right Marker To FFT-Length

Places the marker in such a way that the number of values corresponds to the next FFT-length, i.e. the next power of two.

Double Marker Region

Places the right marker in such a way that its distance from the left marker gets doubled. If there are not enough samples for the right maker to move, then the marker is not moved.

Data Menu

Raw Input Data

Switches the view to show the raw data without any processing whatsoever. This shows the actual signal recorded by the sound card before being converted into the impulse response.

Processed Data

Switches the view to show the data after being converted to an impulse response.

Properties

Opens the ***Measurement File Properties (F4)*** dialog box.

See also: Measurement File Properties Window

Tools Menu

Play

Plays the current data set using the device selected for the EASERA output driver.

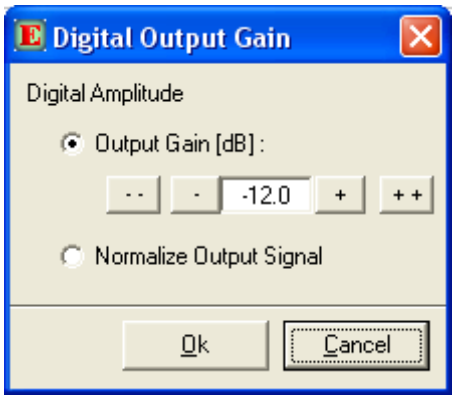
Pause

Interrupts the playing of a data set. If the playing is continued afterwards, the measurement is also replayed.

Stop

Ends the playing of the data set.

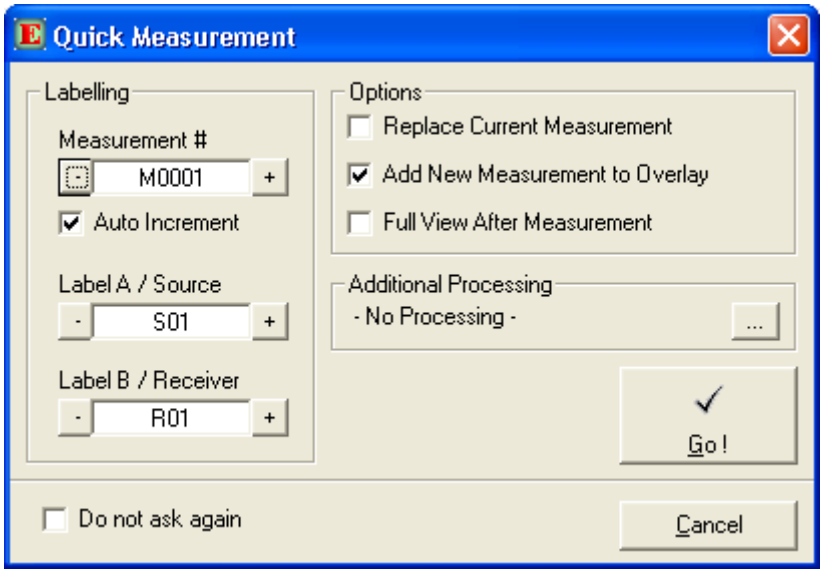
Digital Output Gain



Select TOOLS|DIGITAL OUTPUT GAIN to set the level of the measurement signal relative to full scale and the playback level for loaded files. For typical measurements, it is recommended that the **Output Gain [dB]** option be selected and the value set to between –12dB and –20dB. For playback of a

loaded file, it is recommended that the **Normalize Output Signal** option be selected.

Quick Measurement F5

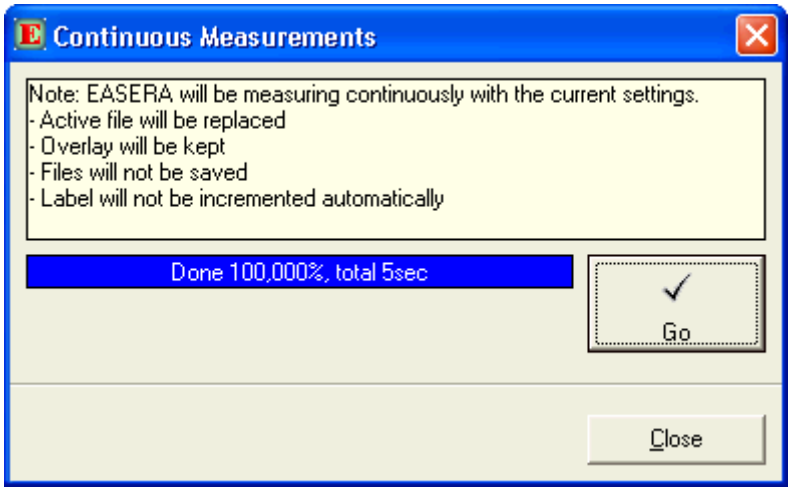


Opens the ***Quick Measurement*** dialog box, allowing the repeat of a measurement using the same parameters as the previous measurement. The labeling and options to replace or overlay the measurement are available.

Continuous Measurements

Repeats the current measurement continuously. Each current measurement is replaced, the file is not saved, and the labels are not modified. Overlays, however, are retained.

This function is suited, for instance, for adjusting the proper alignment of loudspeaker arrays.



Click on the **Go** button to start the measurements. The **Go** button is relabeled to **Stop** and is then used to stop the measurements. Select the **Close** button to close the dialog box

Calculate Data Quantisation

Indicates the bit rate at which conversion actually took place (if a soundcard claims "officially" to do 24 bit, but converts internally at only 20 bit, this function will show 20 bit).

Mouse Menu

Depending on the function keys held, the mouse controls a variety of functions. The menu MOUSE selects the mode the mouse uses when a function key is not used.

Zoom X / Zoom Y

Within the diagram shown it is possible to zoom by selecting an area with the mouse. If the option ZOOM X / ZOOM Y is marked, zooming takes place on the X-axis by left clicking and on the Y-axis by right clicking.

This mode is activated by holding down the function keys *Ctrl+Alt*.

(To revert to the full view of the active curve choose VIEW|FULL or double-click on the diagram.)

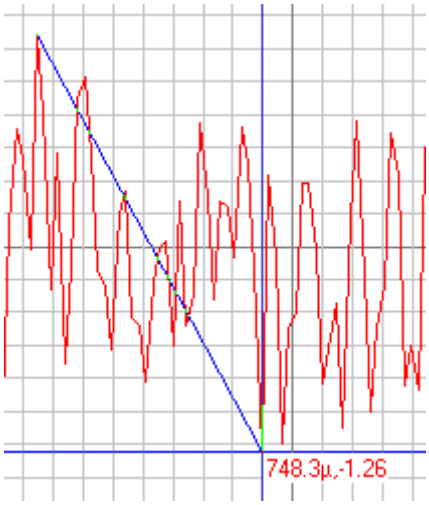
Zoom

If the option ZOOM is marked, zooming takes place on the X-axis as well as on the Y-axis.

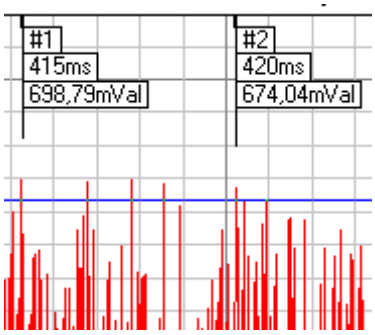
This mode is activated by holding down the function keys *Shift+Ctrl+Alt*.

Peek

Use the LMB to measure distances in the diagram. Just drag the mouse with its left key pressed from the starting point to the target point. The distance is then shown for both the X and Y coordinates.



Click the diagram with the RMB to add cursor positions in the diagram:



You will find a list of all cursors set by selecting the navigator button ***Cursor***.

This mode is activated by holding down the function key **Shift**.

Drag

In the DRAG mode the diagram can be displaced. Click and drag the left mouse button in the diagram.

This mode is activated by holding down the function keys *Shift+Ctrl*.

Set Marker

In the SET MARKER mode the markers are set by left clicking and right clicking.

This mode is activated by holding down the function key **Ctrl**.

Help Menu

Help Topics

Select HELP|HELP TOPICS to open the Help File.

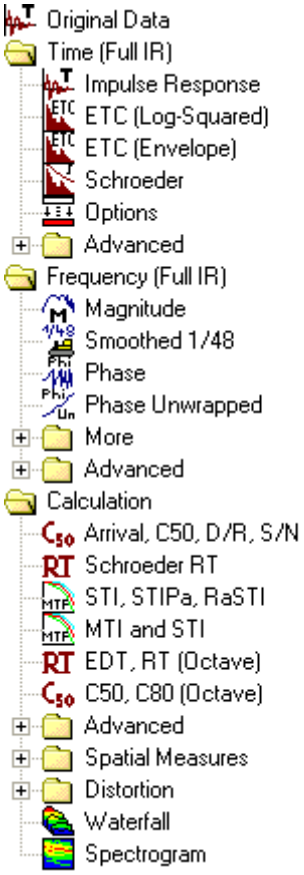
Shortcut: **F1**

About

Select HELP|ABOUT to show the Copyright reference as well as other information, including which version is installed.

Graphs

Select the ***Graphs*** navigator button to see the navigator page that shows a list of the diagrams which EASERA is capable of producing from a data set:



Shortcut: **Shift+F1**

Note: All acoustic measures used in EASERA are explained in detail in the annex of the manual.

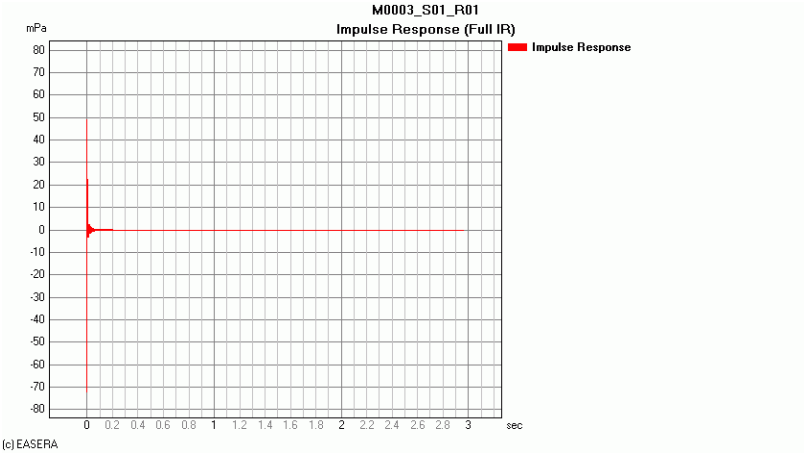
Original Data

Shows the computed original impulse response, the function deactivates any filter settings and switches back to **Full IR**.

Time (…)

The folder *Time (…)* contains diagrams showing the level versus time. If an octave or third-octave filter is activated, this filter is used and the label changes from *Time(...)* to, for instance, *Time (1/3rd Oct. 160Hz)*.

Impulse Response



The impulse response is the signal that would result from stimulating the measuring object with an impulse of minimum length (Dirac pulse).

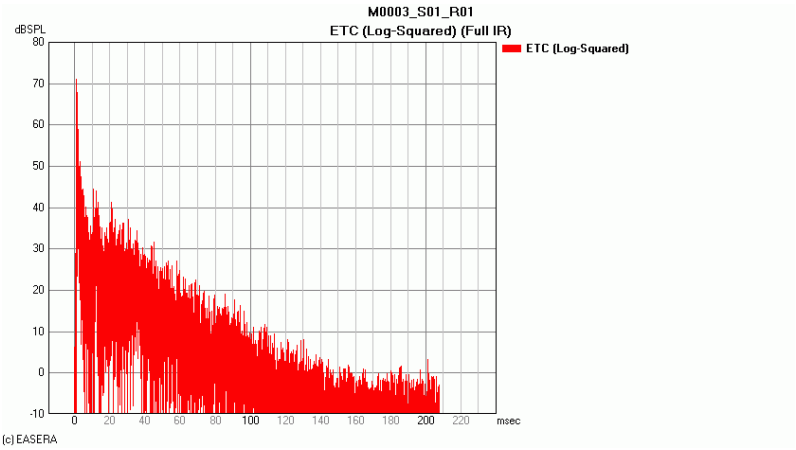
Let's have a short excursion into the systems theory: If any system you choose is stimulated by a signal u(r), the time-related system response y(t) corresponds to the convolution integral of stimulating signal and impulse response h(t):

$$y(t) = \int_{0}^{+\infty} u(r) \cdot h(t-r)\, dr$$

(The frequency-related response would be the convolution product.)

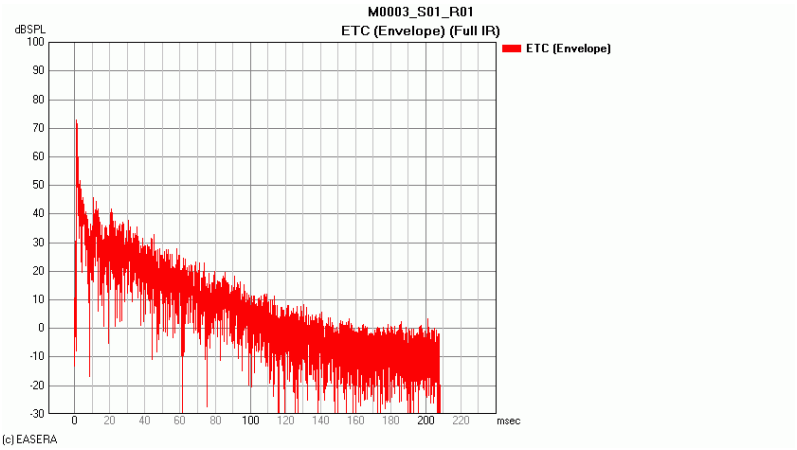
Thus a linear, time-invariant system is fully described by its impulse response, and all other properties can be derived from it.

ETC (Log-Squared)



The Energy Time Curve *ETC (Log-Squared)* shows the energy decrease over time, where the individual samples are squared and then plotted on a logarithmic scale.

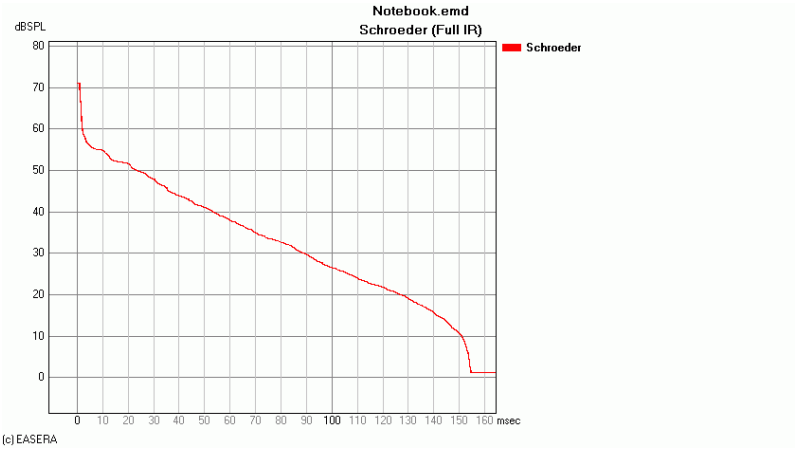
ETC (Envelope)



The Energy Time Curve *ETC (Envelope)* shows the energy decrease over time, where an envelope is laid over the Y-values and the results are plotted on a logarithmic scale. Often this representation is also referred to as the Heyser-ETC.

The envelope is constructed by the analytic function through a Hilbert Transformation of the impulse response.

Schroeder



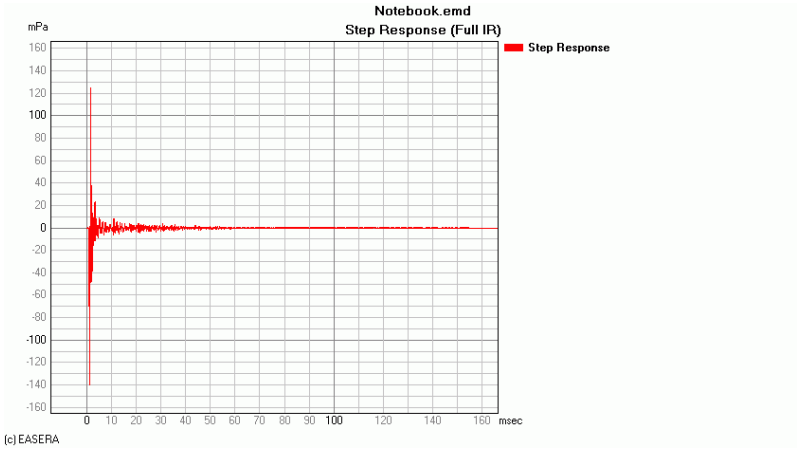
With the Schroeder Integral the energy is integrated, starting from the end of the data set, and the result is plotted on a logarithmic scale. The Schroeder Integral serves as the basis for determining the reverberation times.

Options

Opens the ***Measurement File Properties (F4)*** dialog box to the CALCULATION OPTIONS|GENERAL PROCESSING page.

Time (…) Advanced

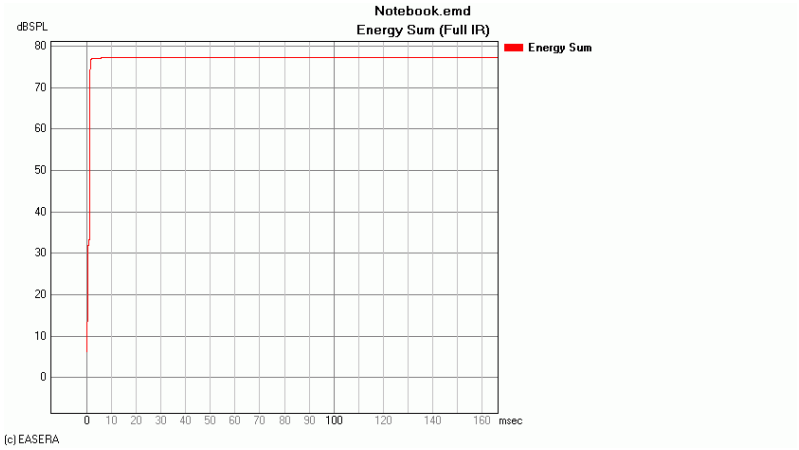
Step Response



Displays the step response of the measured system. The step response shows the reaction of the system to a step function.

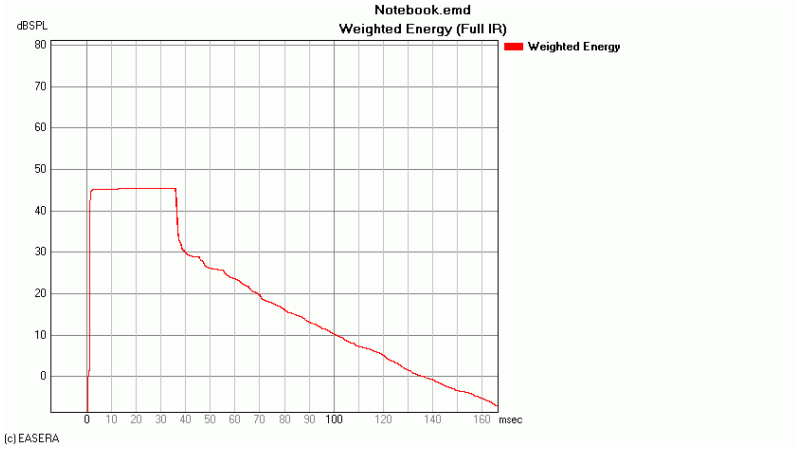
A step function is a jump to a constant value. Contrary to a Dirac pulse, no return jump occurs.

Energy Sum



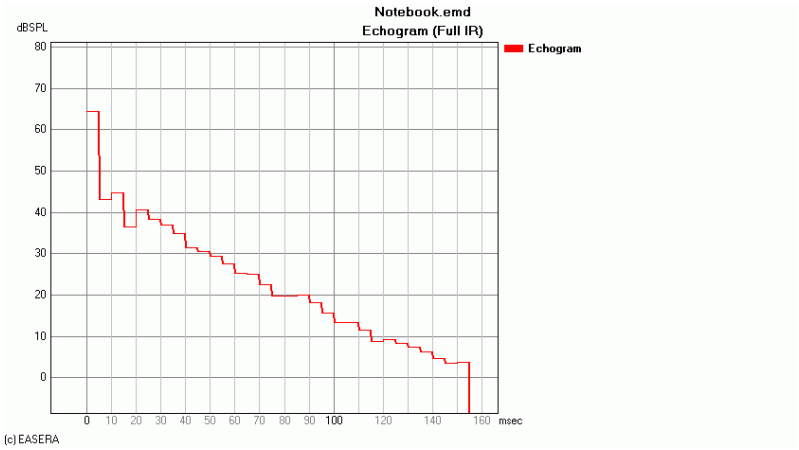
The summed-up energy is the forward integral of the squared signal, plotted on a logarithmic scale.

Weighted Energy



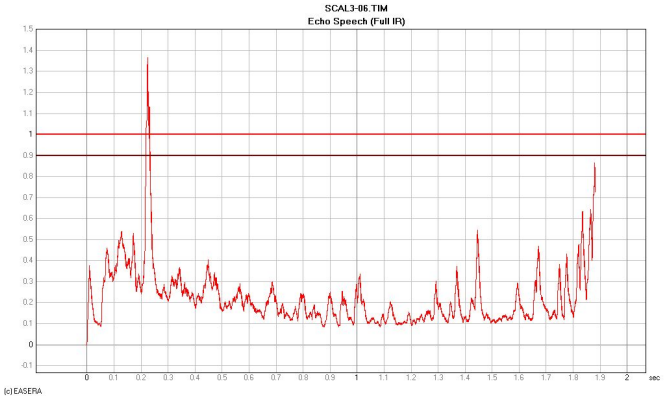
The weighted energy is the energy sum of the anterior period t. The integration period t can be set in the ***Measurement File Properties (F4)*** dialog box on the CALCULATION OPTIONS|GENERAL PROCESSING page under the *Weighted Energy* section. Its default length is 35ms.

Echogram



For an echogram the energy is calculated for periods of length t. The integration period t can be set in the ***Measurement File Properties (F4)*** dialog box on the CALCULATION OPTIONS|GENERAL PROCESSING page under the *Echogram* section. Its default length is 5ms.

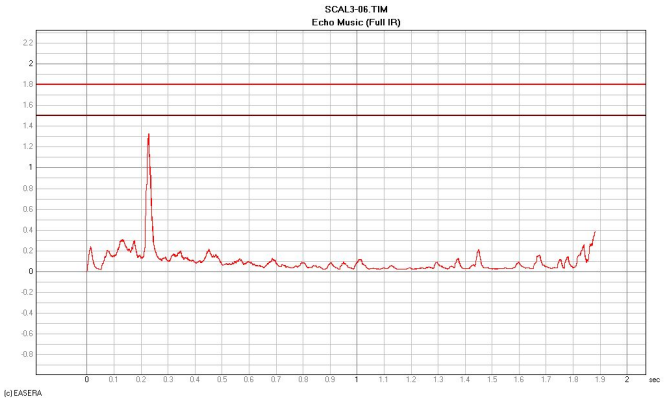
Echo Speech



The function *Echo Speech* enables the echo criterion for speech according to Dietsch to be established. If the curve exceeds the value 1 (for a trained ear 0.9), these reflections are perceived as a disturbing echo.

If measurements are made in the presence of undesired noise there sometimes occur in the display heavily delayed disturbances which do not correspond to real echoes.

Echo Music



The function *Echo Music* enables the echo criterion for music according to Dietsch to be established. If the curve exceeds the value 1.8 (for a trained ear

1.5), these reflections are perceived as a disturbing echo with appropriate music.

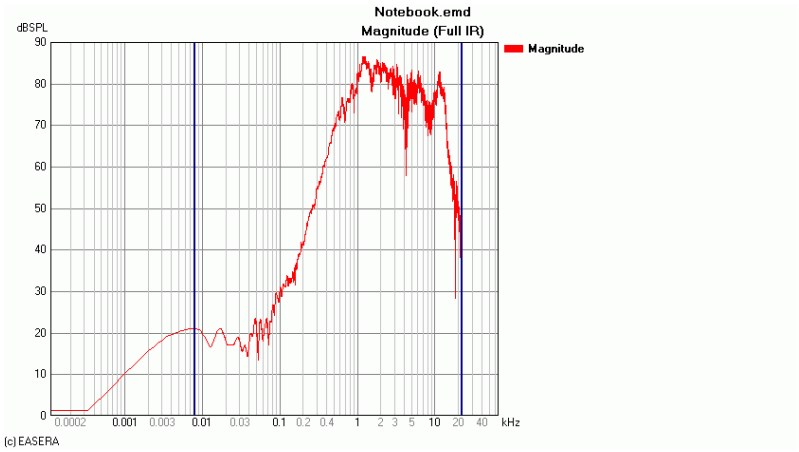
The value 1.8 applies to “light” music (e. g. Mozart), with “heavy” or “dense” music (e. g. Wagner), this value is definitely higher.

If measurements are made in the presence of undesired noise there sometimes occur in the display heavily delayed disturbances which do not correspond to real echoes.

Frequency (...)

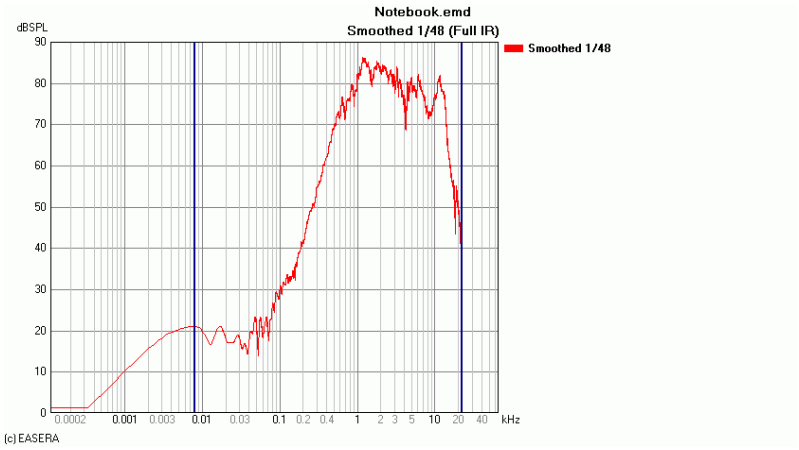
The folder *Frequency (...)* contains diagrams showing the level versus frequency. If an octave or third-octave filter is activated, this filter is used and the label changes from *Frequency (...)* to, for instance, *Frequency (1/3rd Oct. 160Hz)*.

Magnitude



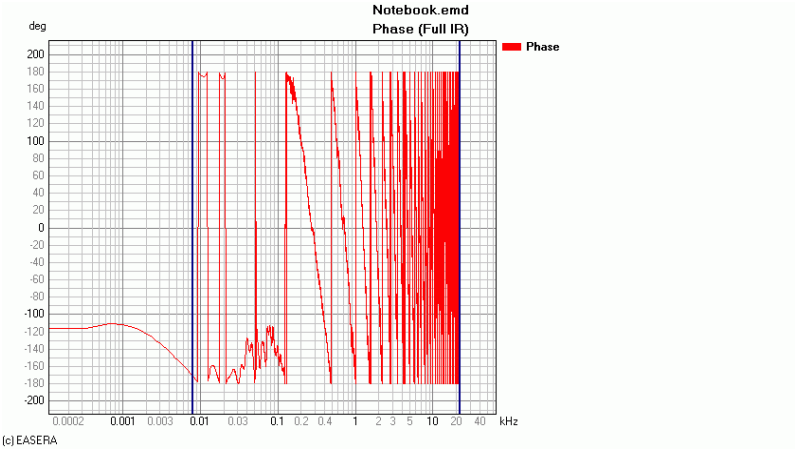
Shows the frequency response, i.e. the level versus frequency.

Smoothed 1/48



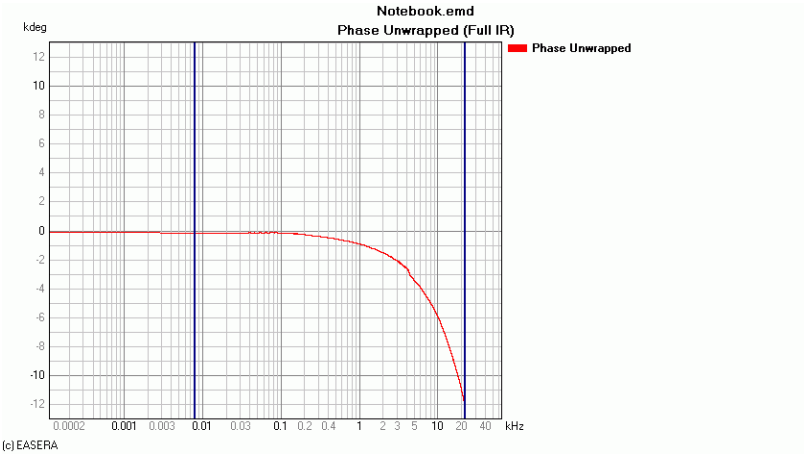
Shows the frequency response, i.e. the level versus frequency, smoothed to 1/48 octave.

Phase



Shows the phase response for a phase angle range of +/- 180°.

Phase Unwrapped



Shows the phase response without limitation to a phase angle range of +/- 180°.

More

Smoothed 1/1

Shows the frequency response smoothed to full octaves.

Smoothed 1/3

Shows the frequency response smoothed to third octaves (major thirds).

Smoothed 1/6

Shows the frequency response smoothed to sixth octaves (major seconds, "whole tones").

Smoothed 1/12

Shows the frequency response smoothed to twelfth octaves (minor seconds, “half tones”).

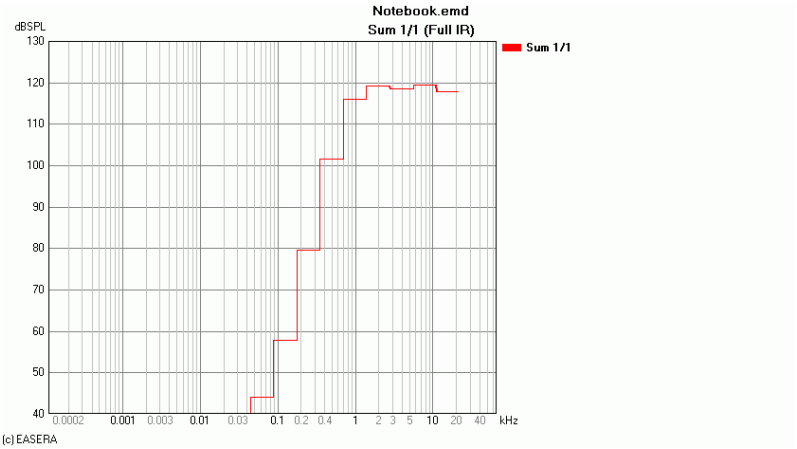
Smoothed 1/24

Shows the frequency response smoothed to twenty-fourth octaves ("quarter-tones").

Smoothed 1/96

Shows the frequency response smoothed to ninety-sixth octaves ("sixteenth-tones").

Sum 1/1



Sums up the signal in the ISO octaves and shows the result in logarithmic scaling.

Sum 1/3

Sums up the signal in the ISO third octaves and shows the result in logarithmic scaling.

Average 1/1

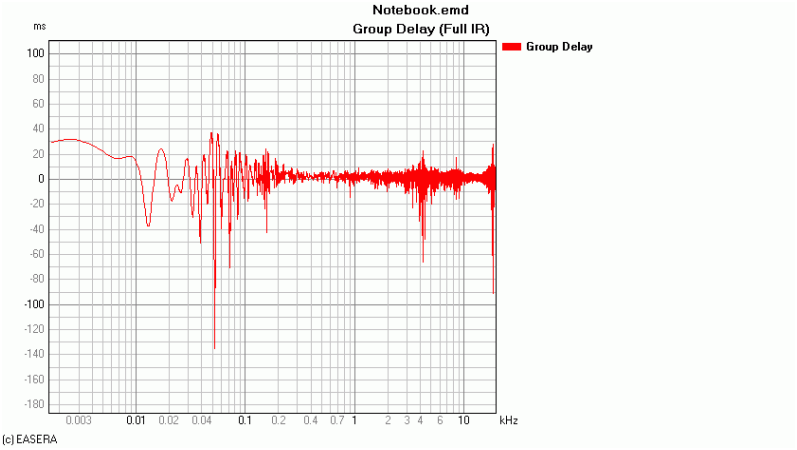
Calculates the average value of the signal in the ISO octaves and shows the result in logarithmic scaling.

Average 1/3

Calculates the average value of the signal in the ISO third octaves and shows the result in logarithmic scaling.

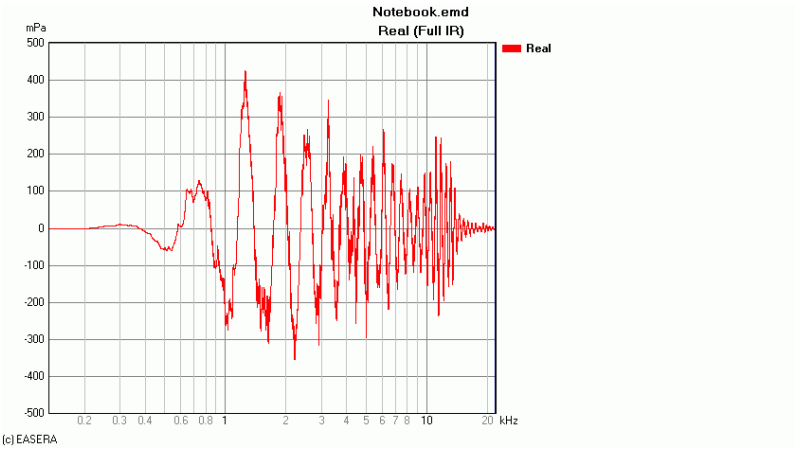
Frequency (...) Advanced

Group Delay



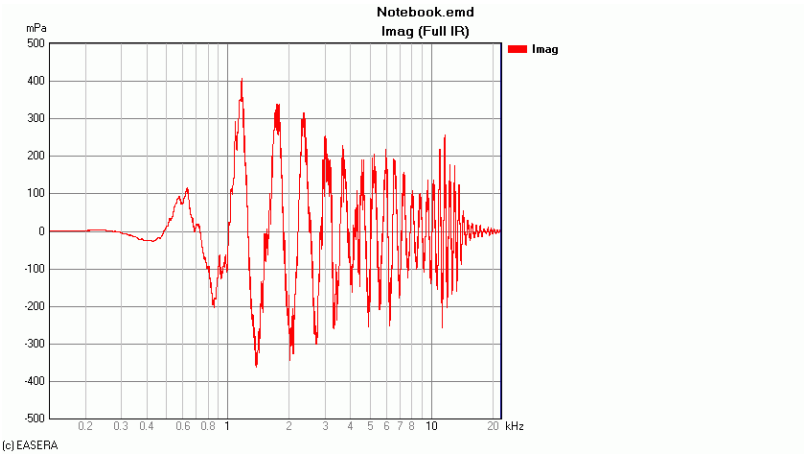
Shows the group delay time, i.e. the delay time of the signal as a function of the frequency.

Real



The signal is composed in its frequency response of a modulus and a phase angle and may thus be split into a real part and an imaginary part. The real part is displayed by *Real*.

Imag



The signal is composed in its frequency response of a modulus and a phase angle and may thus be split into a real part and an imaginary part. The imaginary part is displayed by *Imag*.

Calculation

Arrival, C50, D/R, SNR

Shows the active curve in the time domain (impulse response, ETC or the like) and opens the ***Details*** navigator page. Use the *Details Table* section on the ***Options (F9)*** dialog box VIEW & CALC|LAYOUT page to define what information is to be shown.

Data		
Arrival	79.64	ms
Distance	27.36	m
C50	1.7	dB
C80	2.2	dB
Ltotal	99.9	dBSPL
Center Time	132.74	ms
Noise	45.33	µV
Abs. Max	35.47	mV
SNR	17.94	dB
Section		
From	90.5	ms
To	1.5	s
Abs. Max.	15.32	mV
SNR	19.65	dB
D/R Ratio	-1.6	dB
Split Time	35.00	ms

Data		
Arrival	79.64	ms
Distance	27.36	m
C50	1.7	dB
C80	2.2	dB
Ltotal	99.9	dBSPL
Center Time	132.74	ms
Noise	33.76	dBSPL
Abs. Max	91.63	dBSPL
SNR	17.94	dB
Section		
From	90.5	ms
To	1.5	s
Abs. Max.	84.33	dBSPL
SNR	19.65	dB
D/R Ratio	-1.6	dB
Split Time	35.00	ms

The values that can be shown on the ***Details*** navigator page are described below and refer to the active curve. Most of the values are also shown in the ***Results*** tab.

The calculation of the individual values is described in the appendix (see EaseraAppendix.pdf **).**

Arrival

The time between the start of the measurement and the arrival of the signal, in milliseconds. The arrival of the signal is assumed to be the time at which the signal exceeds the noise by a certain level. This level can be set in the ***Options (F9)*** dialog box PROCESSING|PROCESSING page under the section *Arrival Time*.

For details please see the EaseraAppendix.pdf.

Distance

The distance computed from the *Arrival* time (at a temperature of 20° C).

C_{50}

The quantity C_{50} (measure of definition according to Ahnert) describes the ratio between the energy arriving during the first 50ms after *Arrival* and the energy arriving thereafter.

$$C_{50} = 10 \log \left(\frac{\int_{0}^{50\,ms} p^2(t) \cdot dt}{\int_{50\,ms}^{\infty} p^2(t) \cdot dt} \right) dB$$

The higher this value, the higher the intelligibility. C_{50} is used for speech.

For details please see the EaseraAppendix.pdf.

C_{80}

The quantity C_{80} (measure of clarity according to ABDEL ALIM) describes the ratio between the energy arriving during the first 80ms after *Arrival* and the energy arriving thereafter.

$$C_{80} = 10 \log \left(\frac{\int_0^{80\,ms} p^2(t) \cdot dt}{\int_{80\,ms}^{\infty} p^2(t) \cdot dt} \right) dB$$

The higher this value, the higher the clarity for music performances.

For details please see the EaseraAppendix.pdf.

C_7 / C_{35} / C_{split}

C_7 is also referred to as the direct sound measure, since it describes the ratio between the energy arriving during the first 7ms after *Arrival* and the energy arriving thereafter. It is mostly negative and normally assumes values ranging from –10 to –15 dB.

The quantity C_{Split} describes the ratio between the energy arriving during the first user set time after *Arrival* and the energy arriving thereafter. The so-called split time can be set in the ***Options (F9)*** dialog box PROCESSING|PROCESSING page under the section *Calculation* and is by default 35ms - thus by quantity it would be C_{35}.

For details please see the EaseraAppendix.pdf

D

The quantity D (*Definition*) describes the ratio between the energy arriving during the first 50ms after *Arrival* and the overall energy:

$$D = \frac{\int_0^{50\,ms} p^2(t) \cdot dt}{\int_0^{\infty} p^2(t) \cdot dt}$$

For details please see the EaseraAppendix.pdf.

L_7

Level within the first 7ms after *Arrival*.

L_{50}

Level within the first 50ms after *Arrival*.

L_{80}

Level within the first 80ms after *Arrival*.

L_{35} / L_{Split}

Level within the split time – by default 35ms after *Arrival*.

L_{total}

The integrated overall level for the active curve.

Center Time

The *Center Time* of the integrated energy (“center of the ETC triangle”) is calculated by the following formula:

$$t_s = \frac{\int_0^{\infty} t \cdot p^2(t) \cdot dt}{\int_0^{\infty} p^2(t) \cdot dt}$$

For details please see the EaseraAppendix.pdf.

D/R Ratio

Calculates the ratio between the direct sound energy and the reflected sound energy in dB. Place the left marker on the beginning and the right marker on the end of the reflections in the impulse response.

Early

Calculates the sound pressure of the part up to the left marker, i.e. the direct part.

Reverb

Calculates the sound pressure of the part after the left marker up to the right marker, i.e. the reverb part.

Noise

Amplitude of the noise background.

DC (Noise)

DC part of the noise background.

Mean (DC)

DC part of the overall signal.

Abs. Max

Amplitude of the signal peak, with normalized impulse responses this will be 1.00 Val.

RMS

Effective value of the signal.

INR

Maximum/Noise ratio in dB.

SNR

Signal/Noise ratio in dB.

Crest

Ratio between peak value and effective value in dB.

Section From

Position of the left marker.

Section To

Position of the right marker.

Section Mean (DC)

Calculates the size of the DC component of the signal between the markers.

Section RMS

Effective value between the markers.

Section SNR

Signal/Noise ratio, in dB between the markers.

Section Crest

Ratio between peak value and effective value, in dB between the markers.

Split Time

The value is set in the ***Measurement File Properties (F4)*** dialog box on the CALCULATION OPTIONS|GENERAL PROCESSING page under the *Weighted Energy* section and is used to calculate L_{split} and C_{split}. *This value is shown here only for informative purposes.*

Schroeder RT

Shows the active curve in the time domain as a Schroeder diagram and opens the ***Details*** navigator page.

	RT	
EDT	1.92	s
T10	3.23	s
T20	4.00	s
T30	3.83	s
Time From	289	ms
Time To	1.7	s
T (22)	3.99	s
r	-0.999	
Noise Comp.:	ON	

The values that can be shown on the ***Details*** navigator page are described below and refer to the active curve. Most of the values are also shown in the ***Results*** tab.

EDT

Early Decay Time: A 60 dB level fall-off is extrapolated from the first 10 dB level fall-off. The result determines the EDT.

For details please see the EaseraAppendix.pdf.

T10

A 60 dB level fall-off is extrapolated from the level between 5 dB and 15 dB below the maximum initial level. The result determines the T10 time.

For details please see the EaseraAppendix.pdf.

T20

A 60 dB level fall-off is extrapolated from the level between 5 dB and 25 dB below the maximum initial level. The result determines the T20 time.

For details please see the EaseraAppendix.pdf.

T30

A 60 dB level fall-off is extrapolated from the level between 5 dB and 35 dB below the maximum initial level. The result determines the T-30 time.

For details please see the EaseraAppendix.pdf.

Time From

Position of the left marker.

Time To

Position of the right marker.

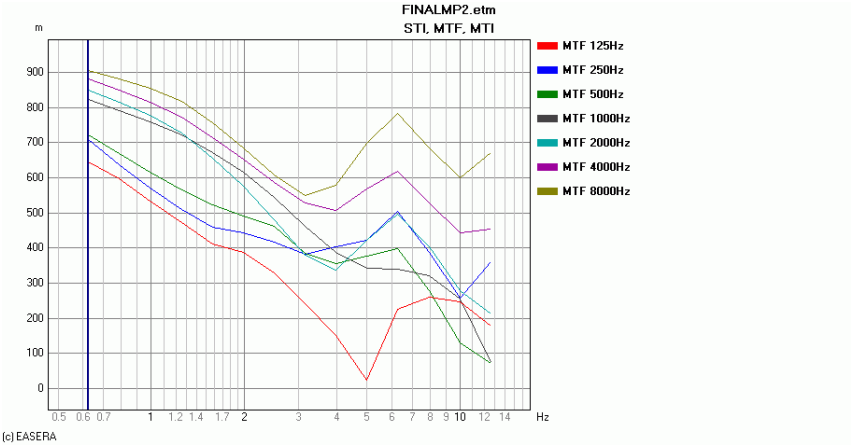
T (x)

From the positions of the left and right markers a level fall-off is calculated which is then extrapolated to a level fall-off over 60 dB. The result determines the T (x) time.

Noise Comp

Indicates whether the noise compensation is used (*ON*) or not. The noise compensation can be set in the ***Options (F9)*** dialog box PROCESSING|PROCESSING page under the section *Reverberation Time* for all future measurements. The noise compensation for the current data set is set in the ***Measurement File Properties (F4)*** dialog box on the CALCULATION OPTIONS|GENERAL PROCESSING page under the *Schroeder Integral* section.

STI, STIPa, RaSTI



Shows the active curve in the frequency domain as a set of modulation transfer functions for each of the octave bands and opens the ***Details*** navigator page.

STI (Mask.)	0,516
AlCons [%]	10,398
STI (Male)	0,525
STI (Female)	0,539
RaSTI	0,493
Equiv. STIPa (Male)	0,541
Equiv. STIPa (Female)	0,552

The values that can be shown on the ***Details*** navigator page are described below and refer to the active curve. Most of the values are also shown in the ***Results*** tab.

The principle used for determining the STI dates back to the era of analog measuring instruments: For calculating the STI there were in those times the signals of the frequencies 125Hz, 250Hz, 500Hz, 1kHz, 2kHz, 4kHz and 8kHz modulated with frequencies of between 0.63Hz and 12.5Hz (the signal intensity fluctuates for instance between 0% and 100%). Owing to reverberation, echoes, or noise, there occurs a modulation loss (the signal intensity fluctuates between x% and 100%, because there also occur signals during the "resting intervals". The ratio between degree of modulation at the listener's seat and degree of modulation of the stimulating signal produces then the modulation transfer function.

In EASERA all degrees of modulation are derived from the impulse response. Contrary to the analog procedure which required 98 individual measurements, there is now only one necessary. Both procedures (the analog one as well as the derivation from the impulse response) are described in the IEC 60268-16 standard, where the different quantities are also defined.

STI

Speech Transmission Index, the mean value of all modulation transfer functions for all frequencies and modulation frequencies. For the STI it is also possible to select two options to modify the results.

- Influences by masking effects may be taken into account (*Mask*) or left out of consideration.
- Influences resulting from ambient noise may be taken into account (*STI +N*) or not (*STI*).

These options and their parameters can be set in the ***Options (F9)*** dialog box PROCESSING|STI OPTIONS page under the section *Octave Levels* for all future

measurements. These options and parameters can be set for the current data set in the ***Measurement File Properties (F4)*** dialog box on the CALCULATION OPTIONS|STI page under the *Octave Levels* section.

For details please see the EaseraAppendix.pdf.

AlCons (%)

The Articulation Loss of Consonants to be expected is calculated from the *Speech Transmission Index* (STI).

For details please see the EaseraAppendix.pdf.

STI (Male)

Mean value of the modulation transfer functions of all frequencies and modulation frequencies, with the individual values being weighted for the male voice according to IEC 60268-16.

For details please see the EaseraAppendix.pdf.

STI (Female)

Mean value of the modulation transfer functions of all frequencies and modulation frequencies, with the individual values being weighted for the female voice according to IEC 60268-16.

For details please see the EaseraAppendix.pdf.

RaSTI

With the RaSTI procedure only the octave bands 500Hz and 2kHz are used. The 500Hz band is modulated with the frequencies 1Hz, 2Hz, 4Hz and 8Hz, and the 2kHz band with the frequencies 0.7Hz, 1.4Hz, 2.8Hz, 5.6Hz and 11.2Hz.

Thanks to the reduced number of octave bands and modulation frequencies the effort for a discrete measurement is quite noticeably reduced. Given that in EASERA all values are derived from the impulse response, there is no advantage over the STI, but there are even disadvantages because of the limited frequency response. As a result the importance of RASTI is fading more and more.

For details please see the EaseraAppendix.pdf.

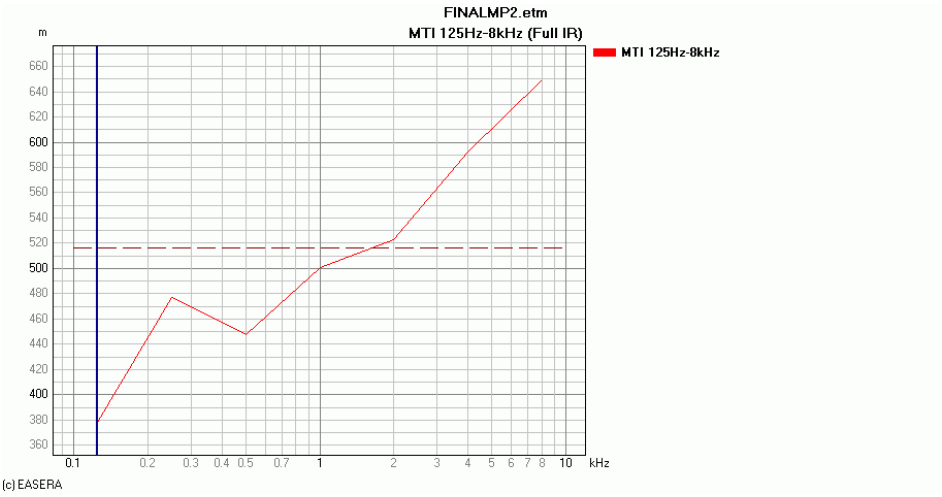
Equiv STIPa (Male)

The STIPa procedure uses only 2 instead of 14 modulation frequencies for all octave bands, which reduces the effort for discrete measurements accordingly (since STIPa always needs to be measured with analog stimulation and all values in EASERA are derived from the impulse response, the STIPa values are given only as equivalent data). With STIPa (Male) the weighting factors for the male voice are used.

Equiv STIPa (Female)

The STIPa procedure uses only 2 instead of 14 modulation frequencies for all octave bands, which reduces the effort for discrete measurements accordingly (since STIPa always needs to be measured with analog external stimulation and all values in EASERA are derived from the impulse response, the STIPa values are given only as equivalent data). With STIPa (Female) the weighting factors for the female voice are used.

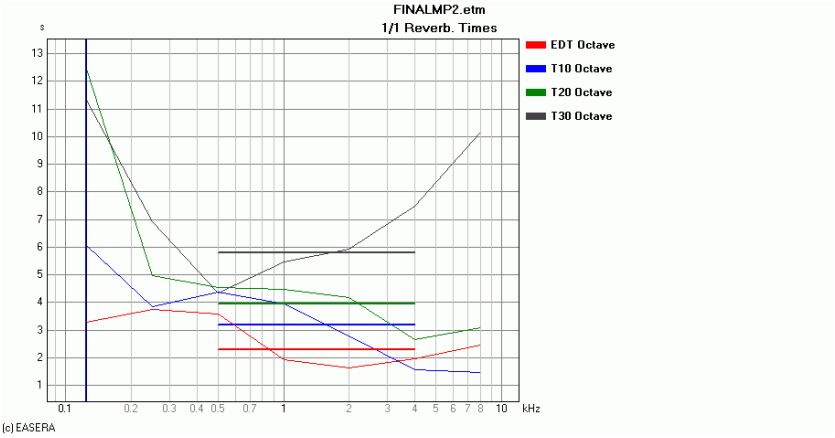
MTI and STI



The *MTI* or *Modulation Transfer Index* for each octave from 125Hz to 8kHz is calculated from the broadband impulse response using modulation frequencies that lie between 0.125Hz and 8Hz. For comparison the STI is shown by a broken line. These values are also shown in the ***Results*** tab.

For details please see the EaseraAppendix.pdf.

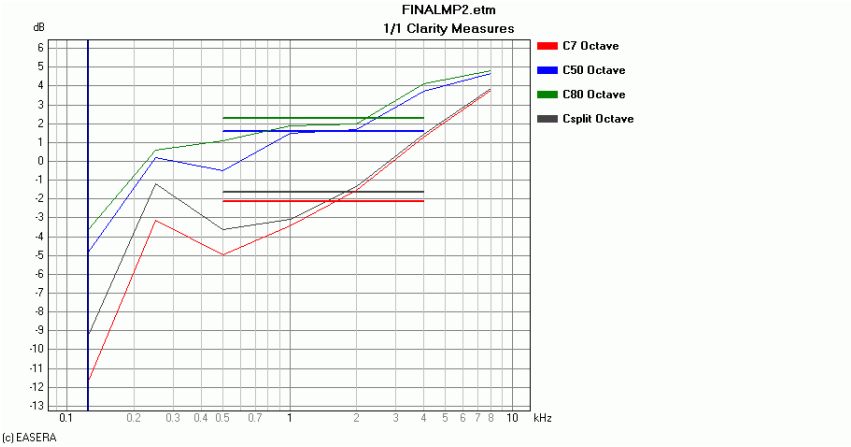
EDT, RT (Octave)



EDT, RT (Octave) shows the reverberation time (as EDT, T10, T20 and T30) for the octave bands between 125Hz and 8kHz. The mean value for the octave bands between 500Hz and 4kHz is shown also by a horizontal line. These lines may be switched off in the ***Options (F9)*** dialog box VIEW & CALC|OPTIONS page under the section *Show Lines*. These values are also shown in the ***Results*** tab.

For details please see the EaseraAppendix.pdf.

C50, C80 (Octave)

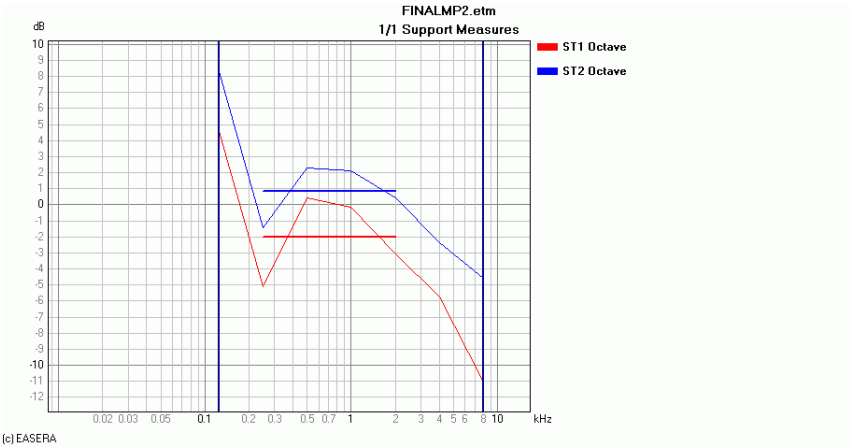


The *Clarity* or *C* values are the ratio between early and late arriving energy. For the times of 7ms, 50ms and 80ms as well as the split time these values are shown for the octave bands between 125Hz and 8kHz. The mean value for the octave bands between 500Hz and 4kHz is also shown by a horizontal line. These lines may be switched off in the ***Options (F9)*** dialog box VIEW & CALC|OPTIONS page under the section *Show Lines*. These values are also shown in the ***Results*** tab.

For details please see the EaseraAppendix.pdf.

Calculation Advanced

Support ST (Octave)



Support ST is a measure for the return of sound from the performers back to the stage. ST1 is a measure for the ability of the performer's to hear each other on the stage, and ST2 is a measure for the extent to which the room reverberence is heard by the performers. These measures are made on the stage using a distance from microphone to sound source of 1m.

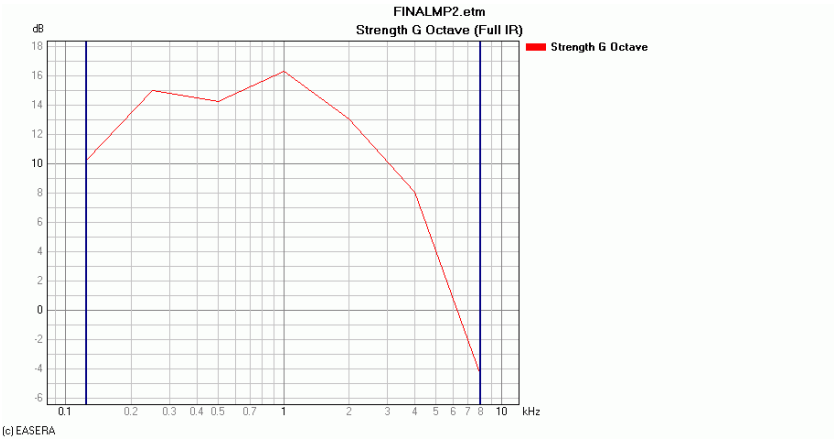
$$ST1 = 10 \log \left(\frac{\int_{20}^{100\,ms} p^2(t) \cdot dt}{\int_{0\,ms}^{10\,ms} p^2(t) \cdot dt} \right) dB$$

$$ST2 = 10 \log \left(\frac{\int_{20}^{200\,ms} p^2(t) \cdot dt}{\int_{0\,ms}^{10\,ms} p^2(t) \cdot dt} \right) dB$$

These values are also shown in the ***Results*** tab.

For details please see the EaseraAppendix.pdf.

Strength G (Octave)



The strength measure *G* is the ratio between the sound energy at the measuring location and at a reference location to be specified (according to ISO 3382 at 10m distance from the sound source, measured in the free field).

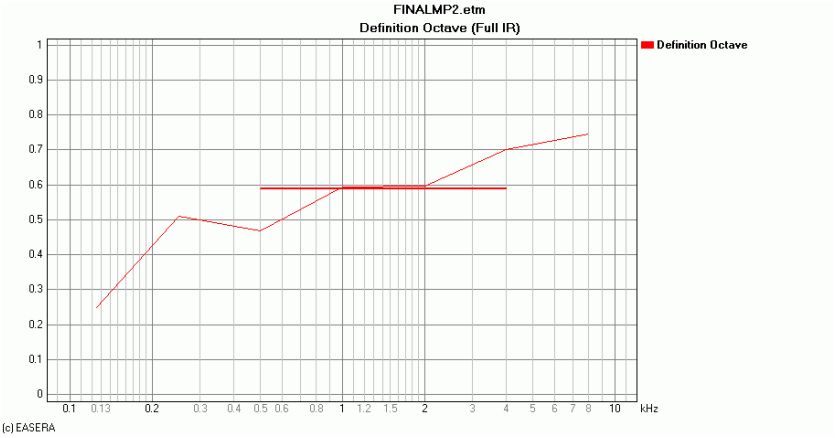
When first selecting this function for a data set it is necessary to indicate a second data set as the reference. If later on another file is to be used as the reference, the existing reference needs to be deleted in the ***Measurement File Properties (F4)*** dialog box on the CALCULATION OPTIONS|GENERAL PROCESSING page under the *Measures with Reference File* section.

Note: For a single measurement the Sound Strength G may also be calculated. In this case the arrival time must be known and after duplicating the file, then windowing the direct sound and scaling it to 10m distance this new file can be used as the reference file.

These values are also shown in the ***Results*** tab.

For details please see the EaseraAppendix.pdf.

Definition (Octave)

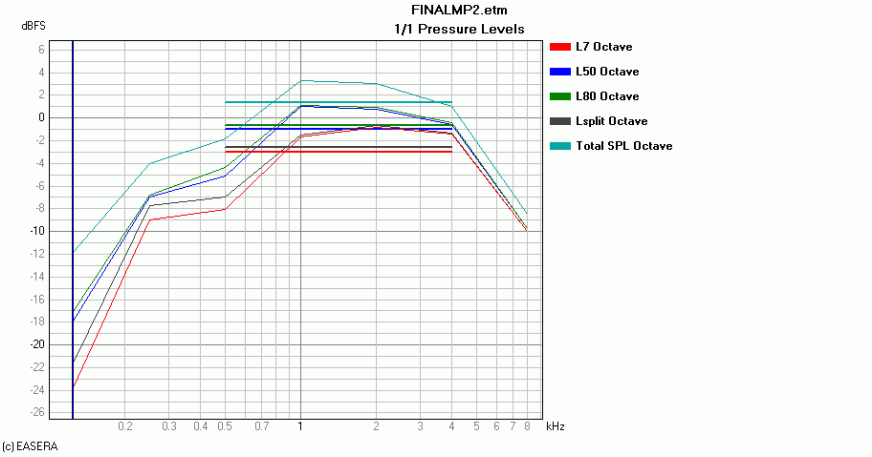


The definition measure *D* (also D_{50}) according to Thiele is the ratio between the energy during the first 50ms and the overall energy.

These values are also shown in the ***Results*** tab.

For details please see the EaseraAppendix.pdf.

L50, L80 (Octave)



L_{50}, L_{80} (Octave) shows the following values for the octave bands:

L_7

Level within the first 7ms.

L_{50}

Level within the first 50ms.

L_{80}

Level within the first 80ms.

L_{split}

Level within the Split time.

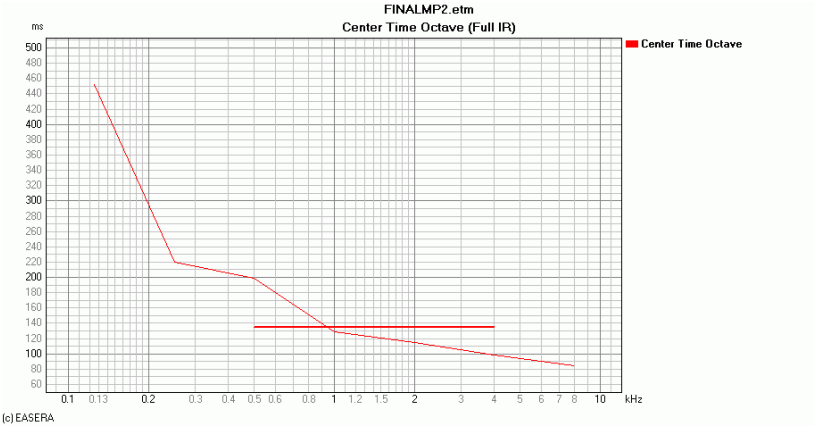
L_{total}

Overall level.

These values are also shown in the ***Results*** tab.

For details please see the EaseraAppendix.pdf.

Center Time (Octave)



The *Center Time* is the center of the integrated energy (like a momentum in mechanics) and calculated by means of the following formula:

$$t_s = \frac{\int_0^\infty t \cdot p^2(t) \cdot dt}{\int_0^\infty p^2(t) \cdot dt}$$

Here it is shown for the individual octave bands. These values are also shown in the ***Results*** tab.

For details please see the EaseraAppendix.pdf.

EDT, RT (1/3rd)

Like *EDT, RT (Octave)*, but using third-octave band filters.

C50, C80 (1/3rd)

Like *C50, C80 (Octave)*, but using third-octave band filters.

Strength G (1/3rd)

Like *Strength G (Octave)*, but using third-octave band filters.

Definition (1/3rd)

Like *Definition (Octave)*, but using third-octave band filters.

L50, L80 (1/3rd)

Like *L50, L80 (Octave)*, but using third-octave band filters.

Center Time (1/3rd)

Like *Center Time (Octave)*, but using third-octave band filters.

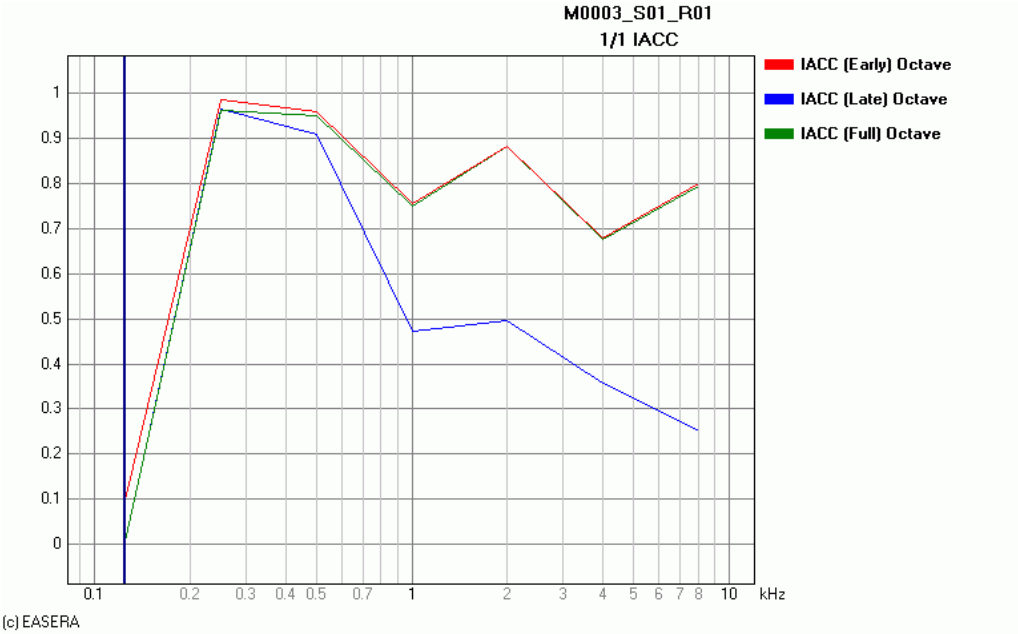
Spatial Measures

The *Spatial Measures* shown here are measures describing an acoustically spatial effect by comparing two channels. These values are also shown in the ***Results*** tab.

For details please see the EaseraAppendix.pdf.

When first selecting these functions it is necessary to indicate a second channel to be used as a reference. If later on another file is to be used as the reference, the existing reference needs to be deleted in the ***Measurement File Properties (F4)*** dialog box on the CALCULATION OPTIONS|GENERAL PROCESSING page under the *Measures with Reference File* section.

IACC (Octave)



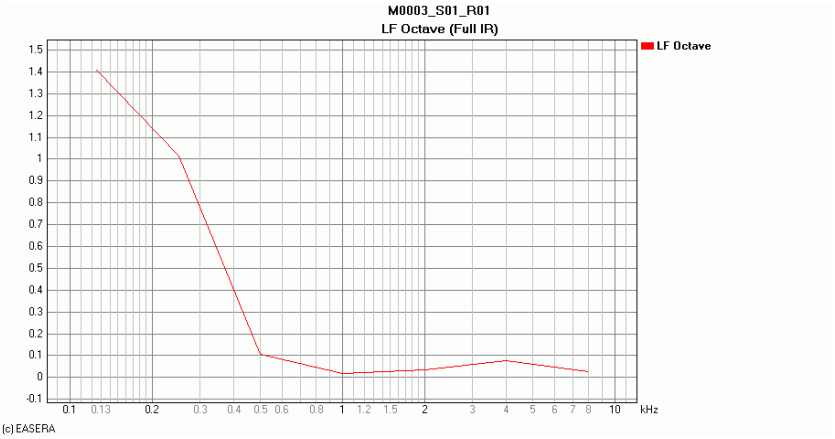
The *Interaural Cross-correlation Coefficient* or *IACC* is measured using a dummy head (or with in-ear microphones of a listener) and compares the impulse response in the left auditory canal with that in the right auditory canal. The *IACC* is determined for diverse start times (t_S) and stop times (t_E), i.e. before the first 80ms (*early*) and thereafter (*late*) as well as for the overall duration of the data set (*full*).

$$IACC(\tau) = \frac{\int_{t_s}^{t_e} p_r(t) \cdot p_l(t+\tau)\, dt}{\sqrt{\int_{t_s}^{t_e} p_r^2(t)\, dt \cdot \int_{t_s}^{t_e} p_l^2(t)\, dt}}$$

These values are also shown in the ***Results*** tab.

For details please see the EaseraAppendix.pdf**.**

Lateral Fraction (Octave)



The *Lateral Fraction* is a spatial measure according to ISO 3382. The Lateral fraction is the fraction of sound energy traveling at right angle to the sound source, relative to the overall sound energy.

The *Lateral Fraction* is measured using a bidirectional microphone aimed at the sound source in such a way that the directional lobes are oriented in a plane vertical to the direction of the sound source. To measure the overall sound energy an omni directional microphone is used.

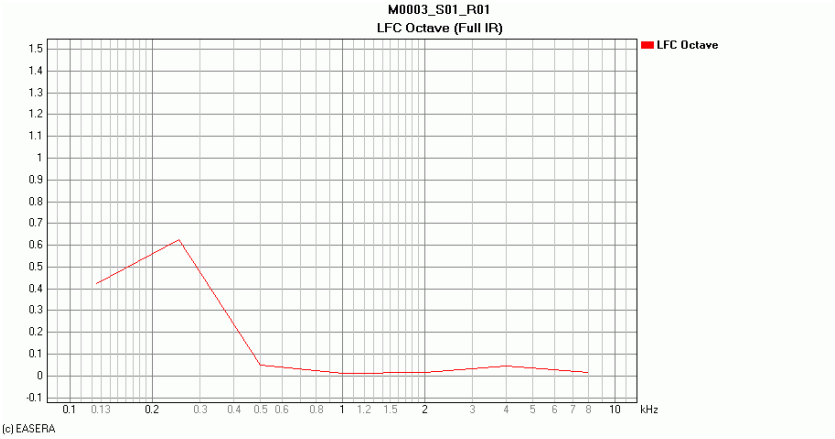
The *Lateral Fraction* is calculated by the following formula (the sound level of the bidirectional microphone is denoted by p_∞, and that of the omni directional microphone is denoted by p):

$$LF = \frac{\int_{0,005\,s}^{0,080\,s} p_\infty^2(t)\,dt}{\int_{0\,s}^{0,080\,s} p^2(t)\,dt}$$

These values are also shown in the ***Results*** tab.

For details please see the EaseraAppendix.pdf.

LF Coefficient (Octave)



The *Lateral Fraction Coefficient* corresponds to the *Lateral Fraction*, but is calculated according to the following formula (the sound level of the bidirectional microphone is denoted by p_∞, and that of the omni directional microphone is denoted by p):

$$LFC = \frac{\int_{0,005\,s}^{0,080\,s} \left|p_\infty(t) \cdot p(t)\right| dt}{\int_{0\,s}^{0,080\,s} p^2(t)\,dt}$$

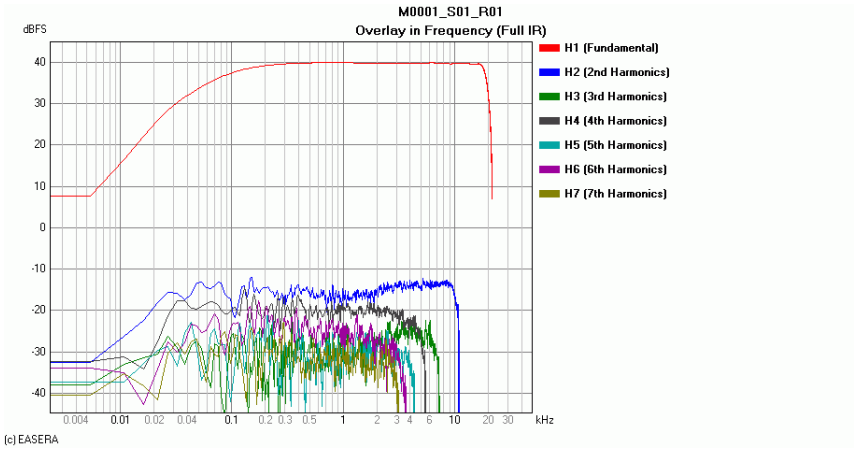
These values are also shown in the ***Results*** tab.

For details please see the EaseraAppendix.pdf.

Distortion

All distortion measurements require a *pink sweep* (logarithmic sweep) as the stimulus signal.

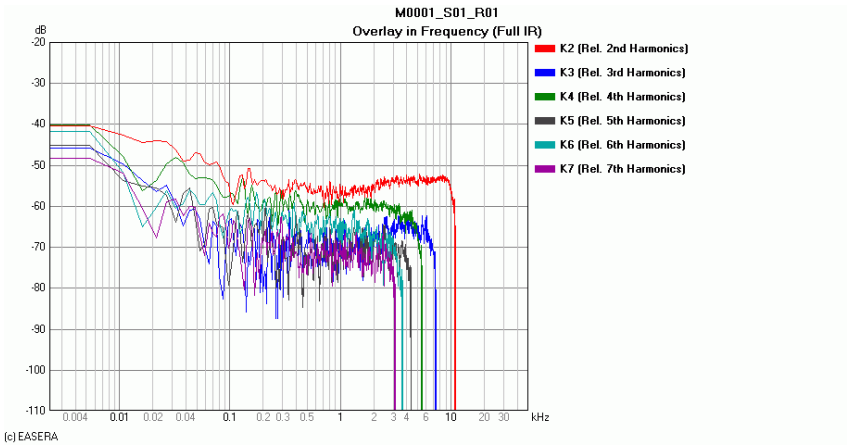
Harmonic Spectra



Harmonic Spectra shows the frequency response of the undistorted signal as well as the distortion coefficients up to the seventh harmonic.

For details please see the EaseraAppendix.pdf.

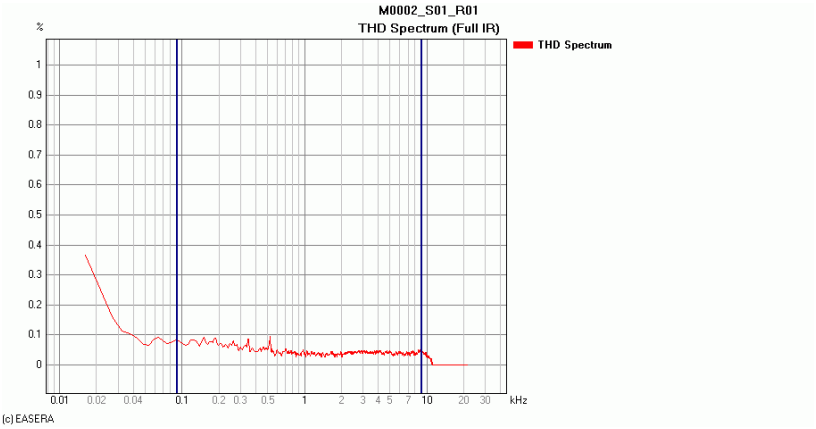
Relative Spectra K2, K3, …



Relative Spectra K2, K3,… shows the harmonic distortion products relative to the undistorted signal.

For details please see the EaseraAppendix.pdf

THD

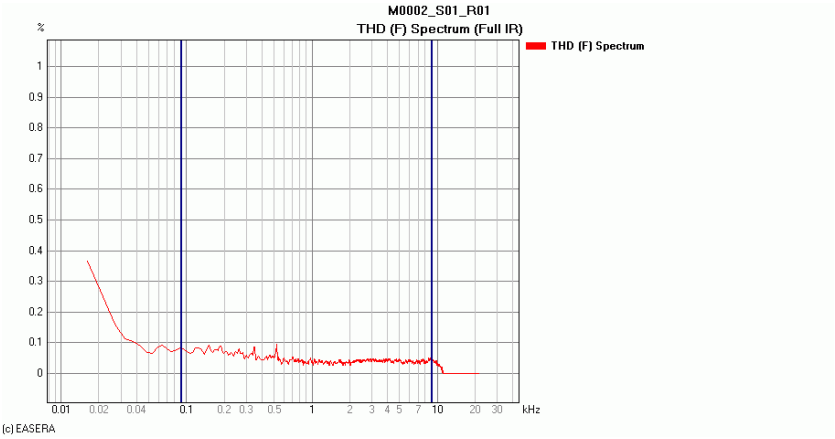


THD shows the harmonic distortion coefficient in %. The harmonic distortion coefficient is defined as the ratio of the harmonic distortion fractions relative to the overall level (H stands for the harmonic distortion fractions and F ("fundamental") for the undistorted fundamental wave):

$$THD = \frac{\sqrt{\sum_i H_i^2}}{\sqrt{F^2 + \sum_i H_i^2}}$$

For details please see the EaseraAppendix.pdf.

THD (F)



THD (F) shows the harmonic distortion coefficient in %, related only to the fundamental wave. The harmonic distortion coefficient is also defined as the ratio of the harmonic distortion fractions relative to the fundamental oscillation (H stands for the harmonic distortion fractions and F ("fundamental") for the undistorted fundamental wave):

$$THD\,(F) = \frac{\sqrt{\sum_i H_i^2}}{\sqrt{F^2}}$$

For details please see the EaseraAppendix.pdf.

Distortion Options

Opens the ***Measurement File Properties (F4)*** dialog box to the CALCULATION OPTIONS|DISTORTION page to set the parameters for the smoothing and window type to be used to calculate the distortion for the current data set.

See also: Measurement File Properties Window

Waterfall

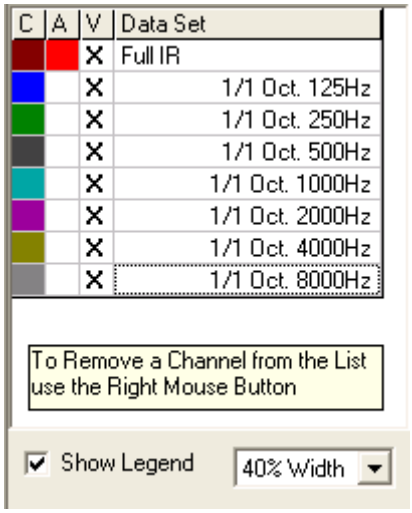
Selects the ***Waterfall*** tab and displays the data set as a waterfall diagram in the Waterfall Window.

Spectrogram

Selects the ***Waterfall*** tab and displays the data set as a spectrogram in the Waterfall Window.

Overlay

Select the ***Overlay*** navigator button to see the navigator page that shows you a list of overlaid curves.



Shortcut: **Shift+F2**

EASERA allows various curves to be represented in the same diagram, either by adding such curves manually using *Add to Overlay* or because an EASERA function produces several curves as a result - e.g. in the case of octave spectra.

To remove a curve from the list just click with the RMB on the row of the curve to remove. The active curve cannot be removed from the list, as at least one curve needs to be displayed.

C

This column shows the *Color* used for the curve.

A

This column shows the *Active curve* marked with a colored square (red in the default color scheme). The *Active curve* is used for the cursor indications, the markers and all editing. To mark a curve as the *Active curve*, click the RMB on the row of the desired curve in this column,

V

This column shows which curves are *Visible* in the diagram. The *Visible* curves are marked with an *X*. To hide a curve (not the *Active* one) or to show it in the diagram again, click with the LMB on the respective entry in this column.

Data Set

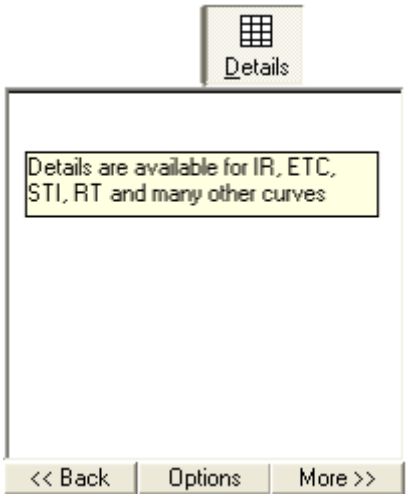
This column shows the description of the curve shown or the name of the data set.

Show Legend

The legend on the right margin of the diagram can be shown or hidden using this check box and its width can be adjusted using the drop-down list.

Details

If the calculation results are not curves, but single values, select the ***Details*** navigator button to see these results for a single curve.



Shortcut: **Shift+F3**

<< Back

Returns to the navigator page ***Graphs***.

Options

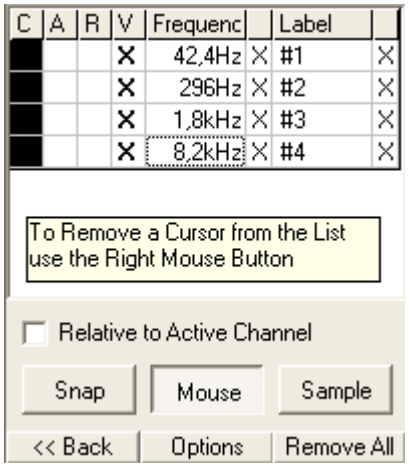
Opens the ***Options (F9)*** dialog box to the VIEW & CALC|LAYOUT page.

More >>

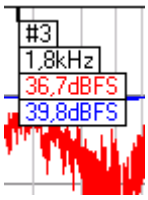
Switches to the ***Results*** tab where further values are shown, if available.

Cursor

Select the ***Cursor*** navigator button to see the navigator page that shows you a list of all stored cursors.



Shortcut: **Shift+F4**



If the mouse mode *Peek* is activated, a stored cursor can be placed in the diagram by RMB. Such a cursor then shows the value of the X-axis (if applicable relative to the *Snap* mode) as well as the associated Y-values of all visible curves. If a cursor is already active, there is no new cursor inserted by RMB, but the active cursor is repositioned.

The maximum number of stored cursors and the maximum number of Y-values shown may be set in the ***Options (F9)*** dialog box VIEW & CALC|OPTIONS page under the section *Cursors*.

C

This column shows the *Color* used for the cursor.

A

This column shows the *Active cursor* marked with a colored square (red in the default color scheme). To mark a cursor as the *Active cursor*, click the RMB on the row of the desired cursor in this column.

If a cursor is set while another cursor is active, the latter is replaced by the new one. When the maximum number of stored cursors is reached, the cursor set last is always marked as active.

R

This column shows the *Reference cursor* marked with a colored square (blue in the default color scheme). To mark a cursor as the *Reference cursor*, click the RMB on the row of the desired cursor in this column.

If a *Reference cursor* is set, the X-values of all other cursors are shown relative to the reference cursor in the time domain. In the frequency domain

the X-values continue to show the actual values. For both domains, the Y-values are shown relative to the Y-value of the *Reference cursor*.

V

This column shows which cursors are *Visible* in the diagram. The *Visible* cursors are marked with an *X*. To hide a cursor or to show it in the diagram again, click with the LMB on the respective entry in this column.

Frequency / Time

This column shows the frequency or time at the cursor position. The indication of frequency or time is shown in the diagram when the next column contains an *X*. To hide the Y-value for the cursor or to show it in the diagram again, click with the LMB on the respective entry in this following column..

Label

This column shows the *Label* for the cursor. The cursor *Label* is shown in the diagram when the next column contains an *X*. To hide the *Label* for the cursor or to show it in the diagram again, click with the LMB on the respective entry in this following column.

Relative to Active Channel

When the option *Relative to Active Channel* is checked, the Y-values of the curve of the active channel are given in absolute terms and those of the other curves are shown relative to the active channel.

Together with the reference cursor this option allows you to relate any cursor and the corresponding level to the value of the reference cursor in the active curve. This option, for example, allows you to see the relative change of location and level of reflections over a range of measurements.

Snap / Mouse / Sample

In the mouse mode *Peek* it is possible to measure an area on the curve by drawing it with the cursor while holding the LMB. Use the buttons *Snap*, *Mouse* and *Sample* to specify how this area is chosen.

The area is defined by the position of the mouse on pressing its left button („starting point“) and then dragging it to the current mouse position („target point“).

Use the RMB in the mouse mode *Peek* to place cursors in the diagram and add them to the list of stored cursors. Contrary to the areas dragged open with the LMB held, the Y-values of stored cursors are always curve values. The X-values for the modes *Mouse* and *Sample* use the X-values of the mouse position, while in the mode *Snap* a jump to the maximum Y-value in the range of +/- 3 pixels takes place and uses the corresponding X-value.

Snap

The starting and target points lie on the envelope of the active curve (The envelope is formed by the maximum within a range of +/- 3 pixels).

Mouse

The starting and target points may be freely chosen within the diagram.

Sample

The starting and target points lie on the active curve.

Back

Returns to the navigator page ***Graphs***.

Options

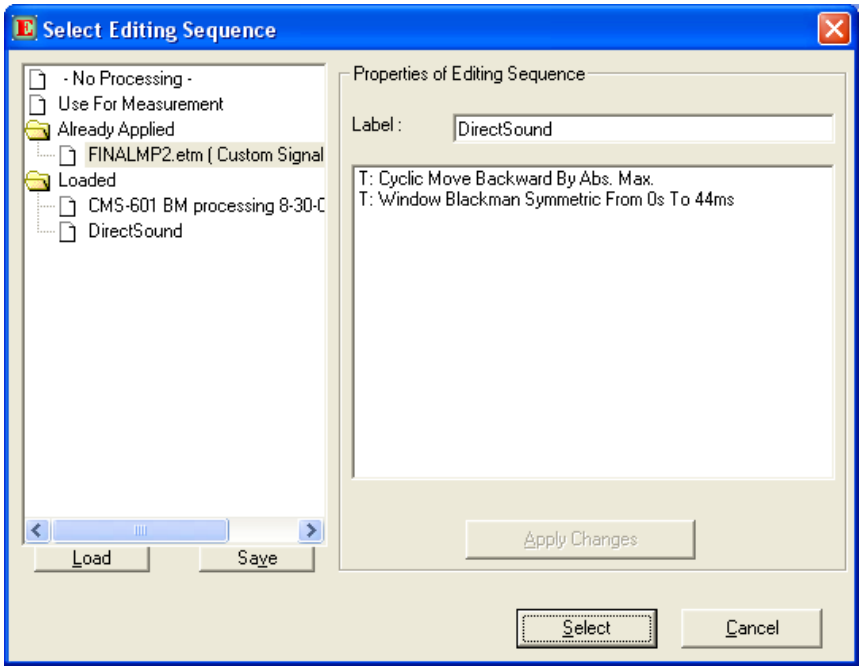
Opens the Options *(F9)* dialog box to the VIEW & CALC|OPTIONS page.

Remove All

Removes all cursors from the diagram and the list.

Select Editing Sequence Window

An *Editing Sequence* is a series of processing steps (editing of the data), which can be also used for other data sets. If the same processing steps are to be carried out with various data sets, they are performed first for only one data set, and then they can be saved for later use. These processing steps can be performed as a complete *Editing Sequence* (i.e. like a macro) for other data sets.



In EASERA the functions EDIT|UNDO and EDIT|REDO allow you to step through the individual steps of an editing sequence. This is also possible if you are not in the same domain as where the original editing was applied. For example, you may window some data in the time domain and afterwards look at the changed frequency response. Using EDIT|UNDO and EDIT|REDO allows you to compare the result of the windowing in the frequency domain as well.

- No Processing -

Removes the existing processing.

Use For Measurement

It is possible to create an *Editing Sequence* that will be automatically applied to all new measurements. This Editing Sequence can be processed with *Use For Measurement*, and may also be selected for use with other data sets.

Already Applied

List of the opened data sets; the processing steps used for them may also be applied to other data sets.

Loaded

List of the loaded editing sequences.

Load

Loads a previously stored editing sequence.

Save

Stores an editing sequence.

Properties of Editing Sequence

The current label and the list of processing steps that are included in the currently selected editing sequence.

Label

Title of the editing sequence, which may be modified.

Apply Changes

Accepts the modifications, e.g. the modification of the title.

Select

Accepts the editing sequence chosen for the current data set and closes the window.

Cancel

Closes the window without making a selection.

Editing Windows

The ***Editing*** dialog box is used to modify the active curve for either the time or frequency domain. Depending on which type of editing is about to be done, the ***Editing*** window assumes different layouts.

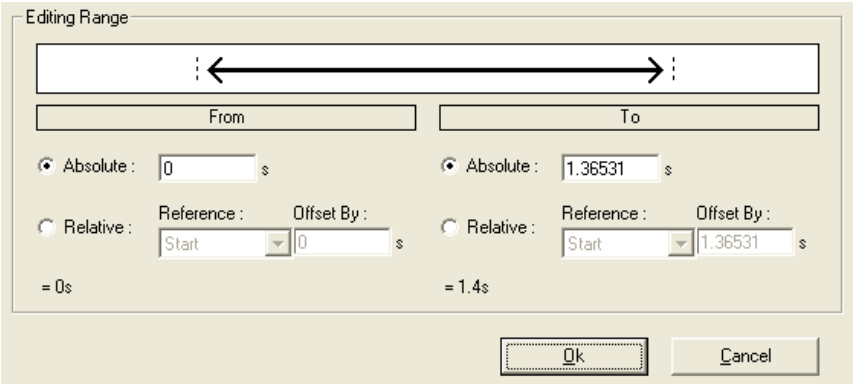
The possible modes are:

- *Smoothing*
- *Set Value*
- *Add Value*
- *Subtract Value*
- *Multiply by Value*
- *Divide by Value*
- *To Power of Value*
- *Cyclic Move*
- *Expand Data*

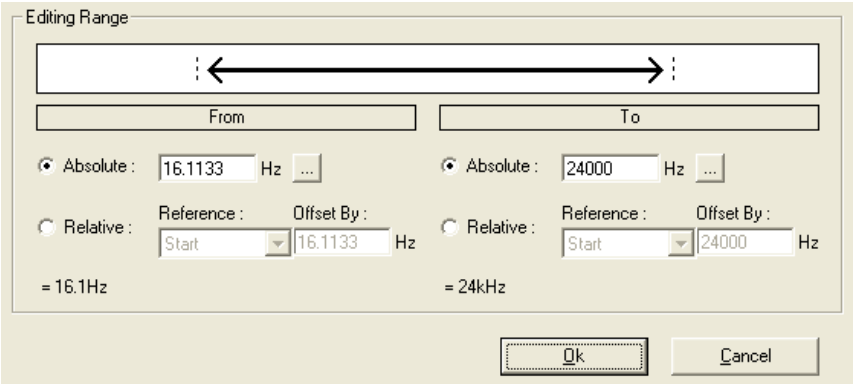
Editing Range

In every mode (except *Expand Data*), the processing can be limited to a partial range of the X-axis.

- **Time Domain**: Editing Range display for time diagrams.



- **Frequency Domain**: Editing Range display for frequency diagrams.



From

Beginning of the range on the X-axis in which the processing takes place. If markers are placed before this window is opened, these fields will hold the position of the left marker. The calculated absolute value is shown below the fields after the equals sign.

- **Absolute**: Enter the start time or frequency for the editing range. In a frequency diagram the **[…]** button on the right side opens the ***EASERA – Entry Data*** dialog box to select a frequency using actual or ISO values for 1/1, 1/3, or 1/6 octave centers.
- **Relative**: Select the start time or frequency reference and offset for the editing range.
  - **Reference**: Select the start time or frequency to be used as a reference.

The following reference locations are available for both time and frequency diagrams:

- **Start**: The first sample in the diagram.
- **Stop**: The last sample in the diagram.
- **Lin. Max.**: The sample with the maximum linear value.
- **Lin. Min.**: The sample with the minimum linear value.
- **Abs. Max.**: The sample with the maximum absolute value.
- **Half**: The sample that is halfway between the first and last sample.

The following reference location is available for time diagrams:

- **Arrival**: The sample where the signal exceeds the noise by a certain value (by default 35 dB). The threshold can be set in the ***Options (F9)*** dialog box on the PROCESSING | PROCESSING page in the *Arrival Time* section.

- **Offset By**: Enter start time or frequency offset relative to the reference.

To

End of the range on the X-axis in which the processing takes place. If markers are placed before this window is opened, these fields will hold the position of the right marker. The calculated absolute value is shown below the fields after the equals sign.

- **Absolute**: Enter the stop time or frequency for the editing range. In a frequency diagram the **[…]** button on the right side opens the ***EASERA – Entry Data*** dialog box to select a frequency using actual or ISO values for 1/1, 1/3, or 1/6 octave centers.
- **Relative**: Select the stop time or frequency reference and offset for the editing range.
  - **Reference**: Select the stop time or frequency to be used as a reference.

    The following reference locations are available for both time and frequency diagrams:

    - **Start**: The first sample in the diagram.
    - **Stop**: The last sample in the diagram.
    - **Lin. Max.**: The sample with the maximum linear value.
    - **Lin. Min.**: The sample with the minimum linear value.
    - **Abs. Max.**: The sample with the maximum absolute value.
    - **Half**: The sample that is halfway between the first and last sample.

    The following reference location is available for time diagrams:

    - **Arrival**: The sample where the signal exceeds the noise by a certain value (by default 35 dB). The threshold can be set in the ***Options (F9)*** dialog box on

the PROCESSING | PROCESSING page in the *Arrival Time* section.

- **Offset By**: Enter stop time or frequency offset relative to the reference.

Ok

Confirms the changes and closes the window.

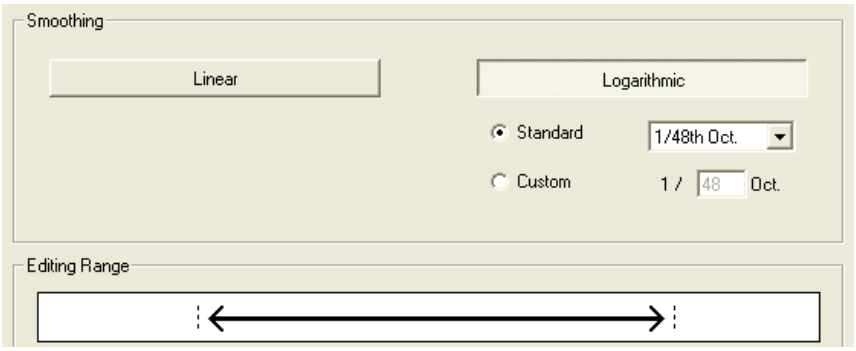
Cancel

Rejects the changes and closes the window.

Smoothing

In the *Smoothing* mode it is possible to smooth the frequency or time responses.

This mode is useful when the preset smoothing functions are not sufficient. It may also be necessary to save a smoothed data set to a file. In order to save the file it will need to be copied first using *Duplicate for Editing*. But consider that this smoothing in the frequency domain will affect the corresponding time domain data as well. In the time domain this smoothing can help to create an envelope function in order to obtain a better overview or extract characteristic features of the data.



Smoothing

EASERA allows two types of smoothing, **Linear** and **Logarithmic**. The frequency domain can use either type, while the time domain allows only the linear smoothing function.

Linear

For smoothing on the linear frequency axis the filter range is set in Hertz. For smoothing on the time axis the range is set in seconds.

Logarithmic

For smoothing on the logarithmic frequency axis the filter range is adjusted in fractions of an octave.

The following intervals are available as presets:

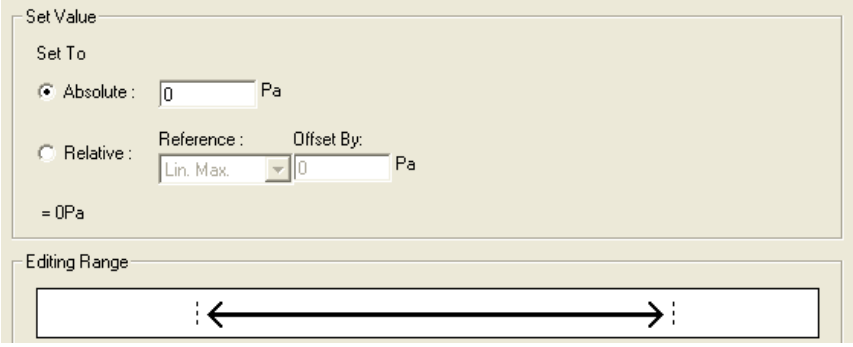
- Full octaves (*1/1 Oct*)
- Third octaves *(1/3rd Oct*)
- Major seconds (*1/6th Oct*)
- Minor seconds (*1/12th Oct*)

- 1/24 octave (*1/24th Oct*)
- 1/48 octave (*1/48th Oct*)
- 1/96 octave (*1/96th Oct*)

Set Value

Use the *Set Value* mode to set the Y-values to a constant value, e.g. to 0. This can be used for eliminating perceptible disturbing peaks.

This mode is particularly useful when one has to construct certain functions for later processing, such as a sequence of steps in time.



Set To

Value to which all data are set within the range determined by the settings in the *Editing Range* frame. The calculated absolute value is shown below the fields after the equals sign.

- **Absolute**: Enter the value for the editing range.
- **Relative**: Select the reference value and offset for the editing range.
  - **Reference**: Select the value to be used as a reference.

    The following values are available for both time and frequency diagrams:
    - **Lin. Max.**: The maximum linear value.
    - **Lin. Min.**: The minimum linear value.
    - **Sign. Max.**: The maximum signed value.
    - **Mean**: The mean of all the linear values.
    - **Noise**: The linear value of the noise.
    - **RMS**: The RMS of all the linear values.
    - **Abs. Max.**: The maximum absolute value.
    - **Neg. Max.**: The maximum linear value with the sign reversed.
    - **Neg. Min.**: The minimum linear value with the sign reversed.
    - **Inv. Max.**: The inverse of the maximum value.
    - **Inv. Abs. Max.**: The inverse of the maximum absolute value.
  - **Offset By**: Enter value to offset relative to the reference.

Add Value

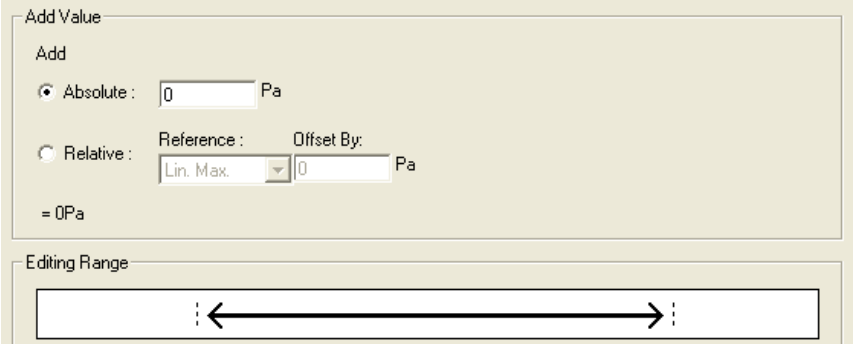
Use the *Add Value* mode to add a certain amount to each of the Y-values.

Adding a value may be useful to not only manipulate data to obtain particular results but also for visual purposes. If one likes to place an impulse response above another in the diagram, this can be achieved by temporarily adding an appropriate positive value.

Example: It is desired to visualize three impulse responses in the diagram, each 10mV on the Y-axis apart from the other. For this purpose one would add 10mV to the second data set and 20mV to the third data set.

This action can be canceled by selecting EDIT|UNDO. Furthermore it is possible to save these two editing sequences to a file and apply them again later to create an identical spacing with another set of files.

For negative values you may also use the *Subtract Value* mode.



Add

Value to be added to all data in the range determined by the settings in the *Editing Range* frame. The calculated absolute value is shown below the fields after the equals sign.

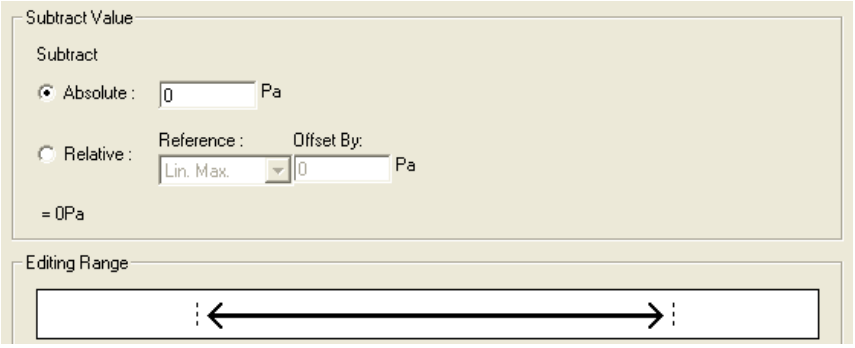
- **Absolute**: Enter the value for the editing range.
- **Relative**: Select the reference value and offset for the editing range.
  - **Reference**: Select the value to be used as a reference.

    A number of values are available for both time and frequency diagrams. See the **Set Value** mode above for the values that are available.
  - **Offset By**: Enter value to offset relative to the reference.

Subtract Value

Use the *Subtract Value* mode to subtract a certain amount from each of the Y-values. The data set may for instance be superposed by a DC component - then the mean of all Y-values could be deducted each time to remove this DC component.

Example: Subtracting the mean in the time domain with a relative offset of 0 removes the DC from the data.



Subtract

Value subtracted from all Y-values in the range determined by the settings in the *Editing Range* frame. The calculated absolute value is shown below the fields after the equals sign.

- **Absolute**: Enter the value for the editing range.
- **Relative**: Select the reference value and offset for the editing range.
  - **Reference**: Select the value to be used as a reference.

    A number of values are available for both time and frequency diagrams. See the **Set Value** mode above for the values that are available.
  - **Offset By**: Enter value to offset relative to the reference.

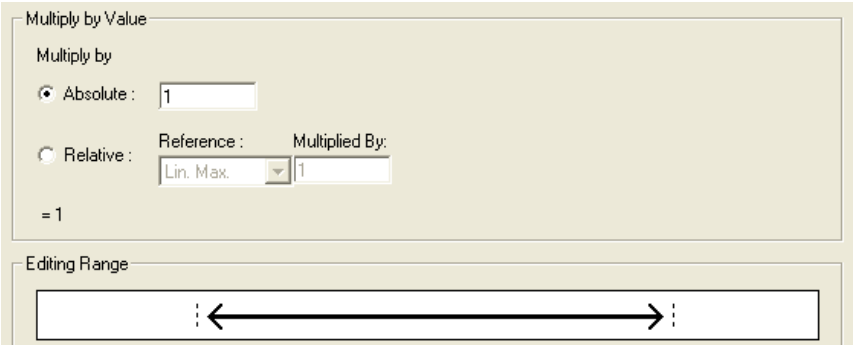
Multiply by Value

Use the *Multiply by Value* mode to multiply each of the Y-values by a certain amount.

Example: Multiplying by the inverse absolute maximum with a relative factor of 10 normalizes the data so that the absolute maximum becomes 10.

Multiplication may be useful to not only manipulate data to obtain particular results but also for visual purposes. If one likes to place an ETC or frequency response above another in the diagram, this can be achieved by temporarily multiplying by an appropriate positive value (on a logarithmic scale).

To divide by values you may also use the *Divide by Value* mode.



Multiply by

Coefficient by which all Y-values are multiplied in the range determined by the settings in the *Editing Range* frame. The calculated absolute value is shown below the fields after the equals sign.

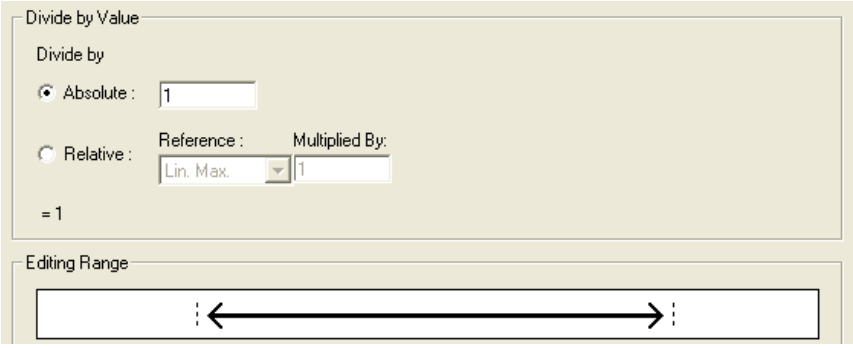
- **Absolute**: Enter the value for the editing range.
- **Relative**: Select the reference value and factor for the editing range.
  - **Reference**: Select the value to be used as a reference.

    A number of values are available for both time and frequency diagrams. See the **Set Value** mode above for the values that are available.
  - **Multiplied By**: Enter factor relative to the reference.

Divide by Value

Use the *Divide by Value* mode to divide each of the Y-values by a certain amount.

Example: Dividing by the absolute maximum with a relative factor of 1 normalizes the data so that the absolute maximum becomes 1.



Divide By

Divisor by which all Y-values are divided in the range determined by the settings in the *Editing Range* frame. The calculated absolute value is shown below the fields after the equals sign.

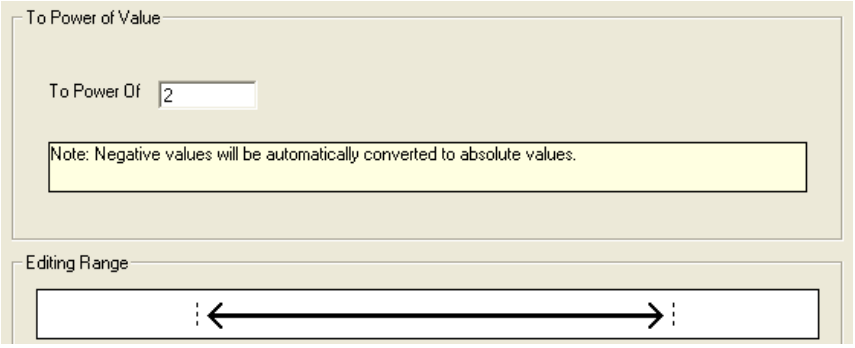
- **Absolute**: Enter the value for the editing range.
- **Relative**: Select the reference value and factor for the editing range.
  - **Reference**: Select the value to be used as a reference.

    A number of values are available for both time and frequency diagrams. See the **Set Value** mode above for the values that are available.
  - **Multiplied By**: Enter factor relative to the reference.

To Power of Value

Use the *To Power of Value* mode to exponentiate each of the Y-values by any exponent.

Example: To extract the root from an impulse response data set, the value to be entered would be 0.5. Because an impulse response usually also contains negative values, this may not be possible in the domain of real numbers. Therefore EASERA always calculates the modulus before exponentiation. First the sign is removed from any data value of the impulse response and only then the root is extracted.



To Power of

Exponent by which the respective Y-values are exponentiated in the range determined by the settings in the *Editing Range* frame. With an exponent of 2 the Y-values are squared, with an exponent of 0.5 the square root is extracted.

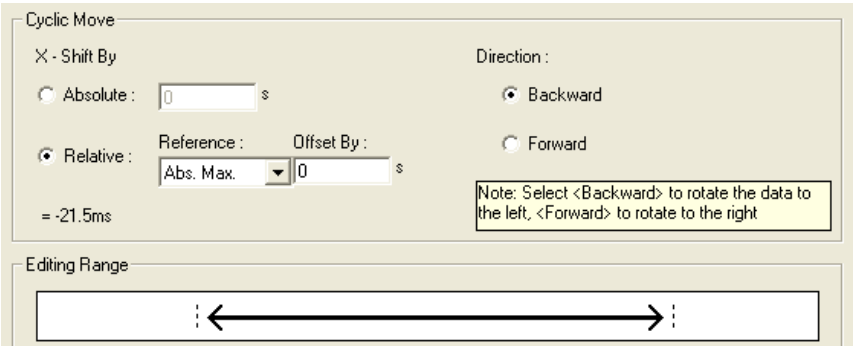
All powers are produced from the modulus so that the results always have a positive sign.

Cyclic Move

Use the *Cyclic Move* modes to move the data to the left or the right, whereby the data pushed beyond the respective margin are rejoined to the data at the opposite margin.

Example: A very typical use of *Cyclic Move* is to move the signal towards smaller times, for example to place the arrival time or the absolute maximum at zero. This can be achieved by selecting a *Delta* value of 0 and choosing the appropriate item from the *Relative To* list. Additionally the direction *Backward* must be selected. Be careful to include the whole range of X-values.

If you select EDIT|CYCLIC MOVE|MOVE ABS MAX TO ZERO these presets are made for you automatically.



X-Shift By

Differential time (or frequency) by which the data is to be moved in the range determined by the settings in the *Editing Range* frame.

- **Absolute**: Enter the amount of time / frequency for the move.
- **Relative**: Select the time / frequency reference and the offset for the move.
  - **Reference**: Select the time / frequency to be used as a reference.

The following reference locations are available for both time and frequency diagrams:

- **Start**: The first sample in the diagram.
- **Stop**: The last sample in the diagram.
- **Lin. Max.**: The sample with the maximum linear value.
- **Lin. Min.**: The sample with the minimum linear value.
- **Abs. Max.**: The sample with the maximum absolute value.
- **Half**: The sample that is halfway between the first and last sample.

The following reference location is available for time diagrams:

- **Arrival**: The sample where the signal exceeds the noise by a certain value (by default 35 dB). The threshold can be set in the ***Options (F9)*** dialog box on the PROCESSING | PROCESSING page in the *Arrival Time* section.

o **Offset By**: Enter time offset relative to the reference.

Direction

Direction to move the data in the range determined by the settings in the *Editing Range* frame.

- **Backward**: Moves the data to the left, i.e. towards the beginning of the file.
- **Forward**: Moves the data to the right, i.e. towards the end of the file.

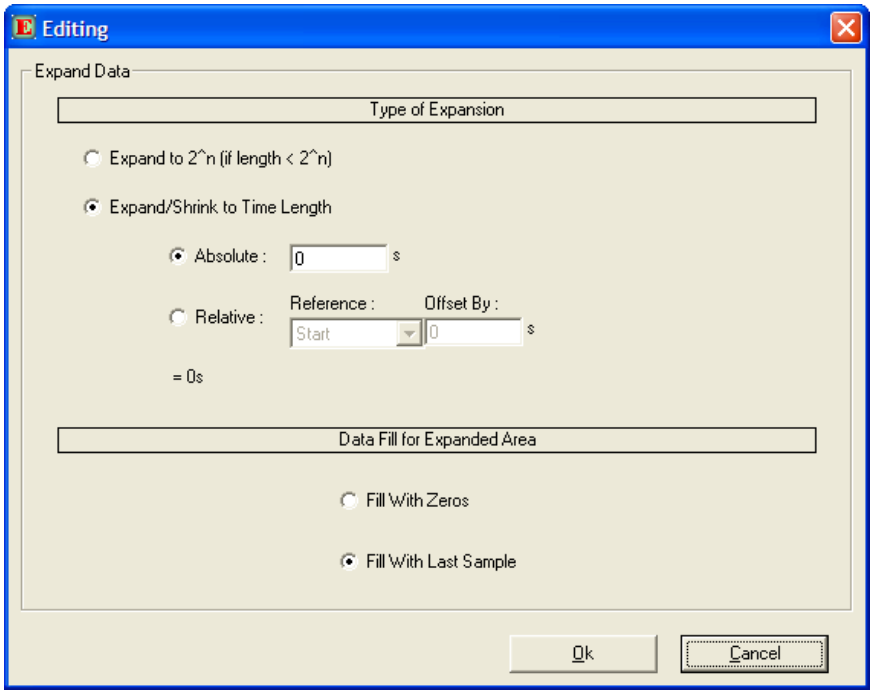
Expand Data

Use the *Expand Data* mode to artificially lengthen or shorten the file.

This mode is especially useful in two cases:

In the first case you may have imported an impulse response that does not have a length that is a power of 2. Because a Fast Fourier Transform (FFT) cannot be applied in that case, it may be beneficial to extend the data to the next number of samples that is a power of 2. (But be careful not to introduce additional artifacts in the frequency domain. Always make sure that the Y-difference from the last valid sample to the added samples is small.)

In the second case you may have measured an impulse response and windowed it to obtain only the direct sound or some reflections. In order to not always process the full length where a great part does not contain any valuable information, you may want to shorten the impulse response accordingly. This will speed up all successive calculations and reduce the disk space consumed when saving the file to the hard disk. (But be careful not to introduce additional artifacts in the frequency domain. Place an appropriate window in order to smoothen the transition between the new start and the new end.)



Type of Expansion

- **Expand to 2^n**: Adds the number of samples needed to expand the file length to the power of 2 of the FFT-order, so as to obtain the number of samples required for a Fast Fourier Transformation (FFT).
- **Expand / Shrink to Time Length**: Time to which the file is to be lengthened or shortened.
  - **Absolute**: Enter the amount of time for the move.
  - **Relative**: Select the time reference and offset for the move.
    - **Reference**: Select the time to be used as a reference.

      The following reference locations are available:
      - **Start**: The first sample in the diagram.
      - **Stop**: The last sample in the diagram.
      - **Lin. Max.**: The sample with the maximum linear value.
      - **Lin. Min.**: The sample with the minimum linear value.
      - **Abs. Max.**: The sample with the maximum absolute value.
      - **Half**: The sample that is halfway between the first and last sample.
      - **Arrival**: The sample where the signal exceeds the noise by a certain value (by default 35 dB). The threshold can be set in the ***Options (F9)*** dialog box on the PROCESSING | PROCESSING page in the *Arrival Time* section.
    - **Offset By**: Enter time offset relative to the reference.

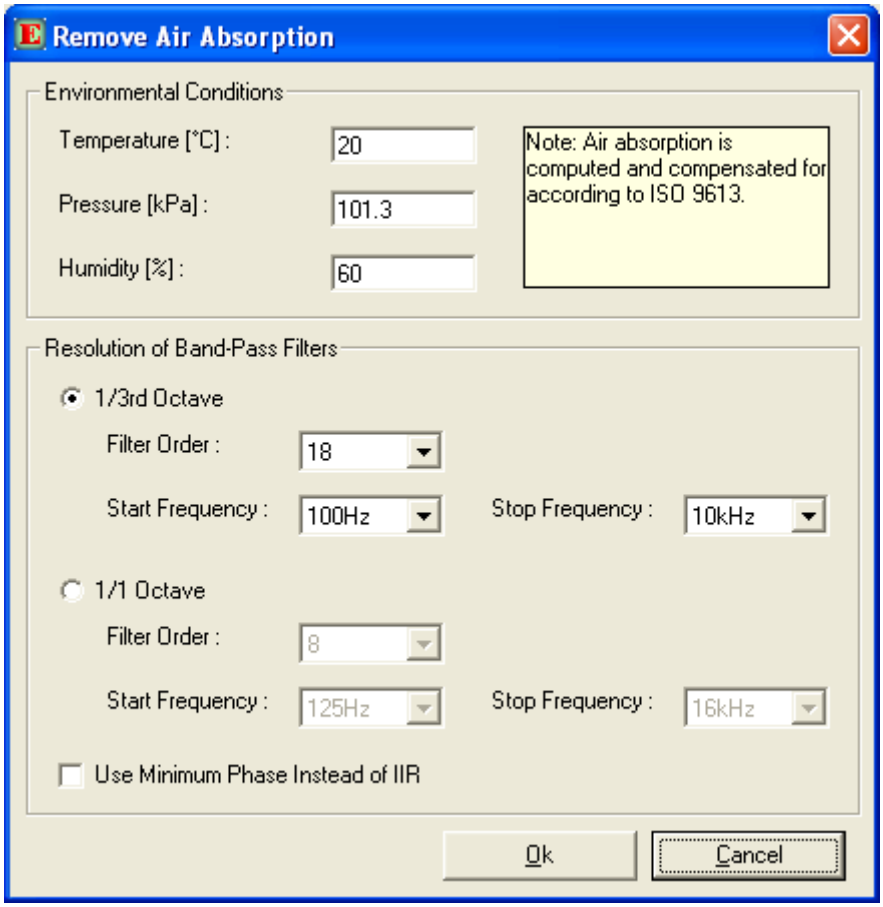
Data Fill for Expanded Area

- **Fill With Zeros**: If the file is lengthened, the additional samples are filled with zeros.
- **Fill With last Sample**: If the file is lengthened, the additional samples are filled with the value of the last sample in the existing data.

Remove Air Absorption Window

Use the ***Remove Air Absorption*** window to compensate air attenuation effects in the impulse response based on the model of ISO 9613. This is particularly important for scale model measurements with air being the propagation medium.

Notice that air attenuation can assume very high values at high frequencies. If the signal-to-noise ratio of the measurement is too low the noise floor at the end of the impulse response will be amplified dramatically.



Ok

Confirms the settings and closes dialog window.

Cancel

Rejects the settings and closes dialog window.

Environmental Conditions

In order to compensate for the attenuation of sound waves propagating through air, the parameters of the transmission medium during the measurement have to be specified. These parameters are used to calculate the air absorption as a function of frequency and distance according to ISO 9613 and to remove it from the impulse response for each sample.

Notice that the propagation distance is derived from the time of each sample in the impulse response using a value for the speed of sound that is calculated based on the given temperature.

Temperature [°C]

Air temperature during the measurement.

Pressure [kPa]

Air pressure during the measurement.

Humidity [%]

Air humidity during the measurement.

Resolution of Band-Pass Filters

The effects of air attenuation must be compensated in a manner that is both time-dependent and frequency-dependent. For this reason, the removal of absorption effects is performed for each frequency band individually. In this context the air attenuation is assumed to be constant throughout the frequency band.

1/3rd Octave, 1/1 Octave

Defines the bandwidth of the frequency bands.

Filter Order

Sets the slope of the band-pass filter.

Start Frequency

Sets the first frequency band that is subjected to the compensation routine.

Stop Frequency

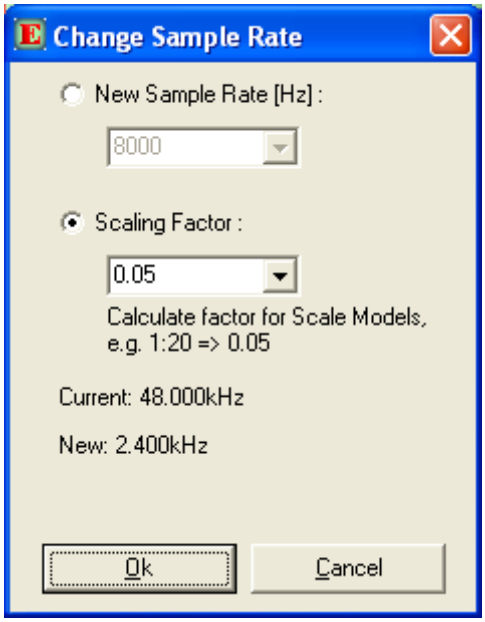
Sets the last frequency band that is subjected to the compensation routine.

Use Minimum Phase Instead of IIR

Instead of standard Butterworth IIR band-pass filters, minimum phase filters can be used as well.

Change Sample Rate Window

Use the ***Change Sample Rate*** window in order to change the sample rate of the measurement to another value. This is particularly important for scale model measurements which are usually performed at a higher sample rate and then scaled down by a factor of e.g. 1:10.



Ok

Confirms the settings and closes dialog window.

Cancel

Rejects the settings and closes dialog window.

New Sample Rate [Hz]

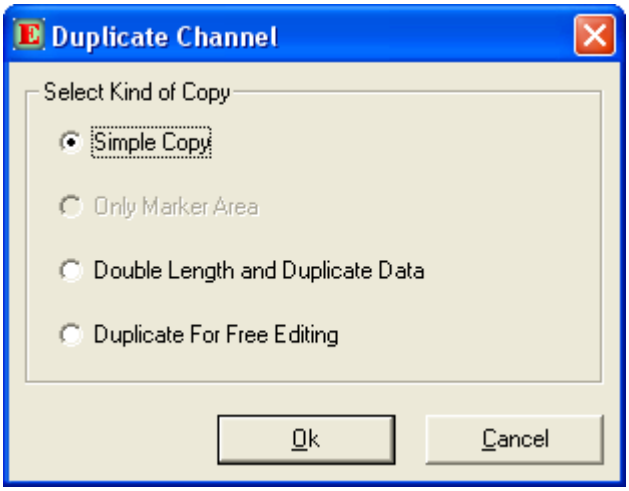
Select the new sample rate from a list of predefined values or enter a user-defined value in Hz.

Scaling Factor

Enter a scaling factor in order to apply it to the current sample rate of the measurement. For example, applying a factor of 0.1 to a measurement performed at 96 kHz will change the sample rate to 9600 Hz.

Duplicate Channel Window

Use the ***Duplicate Channel*** dialog box when a file is to be duplicated.



Select Kind of Copy

The following copying possibilities are available:

Simple Copy

One copy is made and created as a new file.

Only Marker Area

Only the range between the markers is copied to the new file.

Double Length and Duplicate Data

The length of the data set is doubled and the content of the file is duplicated on the time axis.

Duplicate For Free Editing

The file is copied and created as a new data set, and the new file name then contains the indication *For Free Editing*.

EASERA normally keeps the calculated data consistent. A change in the frequency response, for instance, is recalculated to the impulse response. Operations which would lead to data inconsistencies are therefore blocked. In order to enable such operations, the data have to be copied *For Free Editing*. EASERA will then dispense with maintaining data consistency.

Channel Editing Window

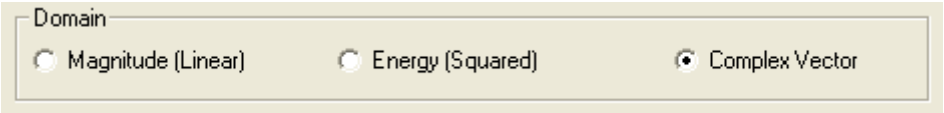
The ***Channel Editing*** dialog box is used when two or more channels are going to be linked by a mathematical operation. All these calculations are computed using the linear data. A new file is created as a new data set, and the new file name then contains an the indication of the type of mathematical operation used to derive the result. Depending on which type of operation is about to be processed, the ***Channel Editing*** window assumes different layouts.

The possible modes are:

- *Division of Channels*
- *Average of Channels*
- *Sum of Channels*
- *Subtraction of Channels*
- *Multiplication of Channels*

Domain

In the three modes *Average*, *Sum*, and *Subtraction (of Channels)*, the processing can use one of three possible summation modes for calculations performed in the frequency domain. This frame is not shown when processed in the time domain.



Magnitude (Linear)

The amplitudes of the channels involved are combined and if the *Average* mode was selected, then the result is divided by the number of channels. The result has a phase angle of 0 and the imaginary part is therefore also 0 for all X-axis values.

This corresponds to a coherent addition, that does not consider the phase of the original data sets.

Energy (Squared)

The amplitudes of the channels involved are energetically computed (i.e. the individual values are squared and summed, the result is divided by the number of channels (only for the *Average* mode), and then the square root is performed). The result has a phase angle of 0 and the imaginary part is therefore also 0 for all X-axis values.

This corresponds to an energetic addition, that does not consider the phase of the original data sets.

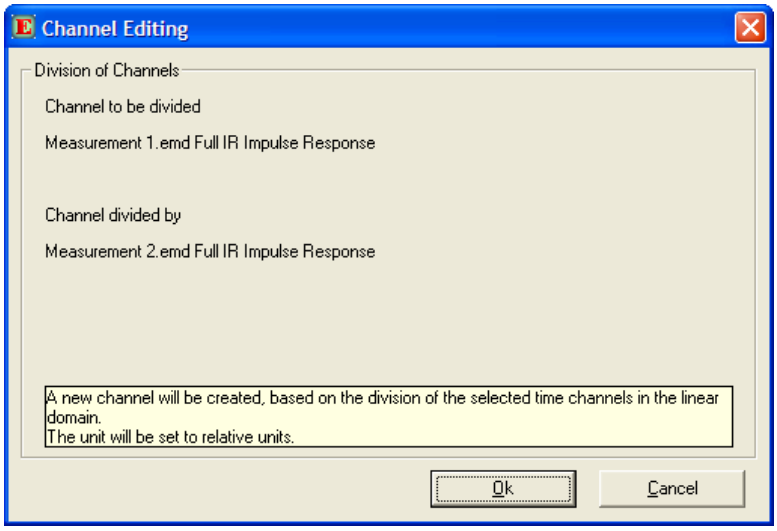
Complex Vector

The vectors of the individual channels are added and if the *Average* mode was selected, then the result is divided by the number of channels. The result has a phase angle computed from the selected channels and therefore it includes an imaginary part.

This corresponds to a complex addition (similar to the summing that occurs in a mixing console), also taking into account the original phase of the original data sets.

Division of Channels

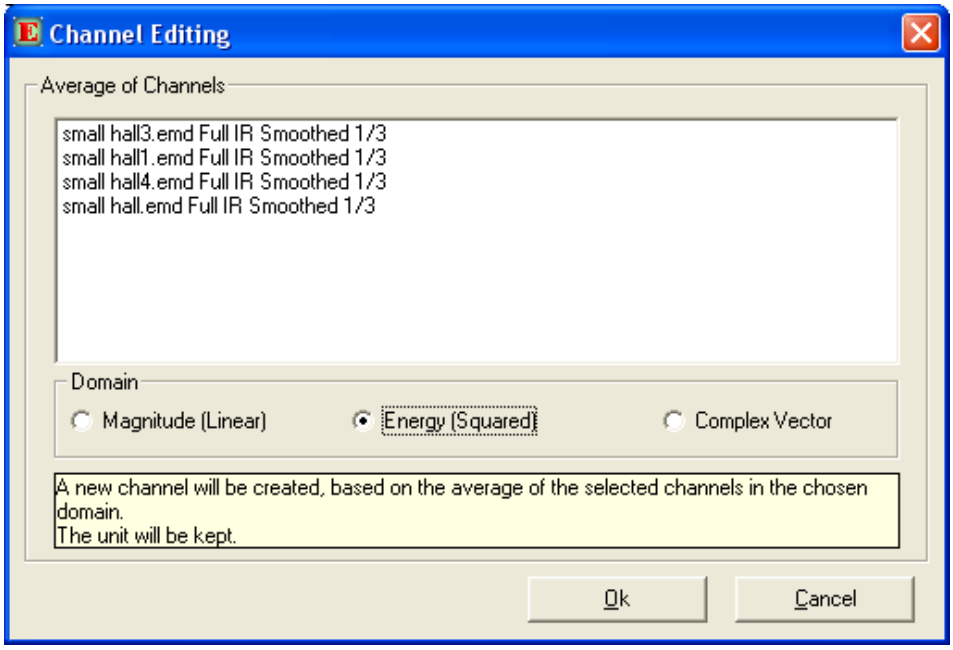
Divides the first channel by the second channel, the result is the level difference.



In the frequency domain, a complex division will be performed.

Average of Channels

Produces the average of two or more channels.

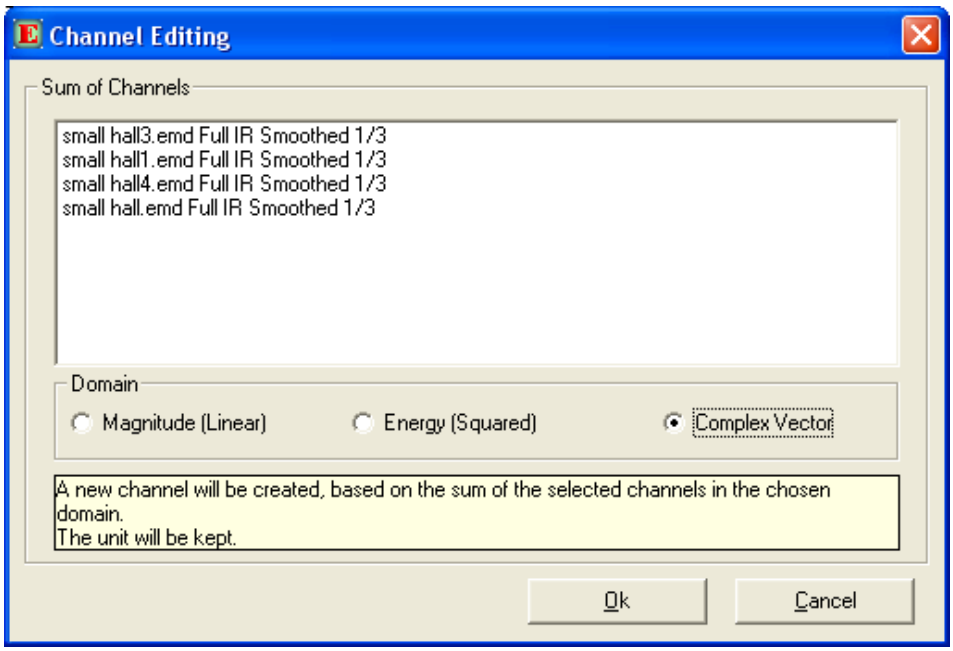


In the frequency domain (shown above), the averaging mode can be selected.

See also: Domain

Sum of Channels

Produces the sum of two or more channels.

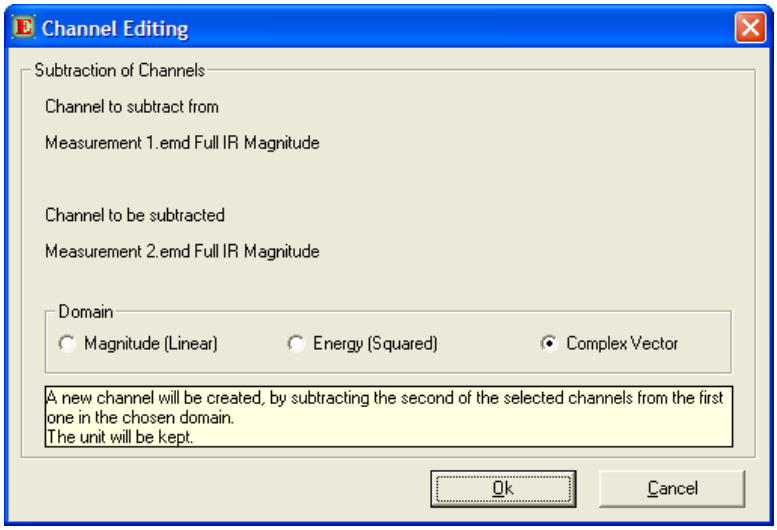


In the frequency domain (shown above), the averaging mode can be selected.

See also: Domain

Subtraction of Channels

Produces the difference between two channels.

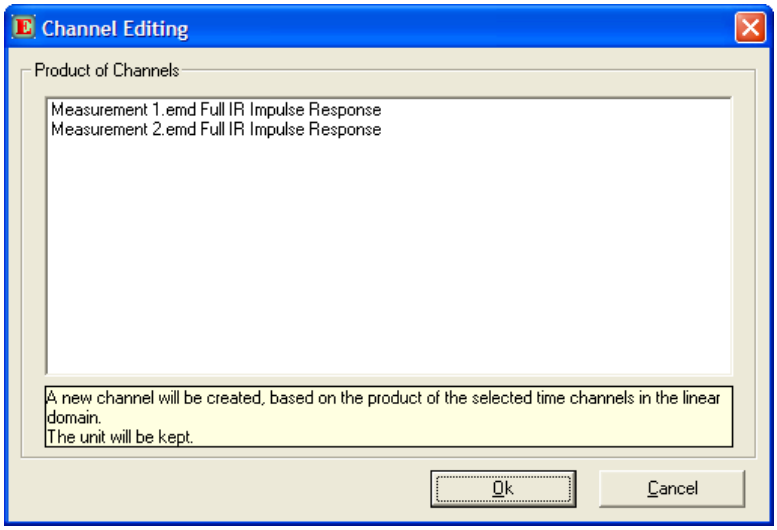


In the frequency domain (shown above), the averaging mode can be selected.

See also: Domain

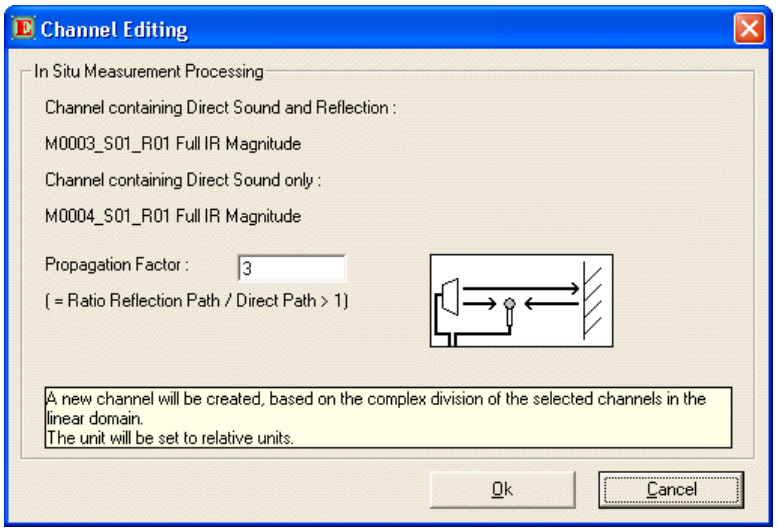
Product of Channels

Forms the product of two or more channels. The result is a level addition.



In the frequency domain, a complex multiplication will be performed.

In Situ Measurement Processing



This option allows the absorption behavior of materials already built in to be determined. There are two measurements that need to be done:

With the first measurement a loudspeaker is aimed at the surface to be measured, and the measurement microphone is placed between the loudspeaker and the surface. The distance of the loudspeaker from the surface is chosen so that the bulk of the sound energy hits the surface. This distance shall, however, be as large as possible, while fulfilling this condition.

With the second measurement the loudspeaker-microphone setup is arranged for free-field or large-room-volume measurement.

By comparison with the direct sound, the sound reflected by the surface covers a longer distance to the microphone and its level is therefore lower. For eliminating this level difference from the results, the path-length ratio has to be entered as the *Propagation Factor*.

With the first and second measurements all signal components arriving after the direct sound or after the reflection, respectively, need to be reduced by a window. The size of the window is determined by the lower limiting frequency.

If the direct sound impulse response and the reflections are clearly separable, the transfer function may also be determined by a single measurement. In this case the data needs to be duplicated, and the first data set windowed to include only the direct sound and the second data set windowed to include both the direct sound and the reflections of the surface under test. The size of the window is determined by the respective lower limiting frequency.

The result obtained with EASERA is the complex transfer function of the material of the reflecting surface. (The frequency response may then be passed on for further evaluation and computation of the absorption coefficients outside of EASERA by exporting the spectrum data.)

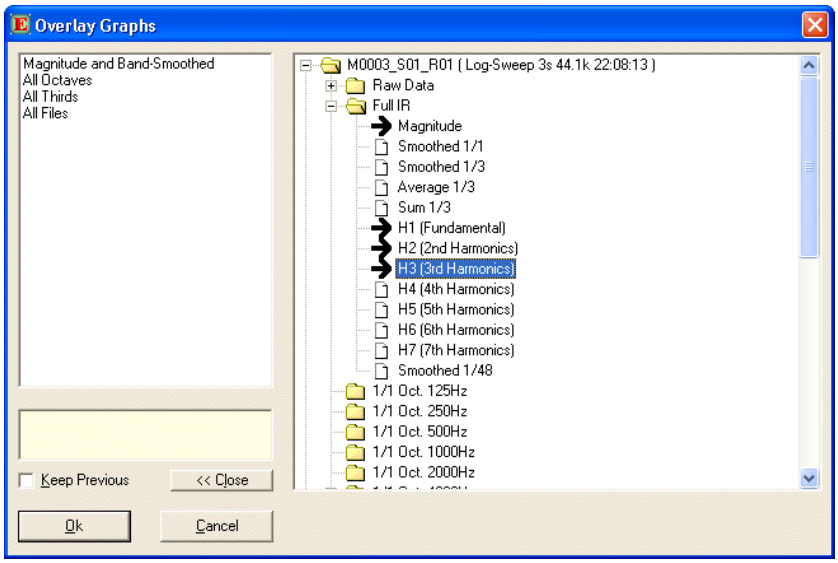
OK

Closes the window and processes the data.

Cancel

Closes the window without processing the data.

Overlay Graphs Window



To enable EASERA to show several curves simultaneously, overlays are formed.

On principle, there are two ways of forming such an overlay: On the one hand one may use the function *Add to Overlay* each time for adding a new curve to the ones already existing.

On the other hand one may open the ***Overlay Graphs*** dialog box: Here you can choose from the available overlays, but you may also compile your own overlay from all the results calculated so far.

Keep Previous

When the option *Keep Previous* is activated, the selected curves are added to the existing ones, otherwise they are replaced.

Select/Close

Opens and closes the tree view for choosing the individual curves of an overlay.

OK

Closes the window and shows the selected overlay.

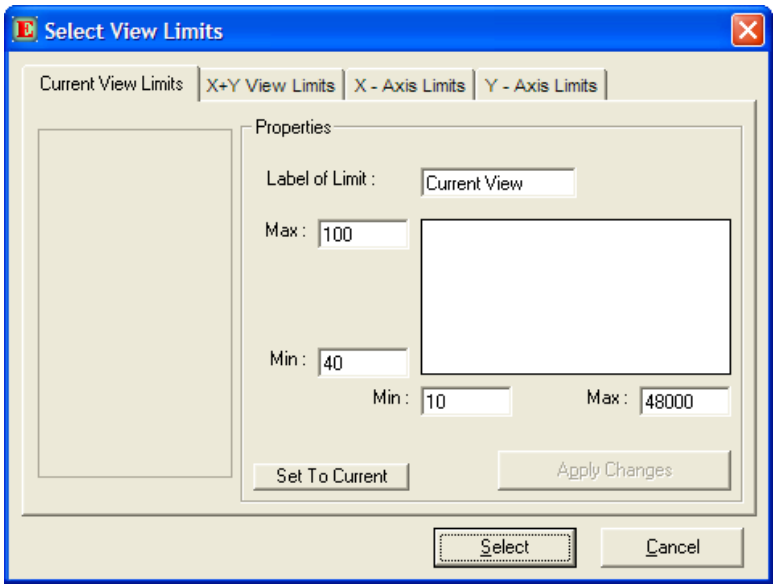
Cancel

Closes the window without changing the display.

Select View Limits Window

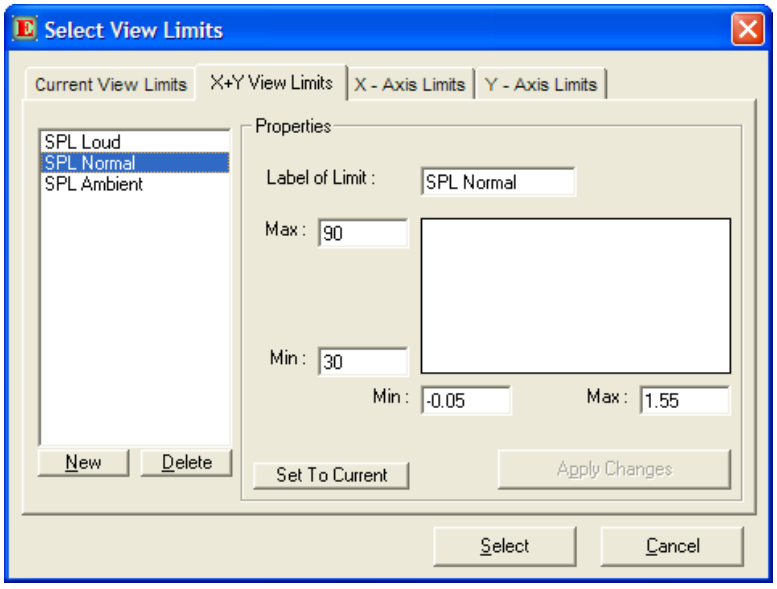
In EASERA it is possible to store and recall the limits of the diagram using the ***Select View Limits*** dialog box.

Current View Limits



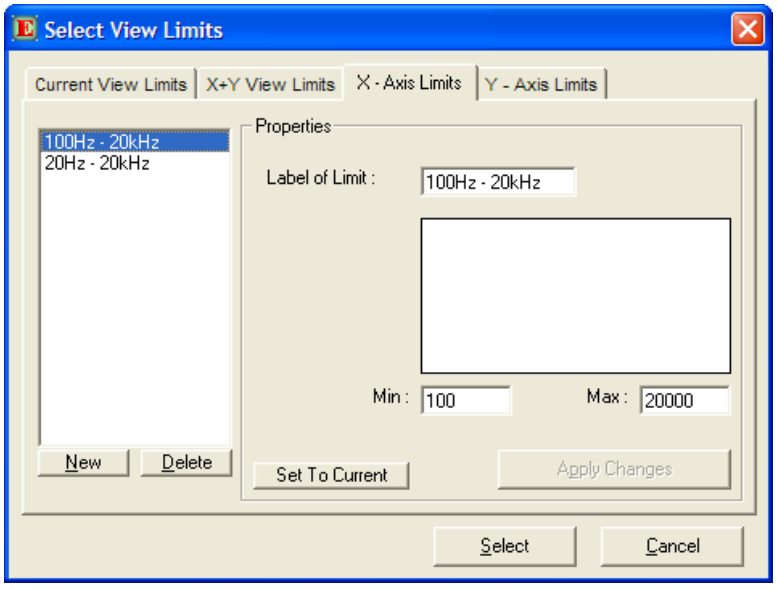
Sets the limits of the diagram without storing them.

X+Y View Limits



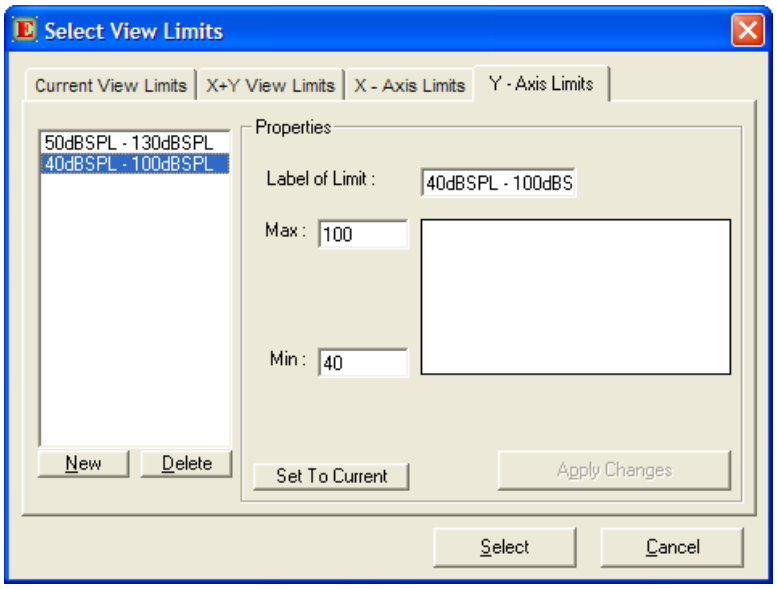
Sets the X- and Y-limits of the diagram. The limits are stored as permanent limits and may later on be recalled.

X-Axis Limits



Sets only the X-limits of the diagram. The limits are stored as permanent limits and may later on be recalled.

Y-Axis Limits



Sets only the Y-limits of the diagram. The limits are stored as permanent limits and may later on be recalled.

New

Creates a new data set. Depending on the tab chosen, the data set contains the limits for the x-axis, the y-axis or for both axes.

Delete

Deletes the chosen data set.

Label of Limit

Name of the data set.

Max

The upper or right limit.

Min

The lower or left limit.

Set To Current

Sets the limits to the values of the current diagram.

Apply Changes

Writes the changes into the data set.

Select

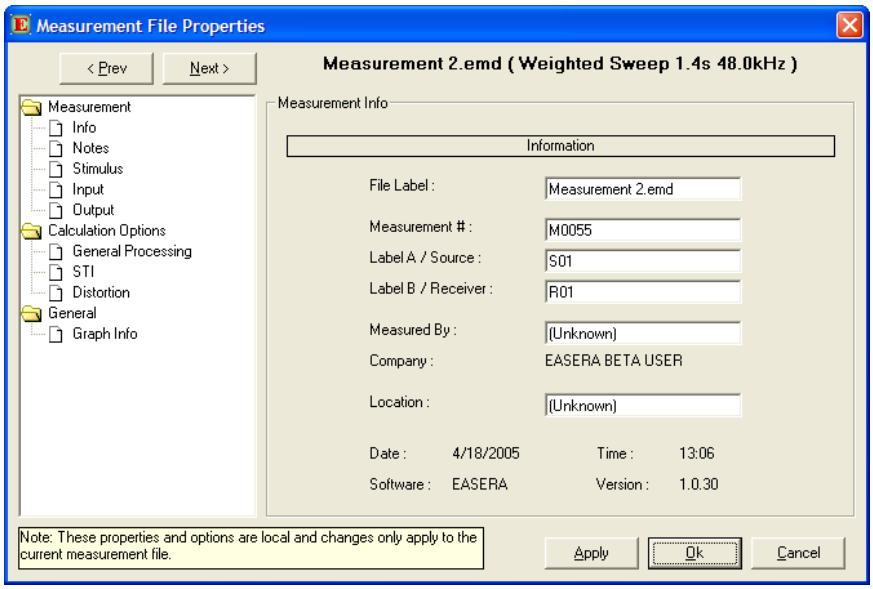
Closes the dialog and accepts the limits of the chosen data set.

Cancel

Closes the dialog and leaves the limits unchanged.

Measurement File Properties Window

In the ***Measurement File Properties*** dialog box you may have a look into the details of the current data set and modify them. The changes apply only to the selected file. This window may also be opened by pressing F4.



< Prev

Selects the previous channel in the list of measurements.

Next >

Selects the next channel in the list of measurements.

Apply

Writes the changes into the current data set and updates the display in the EASERA main window.

OK

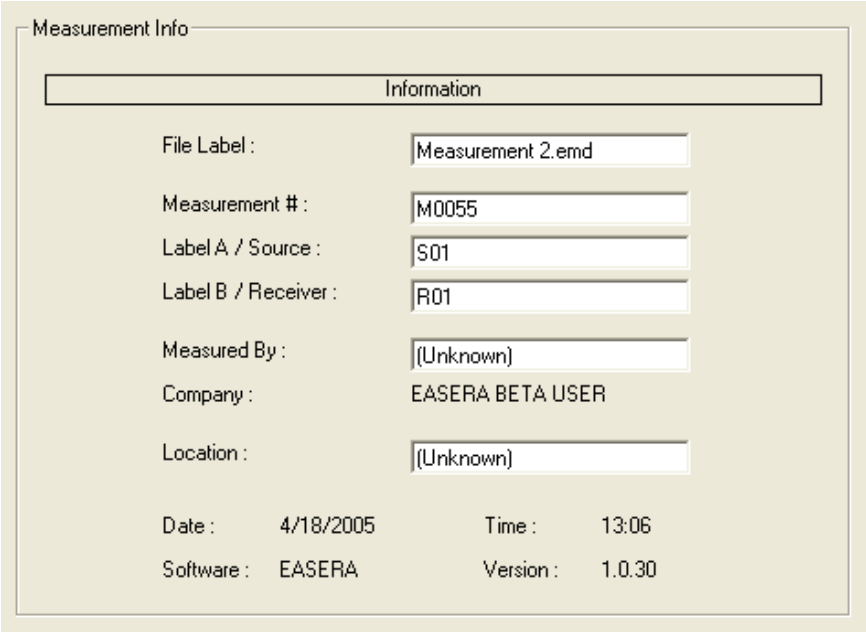
Closes the window and accepts the changes.

Cancel

Closes the window and rejects the changes.

Info

This frame shows information about the software used for the measurement and allows viewing and editing of the labels for the data set.



File Label

Name used when displaying and saving the measurement file.

Measurement #

Number and general label of the measurement.

Label A / Source

Designation for the source or the measurement situation.

Label B / Receiver

Designation for the receiver or the measurement situation.

Measured By

Name of the person performing the measurement.

Company

Company (read only).

Location

Location of the measurement.

Date

Date of the measurement (read only).

Time

Time of the measurement (read only).

Software

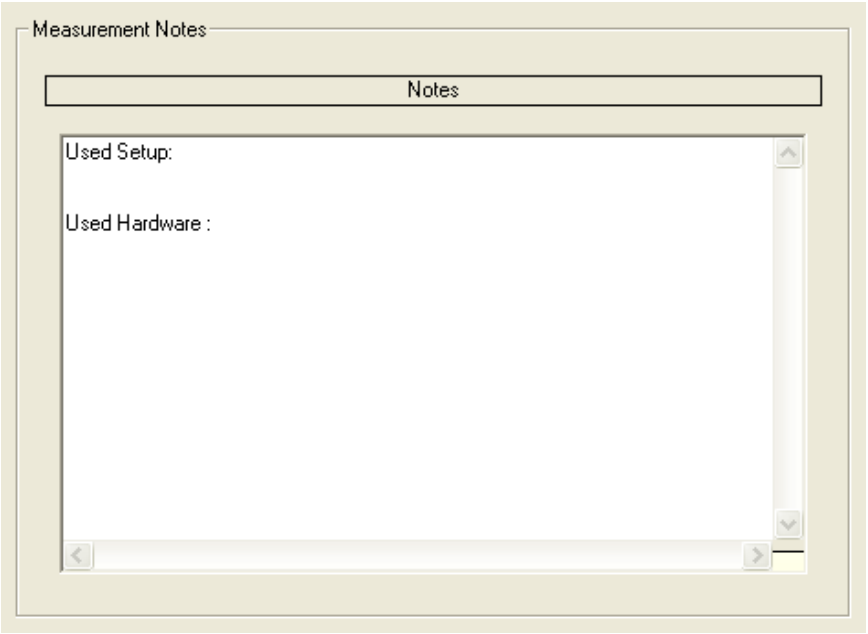
Designation of the software (read only).

Version

Version of the software (read only).

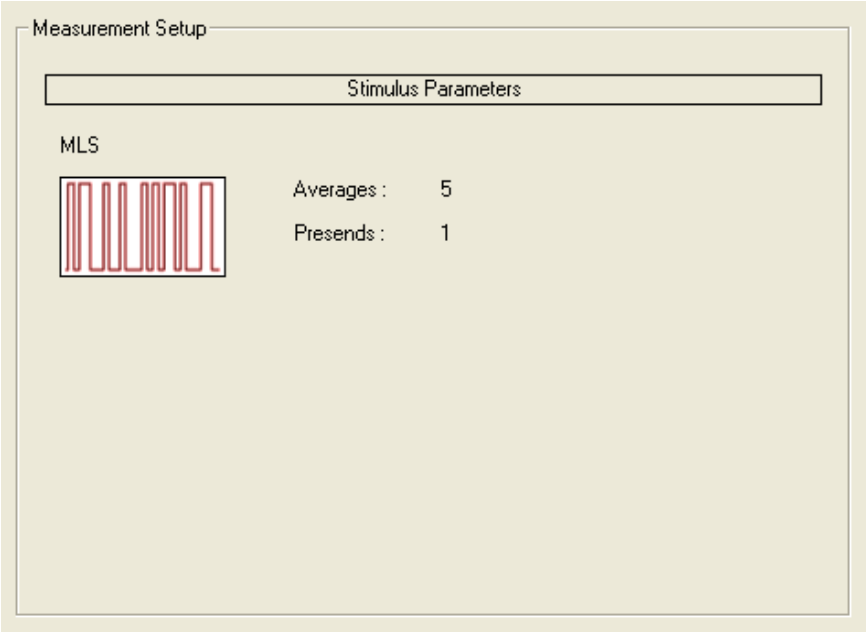
Notes

This frame shows allows viewing and editing of the field for freely formulated notes.



Stimulus

This frame shows information on the stimulus signal used:



Averages

Number of averaged measurements.

Presends

Number of present stimulus signals.

Start Frequency

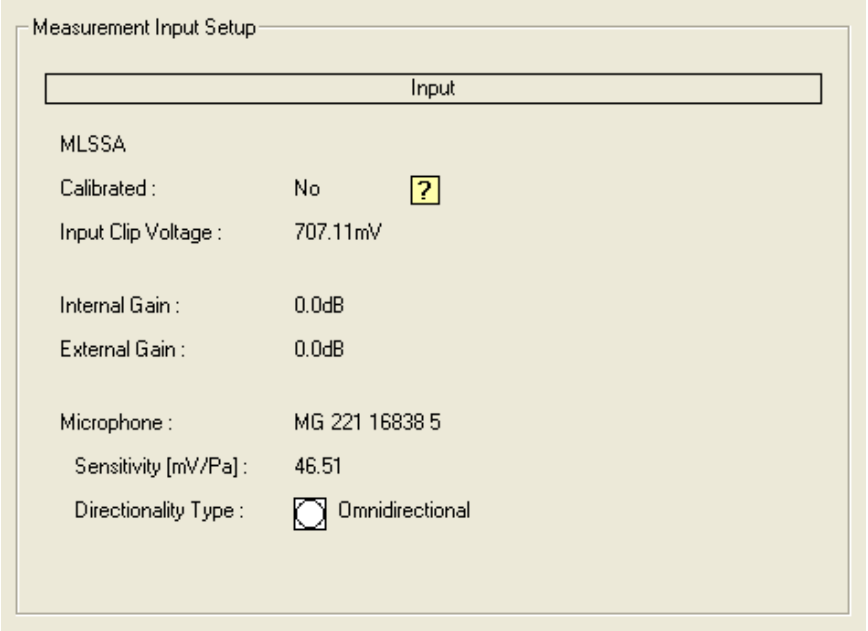
Start frequency (with sweep signals).

Stop Frequency

Final frequency (with sweep signals).

Input

This frame shows information on the initial configuration during the measurement:



Calibrated

Was the input calibrated or not.

Input Clip Voltage

Voltage at which the input had become clipped.

Internal Gain

Gain setting of the soundcard.

External Gain

Gain setting of external hardware.

Microphone

Microphone label.

Sensitivity

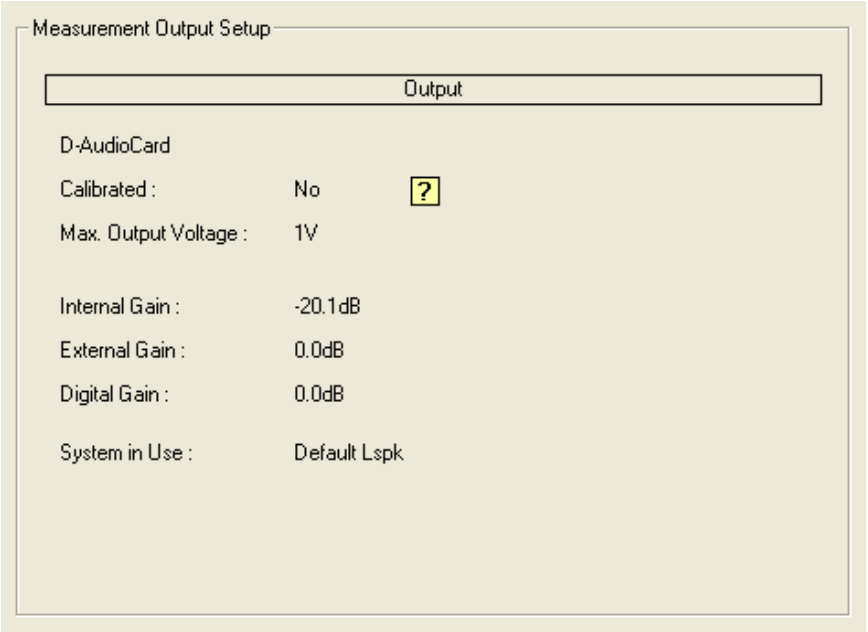
Microphone sensitivity.

Directionality Type

Directional characteristic of the microphone.

Output

This frame shows information on the output configuration:



Calibrated

Was the input calibrated or not.

Max. Output Voltage

Clipping threshold of the output.

Internal Gain

Gain setting of the soundcard.

External Gain

Gain setting of external hardware.

Digital Gain

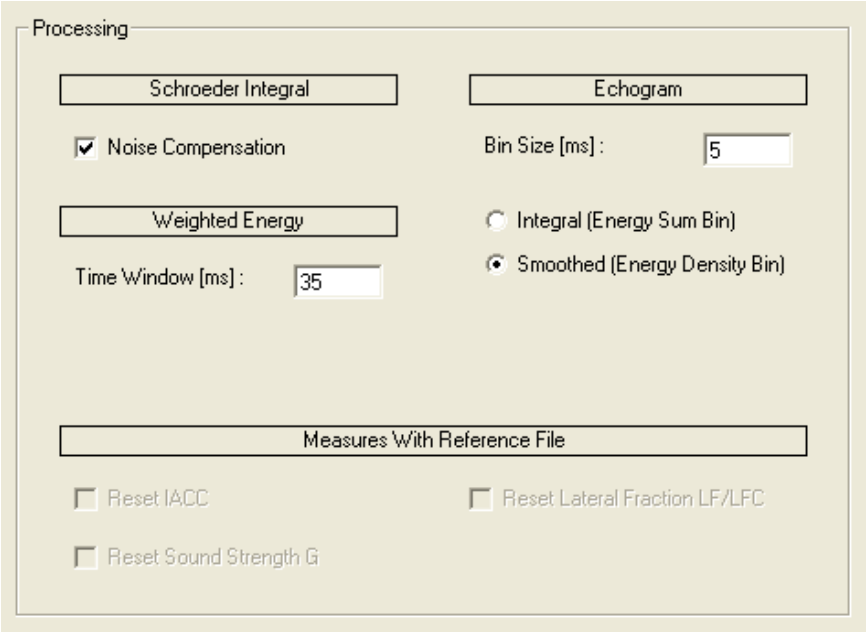
Gain setting of excitation signal.

System in Use:

Name of the system used.

General Processing

This frame allows viewing and editing of general adjustments for the processing:



Schroeder Integral

The following option is available:

Noise Compensation

Noise compensation during execution of the Schroeder integral.

Weighted Energy

The following option is available:

Time Window

Time window during formation of the weighted energy.

Echogram

Echogram settings. The following options are available:

Bin Size

Evaluation step during generation of the echogram.

Integral (Energy Sum Bin)

Generates the echogram as a sum of the energy components in the respective period.

Smoothed (Energy Density Bin)

Generates the echogram as an average of the energy components in the respective period.

Measures with Reference File

Reset the reference file. The following options are available:

Reset IACC

When the interaural cross correlation for a data set is first selected, a second data set needs to be chosen as a reference. If later on another data set is to be used as the reference, the existing reference has to be reset here first.

Reset Sound Strength G

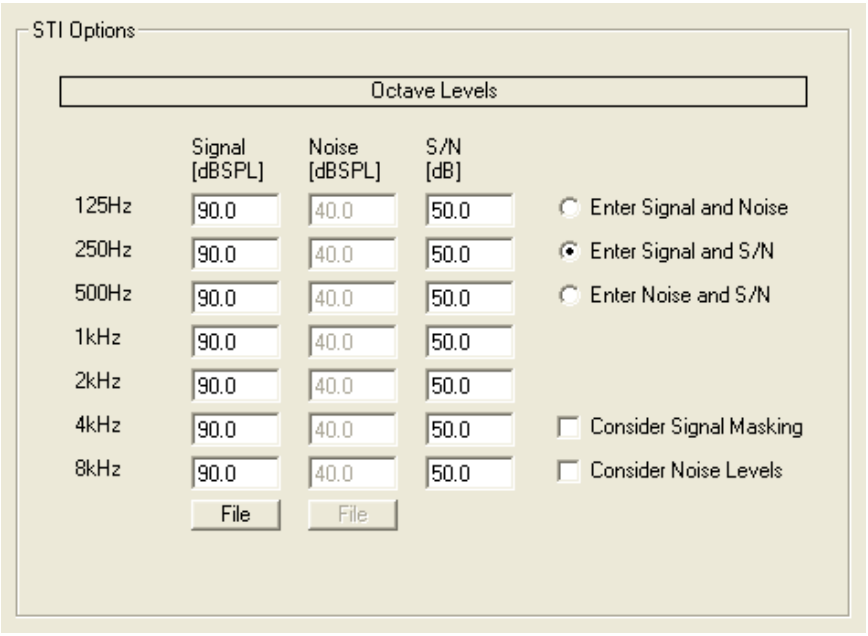
When the *Strength G* for a data set is first selected, a second data set needs to be chosen as a reference. If later on another data set is to be used as the reference, the existing reference has to be reset here first.

Reset Lateral Fraction LF / LFC

When the *Lateral Fraction* for a data set is first selected, a second data set needs to be chosen as a reference. If later on another data set is to be used as the reference, the existing reference has to be reset here first.

STI

This frame allows viewing and editing of the STI calculation parameters for the data set.



Octave Levels

If masking effects or ambient noise are to be taken into account when determining speech intelligibility, these values have to be ascertained in advance and entered here. The following modes may be used:

Enter Signal and Noise

The octave spectra of the signal and the ambient noise are entered.

Enter Signal and S/N

The octave spectra of the signal and the signal-to-noise ratio are entered.

Enter Noise and S/N

The octave spectra of the ambient noise and the signal-to-noise ratio are entered.

Consider Signal Masking

Considers masking effects when calculating speech intelligibility. Since these masking effects depend on the signal strength, this has to be entered under *Octave Levels*.

Consider Noise Levels

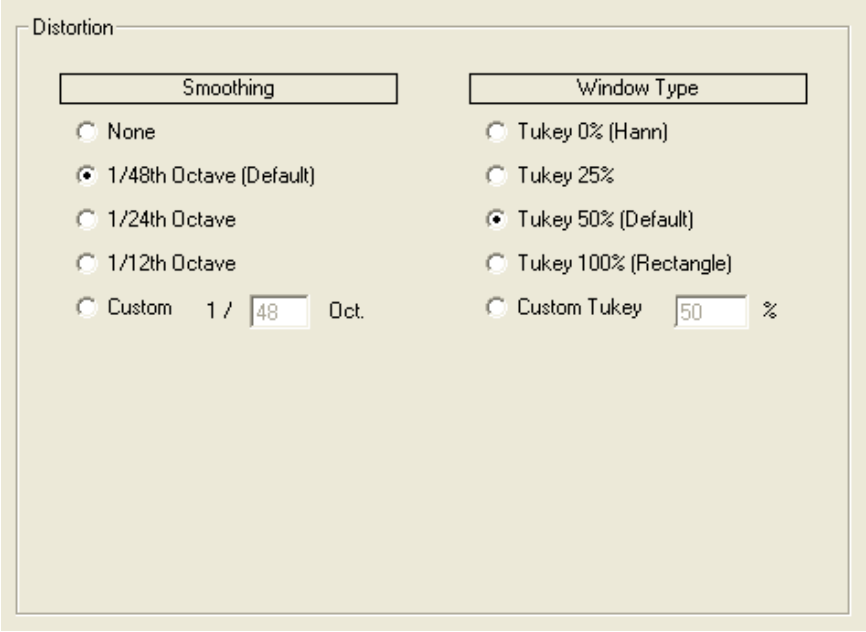
Considers the reduction of speech intelligibility by ambient noise. This noise has to be entered under *Octave Levels*.

File

Opens an EASERA Live Spectrum (els) format file saved from the ***Live*** tab.

Distortion

This frame allows viewing and editing of the distortion calculation parameters for the data set.



Smoothing

Smoothing of the curve. The following options are available:

None

No smoothing.

1/48th octave (Default)

Smoothing to one 48th octave.

1/24th octave

Smoothing to one 24th octave.

1/12th octave

Smoothing to one 12th octave (half tone or minor second).

Custom

Smoothing to a freely chosen fraction of an octave.

Window Type

FFT-window. The following options are available:

Tukey 0 % (Hann)

Tukey filter with a constant range of 0% (corresponds to a Hann window).

Tukey 25%

Tukey filter with a constant range of 25%.

Tukey 50 % (Default)

Tukey filter with a constant range of 50% (this is the default).

Tukey 100 % (Rectangle)

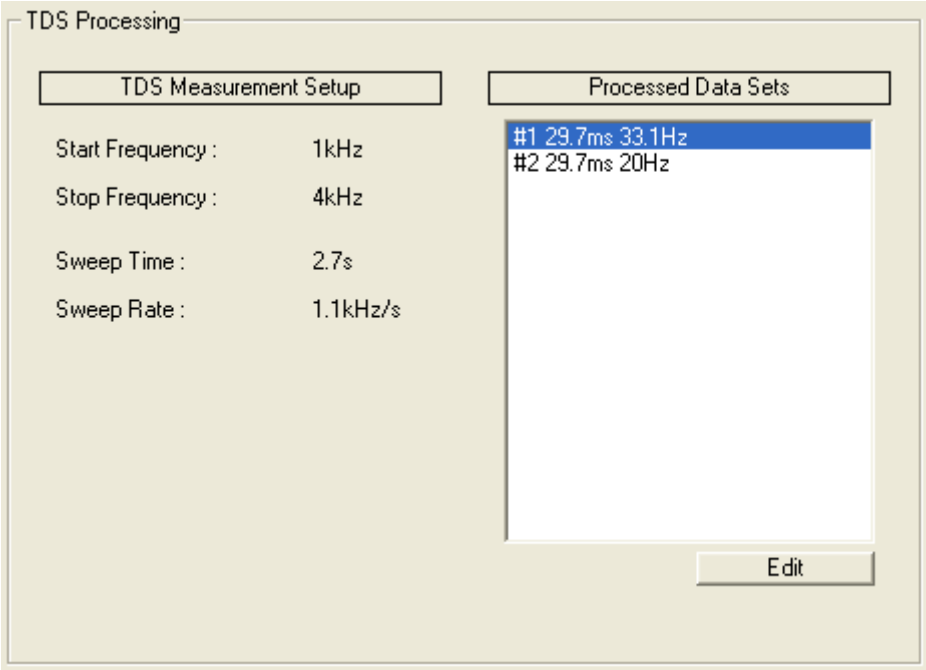
Tukey filter with a constant range of 100% (corresponds to a rectangular window).

Custom Tukey

Tukey filter with a freely selectable constant range.

TDS Processing

When a TDS-file is processed, the appertaining parameters may be viewed and edited in this frame. ***This option is available only if a TDS-file is selected.***



TDS Measurement Setup

Start Frequency [Hz]:

Start frequency.

Stop Frequency [Hz]:

Final frequency.

Sweep time [s]:

Duration of the Sweep in seconds.

Sweep Rate [Hz/s]:

Sweep duration in a specific frequency range.

Processed Data Sets

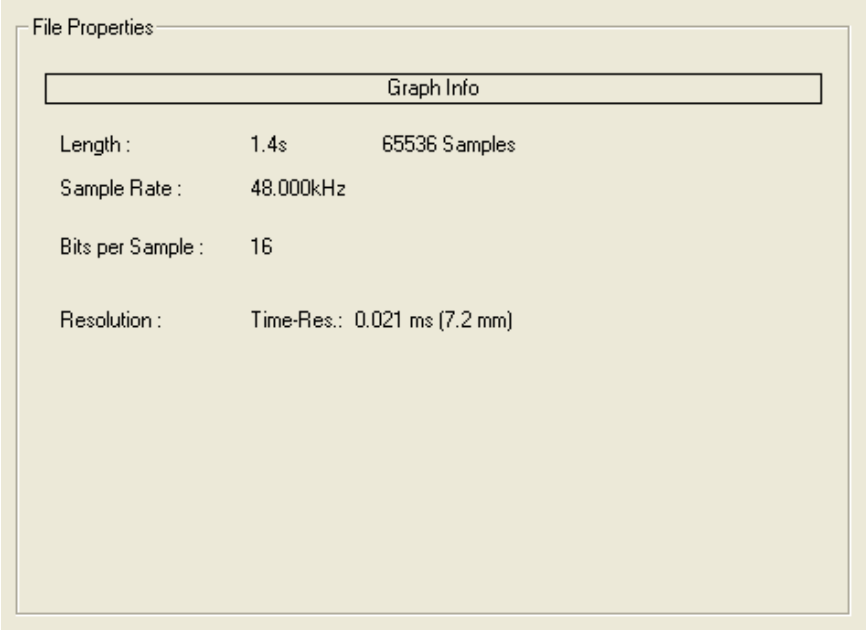
A list of processed data sets that can be opened using the **Edit** button.

Edit:

Opens the ***TDS Post Processing*** dialog box with the selected processed data set.

Graph Info

This frame shows information on the measured curve:



Length

The duration of the measurement in seconds and samples.

Sample Rate

Sampling frequency of the AD converter used.

Bits per Sample

Resolution of the AD converter.

Resolution

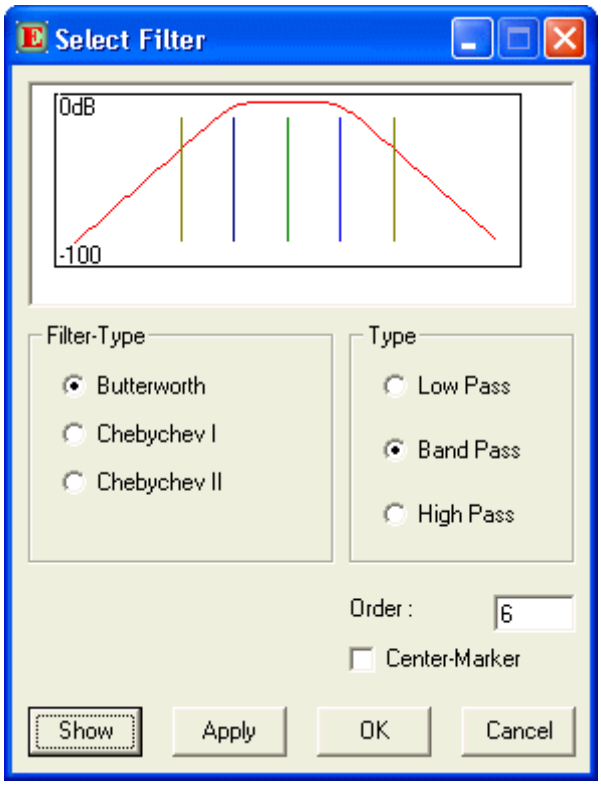
With time-axis diagrams: Reciprocal value of the sample rate, thus the duration of a sample.

With frequency-axis diagrams: Quotient of sample rate divided by the number of samples, thus the smallest frequency step.

Select Filter Window

Use the ***Select Filter*** dialog box to generate freely definable highpass, lowpass and bandpass filters. Before applying these filters the limit frequencies need to be set by the markers.

It is possible to apply various filters consecutively, which are all simultaneously active.



Filter-Type

There are three filter types available:

- **Butterworth**: Maximally flat filter in the passband and stopband.
- **Chebychev I**: Has ripple in the passband and is flat in the stopband.
- **Chebychev II**: Flat in the passband and is has ripple in the stopband.

Type

There are three pass-band types available:

- **Lowpass**: Uses the right marker to specify the upper band limit.
- **Bandpass**: Uses both markers to specify the band limits.
- **Highpass**: Uses the right marker to specify the lower band limit.

Order

Specify here the order of the filter. The slope steepness outside of the transmission range amounts to 6dB / octave and filter order. Thus a filter of the 6^{th} order has a slope steepness of 36 dB.

Center Marker

With bandpasses the lower and upper limit frequencies are generally specified by means of the markers. If the option *Center Marker* is activated, the center frequency is set by the left marker and the upper limit frequency by the right marker. The lower limit frequency is then computed from the upper limit frequency and the center frequency.

Show

Inserts the filter curve into the diagram.

Apply

Accepts the settings.

Ok

Closes the window and accepts the changes.

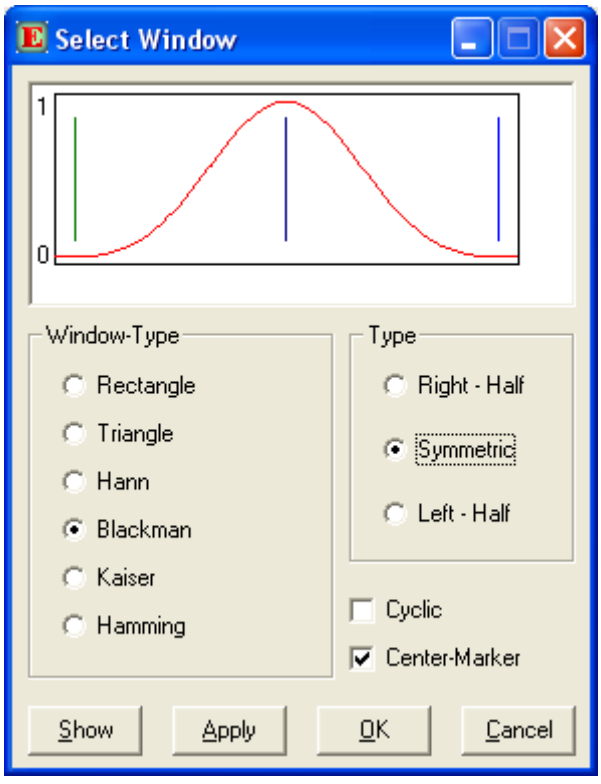
Cancel

Closes the dialog and rejects the settings.

Select Window Window

Use the ***Select Window*** dialog box to create a window displaying a partial range of the data set in the time domain. This partial range needs to be defined using the two markers prior to opening the ***Select Window*** dialog box.

This function allows on the one hand to select a certain partial range of the samples for evaluation and on the other hand, by means of a window function, to minimize disturbing influences stemming from the discontinuities at the signal limits.



Window Type

EASERA allows the following windowing functions to be selected:

- Rectangle (i.e. no windowing)
- Triangle
- Hann
- Blackman
- Kaiser
- Hamming

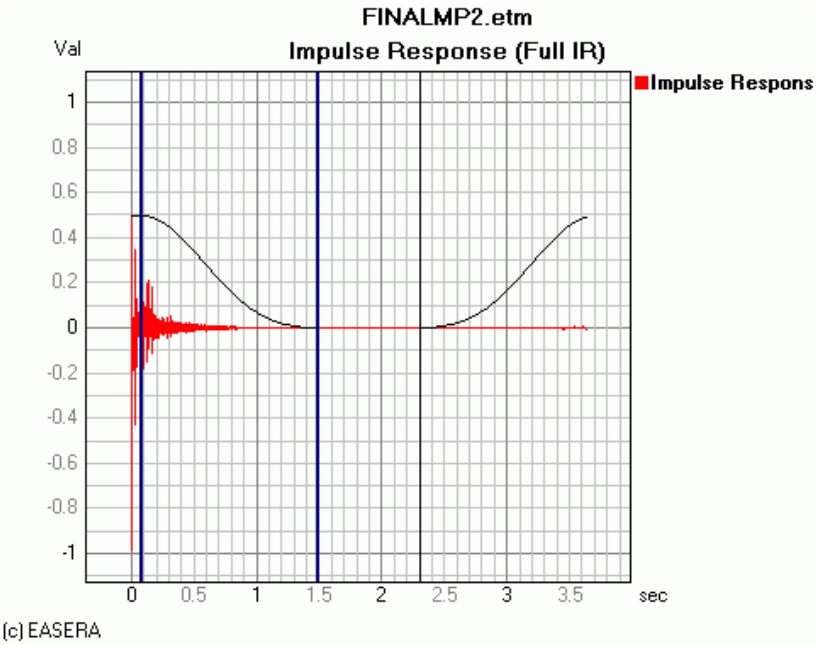
Type

The symmetry of the window may be one of the following:

- left-side not attenuated, right side attenuated (Right-Half)
- bilateral (Symmetric)
- right-side not attenuated, left side attenuated (Left-Half)

Cyclic

If symmetric the *Center Marker* option is activated, it may happen that the windows will reach beyond the beginning or the end of the data range. By activating the option *Cyclic* they are rejoined to the opposite end of the data set.



Center Marker

With symmetric windows, the lower and upper limit positions are generally specified by means of the markers. If the option *Center Marker* is activated, the center position is set by the left marker and the upper limit position by the right marker. The lower limit position is then computed from the upper limit position and the center position. This is especially suitable for the triangle window.

Show

Inserts the window into the diagram.

Apply

Accepts the settings.

Ok

Closes the dialog and accepts the settings.

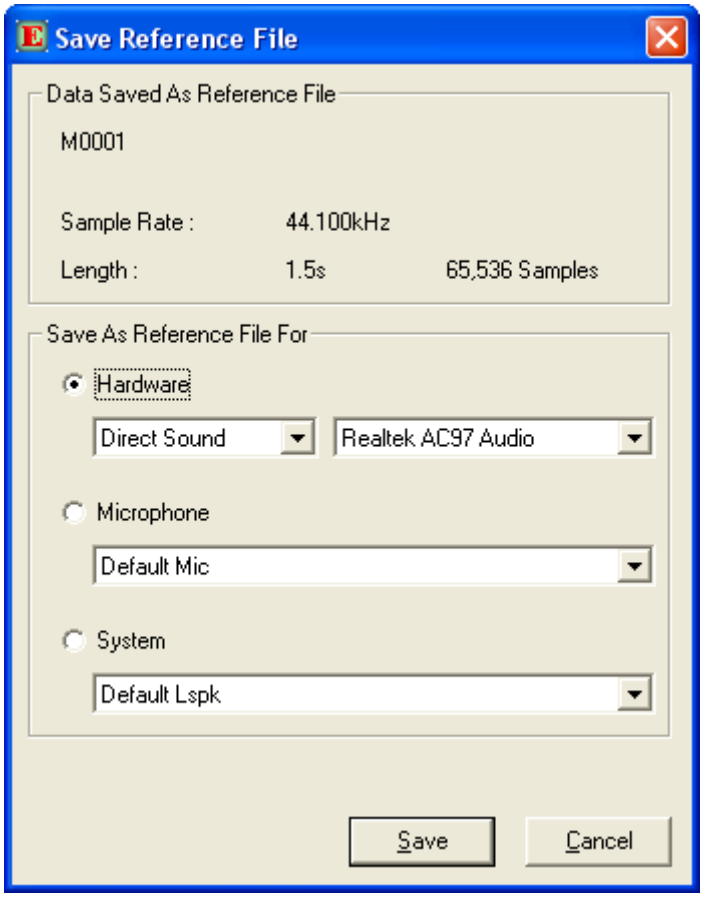
Cancel

Closes the dialog and rejects the settings.

Save Reference File Window

Use the **Save Reference File** Window to save the active data set as a reference file. This reference file may be later used to compensate for the frequency response of the selected hardware, microphone or system/loudspeaker.

These references can then be activated on the ***Measure*** tab.



Data Saved As Reference File

Sample Rate

Displays the sample rate of the active data set.

Length

Displays the length of the active data set in time and in samples.

Save As Reference File For

Hardware

Selecting this option will save the active data set as a reference file for the measurement hardware, for example the soundcard. Select the appropriate driver and hardware device in the drop-down selection lists below. The reference file can later on only be activated for the chosen hardware and driver.

Microphone

Selecting this option will save the active data set as a reference file for the measurement microphone. Select the appropriate microphone in the drop-down selection list below. The reference file can later on only be activated for the chosen microphone.

System

Selecting this option will save the active data set as a reference file for the system or loudspeaker. Select the appropriate system in the drop-down selection list below. The reference file can later on only be activated for the chosen system.

Save

Closes the dialog and saves the reference file.

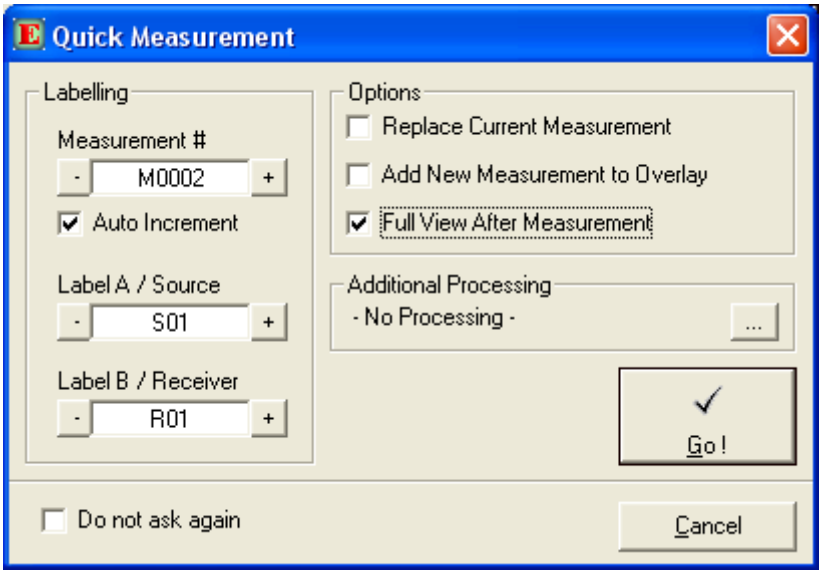
Cancel

Closes the dialog without creating a reference file.

Quick Measurement Window

Use the **Quick Measurement** Window to quickly repeat a measurement without going to the ***Measure*** tab. In this window a subset of the controls available on the ***Measure*** tab can be accessed.

For more details on the individual commands see the full description in the chapter Measure.



Labeling

Measurement

Enter the measurement number and general label for the next measurement. This field is synchronized with the corresponding entry on the ***Measure*** tab.

Auto Increment

Activating this switch will increment the measurement number automatically after the measurement. This control is synchronized with the corresponding control on the ***Measure*** tab.

Label A / Source

Enter an additional label or the source position for the next measurement. This field is synchronized with the corresponding entry on the ***Measure*** tab.

Label B / Receiver

Enter an additional label or the receiver position for the next measurement. This field is synchronized with the corresponding entry on the ***Measure*** tab.

Options

Replace Current Measurement

Activating this switch will replace the currently active data set by the new measurement.

Add New Measurement To Overlay

Activating this switch will maintain the current overlay and add the new measurement to it.

Full View After Measurement

Activating this switch will automatically scale the display to a full view after the measurement.

Additional Processing

The **[…]** button allows you to select an Editing Sequence from memory or loaded from a file to be applied automatically to the new measurement.

For more details on this command see the full description in the chapter Measure.

Go!

Starts the measurement using the defined parameters.

For more details on this command see the full description in the chapter Measure.

Do not ask again

Activating this switch will always use the current measurement setup directly and not display the **Quick Measurement** window before the measurement is performed.

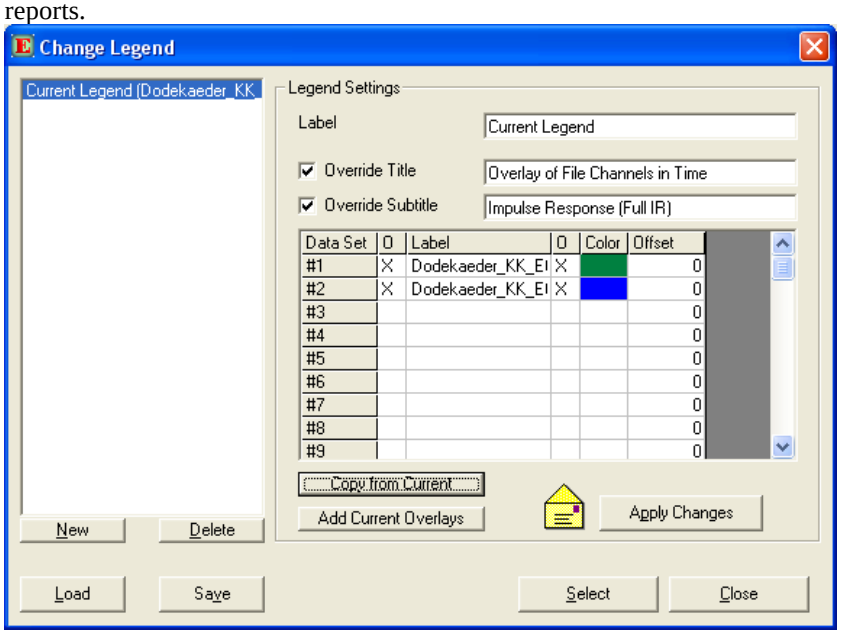
Be careful with this option as this will immediately execute a measurement when you press the **Go** button in the ***View & Calc*** window. Reset this switch by activating the **Prompt** switch in the ***View & Calc*** window.

Cancel

Closes the dialog and rejects the settings.

Change Legend Window

Use the **Change Legend** Window to quickly override the current diagram colors and labels. Legends created here will be stored for later use and may thus be utilized to create a repeatable, standardized look of diagrams, e.g. for reports.



New

Choose this button to create a new Legend. The legend name will be based on the currently selected Legend with a number added to the end of the name.

Delete

Choose this button to delete the selected Legend from the list.

Load

Choose this button to load a saved Legend from the disk.

Save

Choose this button to save the selected Legend to the disk.

Select

Choose this button to accept the changes and apply the legend to the diagram.

Close

Choose this button to close the ***Change Legend*** dialog box.

Legend Settings

Label

Use the label setting to name the current legend in a unique and descriptive way.

Override Title

Activating this option will override the diagram's main title with the label entered to the right.

Override Subtitle

Activating this option will override the diagram's main subtitle with the label entered to the right.

Dataset

The list contains the color and label settings for the (up to) 32 data sets displayed. Each row corresponds to a particular data set and will override the currently displayed label and color. Also a Y-offset can be defined to distinguish data sets graphically.

0

Enables override for the label entered to the right of the checkbox.

Label

Text that will be displayed instead of the label generated automatically for the data set.

0

Enables override for the color entered to the right of the checkbox.

Color

Color that will be used instead of the color generated automatically for the data set.

Offset

A relative value to move the data set up or down the Y axis. Note that this setting only changes the current display but it does not affect the measurement data itself.

Copy from Current

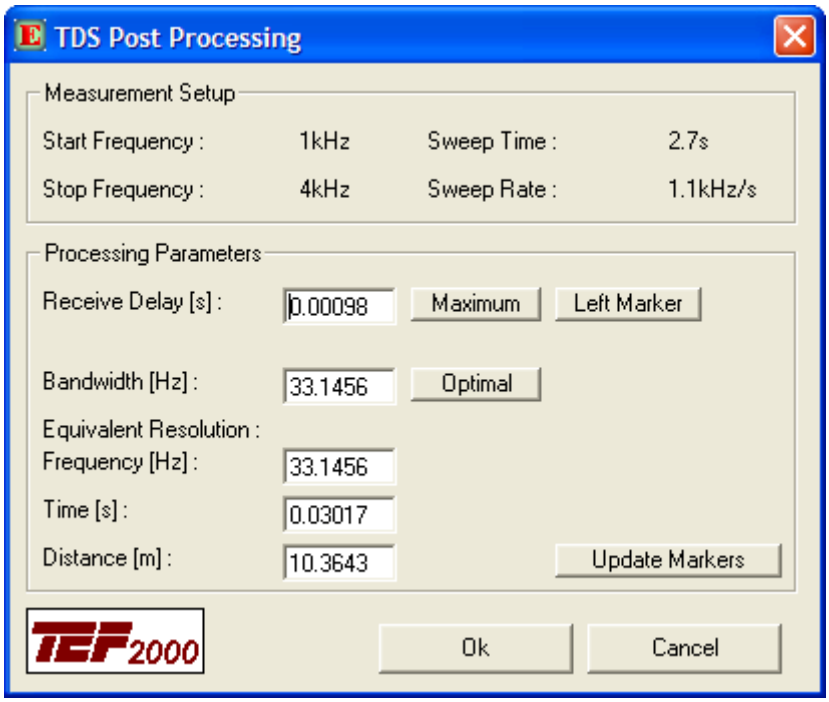
Copies all settings from the currently active diagram into the selected legend. This includes all titles, colors and labels.

Add Current Overlays

If the selected legend contains less datasets than displayed in the current diagram the additional data sets can be added using this command without overwriting the settings that already exist.

TDS Post Processing Window

Use the **TDS Post Processing** Window to enter the parameters for the software-based heterodyning process to filter the raw data according to the principles of Time Delay Spectrometry.



Ok

Closes the dialog and accepts the settings.

Cancel

Closes the dialog and rejects the settings.

Measurement Setup

Start Frequency [Hz]

Start frequency of the TDS sweep that was used as the excitation signal.

Stop Frequency [Hz]

Final frequency of the TDS sweep that was used as the excitation signal.

Sweep Time [s]

Duration of the Sweep in seconds.

Sweep Rate [Hz/s]

Sweep duration in a specific frequency range.

Processing Parameters

Receive Delay [s]

The center of the window used for TDS processing.

Maximum [s]ets the receive delay to the time of maximum value in the ETC.

Left Marker [s]

Sets the receive delay to the time location of the left marker.

Bandwidth [Hz]

The band width of the filter used for TDS processing

Optimal [Hz]

Sets the bandwidth to the preferred value which is the square root of the sweep rate.

Equivalent Resolution

Allows the bandwidth to be entered indirectly.

Frequency [Hz] :

Sets the bandwidth to a value with the equivalent frequency resolution.

Time [s] :

Sets the bandwidth to a value with the equivalent time resolution.

Distance [m] :

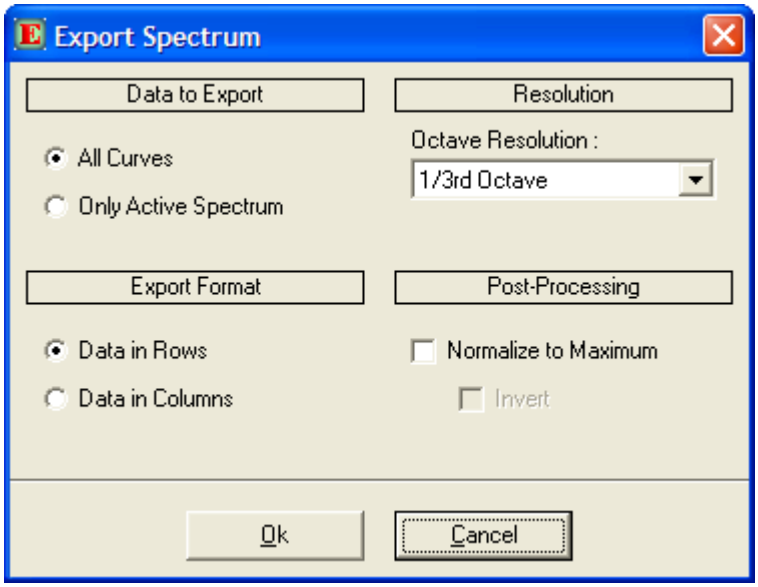
Sets the bandwidth to a value with the equivalent distance resolution.

Update Markers

Updates the markers in the EASERA main window by placing the left marker at the receive delay and the right marker at the end of the time window.

Export Spectrum Window

Use the **Export Spectrum** Window to create a text file that contains the levels of the current frequency domain data in a 1/n fractional octave format. Before saving, the data can be processed in several ways by selecting the desired resolution, by normalizing or inverting the data.



Data to Export

All Curves

Saves all currently displayed curves to the text file.

Only Active Spectrum

Saves only the active curve to the text file.

Resolution

Octave Resolution

Select a 1/n fractional octave resolution to save the data in.

Export Format

Data in Rows

Saves the text information in a format where all level values of a data set are arranged in a row.

Data in Columns

Saves the text information in a format where all level values of a data set are listed below each other in a column.

Post Processing

Normalize to Maximum

Calculates the maximum of the particular data set and normalizes it so that the maximum becomes 0dB.

Invert

If the data is to be normalized it can also be inverted by enabling this option. This will change the sign of the level and thus effectively invert the frequency response around the 0dB point.

Ok

Closes the dialog and accepts the settings.

Cancel

Closes the dialog and cancels the file export.

Chapter V: Waterfall

EASERA Waterfall Tab

Key Conventions

F1	Help
F9	Options
Ctrl+F1	Select the ***Start*** tab
Ctrl+F2	Select the ***Measure*** tab (If it is visible)
Ctrl+F3	Select the ***Live*** tab (If it is visible)
Ctrl+F4	Select the ***View & Calc*** tab (If it is visible)
Ctrl+F5	Select the ***Waterfall*** tab (If it is visible)
Ctrl+F6	Select the ***Results*** tab (If it is visible)
Shift+F1	Select the ***Home*** navigator page
Shift+F2	Select the ***Wizard*** navigator page
Shift+F3	Select the ***Files*** navigator page
Ctrl+B	Send Picture To Clipboard
Ctrl+F	Send Picture To File

Mouse Conventions

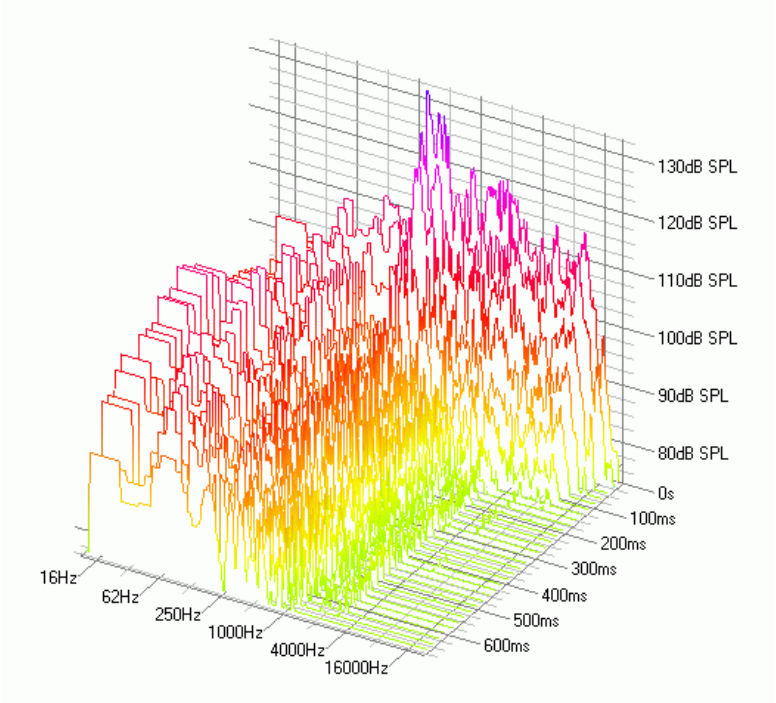
LMB	Left Mouse Button click
RMB	Right Mouse Button click

Use the LMB to select items.

Use the RMB to open a menu based on the context of the selected item or window location.

EASERA Waterfall Window

Waterfall diagrams are a three-dimensional representation of the quantities Time, Frequency and Level. These enable the terminal transient behavior of a loudspeaker or the reverberation time characteristic of a room to be evaluated.



File Menu

Options

Choose this command to display the ***Options*** dialog box, which controls various program-wide settings. See Options for more information on the dialog box.

Shortcut: **F9**

Send Picture To

Allows the currently displayed graph to be saved to the clipboard or in a file.

File

By using FILE|SEND PICTURE TO|FILE, you save the currently displayed graph as a graphic in a file. EASERA supports the following file formats:

- Windows Bitmap (bmp)
- JPEG (jpg)
- Compuserve GIF (gif)
- Portable Network Graphics (png)
- Tagged Image File Format (tif)

- LuRa Tech Wavelet (lwf)
- Zsoft Paintbrush (pcx)
- Windows Icon (ico)
- Enhanced Windows Metafile (emf)
- Truevision Targa (tga)
- Paint Shop Pro Image (psp)

Shortcut: **Ctrl+F**

Clipboard

By using FILE|SEND PICTURE TO|CLIPBOARD, you save the currently displayed graph to the clipboard.

Shortcut: **Ctrl+B**

Exit

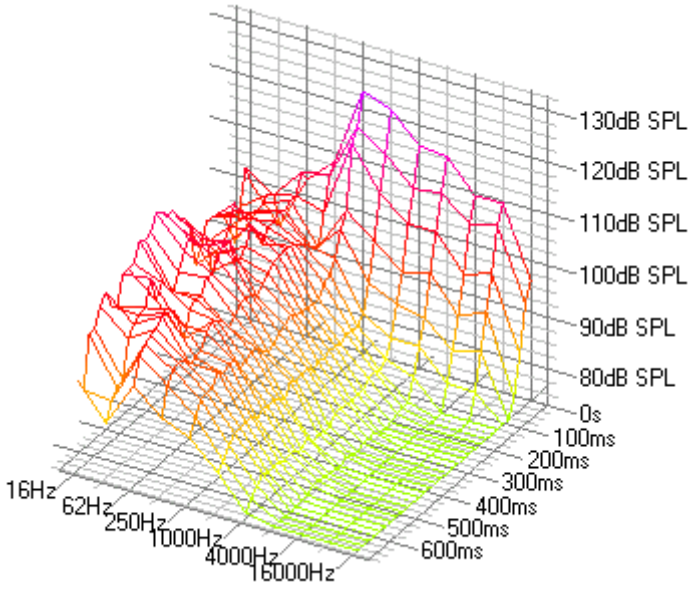
By using FILE|EXIT, you end the program.

View Menu

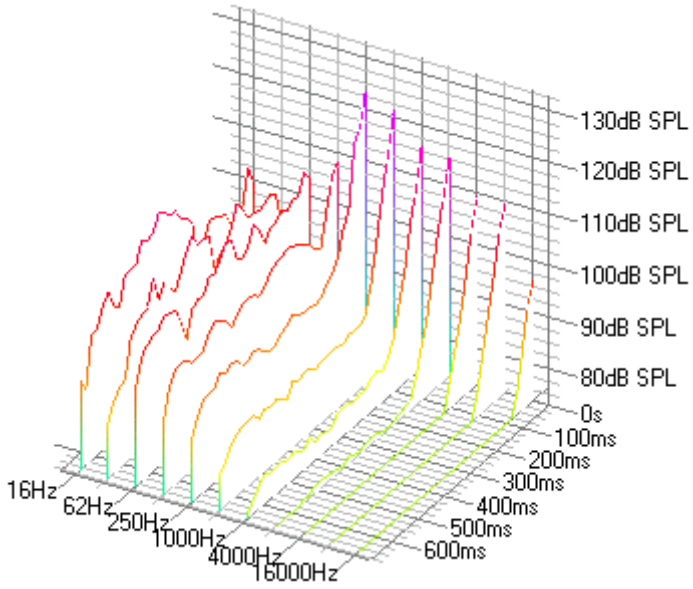
The functions of the VIEW menu can also be selected via the button bar or the ***View*** navigator page.

- **3D Perspective**: Shows the measurement in the usual 3D display (at angles of 120° and 30°).
- **Side View (x)**: Shows the Waterfall diagram from the side, thus showing only the axes of frequency and level.
- **End View (y)**: Shows the Waterfall diagram from the end, thus showing only the axes of time and level.
- **Plan View (z)**: Shows the Waterfall diagram from the top, thus showing only the axes of frequency and time.
- **Redraw**: Recalculates the graph.
- **Full View**: Zooms the graph to 100%.
- **Spin**: Starts and stops a permanent spin around the vertical axis.

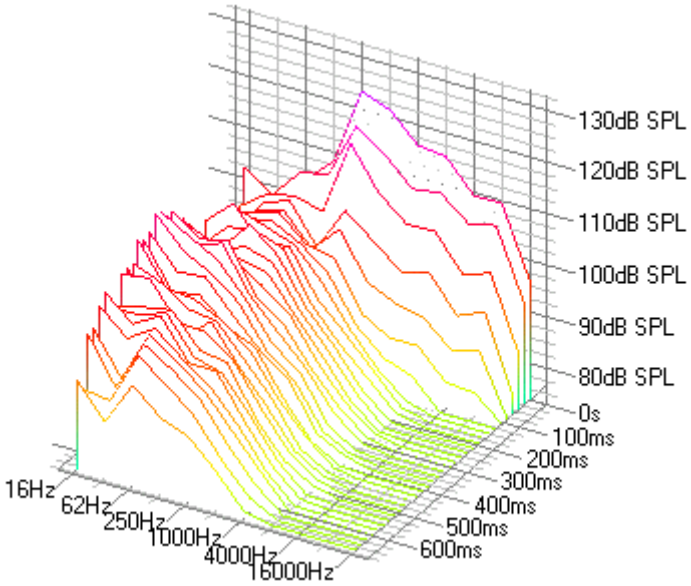
- **Grid**: Shows the Waterfall diagram as a grid of lines.



- **Frequency Slices**: Shows the Waterfall diagram with slices showing Level/Time for the individual center frequencies.



- **Time Slices**: Shows the Waterfall diagram with slices showing Level/Frequency for the individual time steps.



- **Fill**: Shows or hides the Waterfall diagram as a full-face representation in color-rendered form.

Graphs Menu

The functions of the GRAPHS menu can also be selected via the button bar or the ***Graphs*** navigator page.

- **Spectrogram**: Shows the graph as a spectrogram (presentation of time and frequency, the level is visualized by the color).
- **Waterfall**: Shows the graph as a 3D waterfall diagram.
- **Magnitude**: Shows the graph without frequency averaging.
- **1/1 Octave Average**: Averaging on octaves.
- **1/3 Octave Average**: Averaging on thirds.
- **1/6 Octave Average**: Averaging on major seconds (full tones)
- **1/12 Octave Average**: Averaging on minor seconds (half-tones)
- **1/24 Octave Average**: Averaging on quarter-tones
- **1/48 Octave Average**: Averaging on eighth-tones
- **1/96 Octave Average**: Averaging on sixteenth-tones

Help Menu

Help Topics

With HELP|HELP TOPICS, you call up the Online Help.

About

Under HELP|ABOUT, you will find the Copyright reference and other information.

Graphs

Select the ***Graphs*** navigator button to see the navigator page that allows you to select the type of graph to be displayed.

- **Spectrogram**: Shows the graph as a spectrogram (presentation of time and frequency, the level is visualized by the color).
- **Waterfall**: Shows the graph as a 3D waterfall diagram.

Axes

Select the ***Axes*** navigator button to see the navigator page that allows you to set the axis settings.

Time

- **Start**: Commencement of the representation period in seconds.
- **Stop**: End of the representation period in seconds.
- **Steps**: The resolution on the time axis as a multiple of the sampling-period duration.
- **Window**: Window of the FFT analysis.

Frequency

- **Start**: Lower frequency limit in Hertz.
- **Stop**: Upper frequency limit in Hertz.
- **Logarithmic/Linear**: logarithmic or linear representation of the frequency axis.
- **FFT Size**: The FFT quantity and thus the resolution limit on the frequency axis.

Magnitude

- **Max**: Upper level limit.
    - With acoustic measurements in dB or Pascal.
    - With electric measurements in dBV or V.
    - With sound files in dBFS or Val(ues).
- **Min**: Lower level limit (as regards the units, see *Max*)
- **Logarithmic/Linear**: Specifies whether the level limits are given in dB or in Pascal.

Default

Restores the work's settings.

Apply

Applies the changes.

View

Select the ***View*** navigator button to see the navigator page that allows you to adjust the parameters and style of the graph display.

View Parameters

- **Hor. Angle [°]**: Rotation angle around the vertical axis.
- **Ver. Angle [°]**: Rotation angle around the transversal axis.
- **Zoom [%]**: Enlargement of the representation.

Graph

- **Average**: Averaging in the frequency axis, was extensively described in the menu item GRAPHS.
- **Style**: Representation mode of the Waterfall diagram, was extensively described in the menu item VIEW.
- **Outline/Fill**: Representation as wireframe model or in full-face mode.

Apply

Applies the changes.

Chapter VI: Results

EASERA Results Tab

Key Conventions

F1	Help
F9	Options
Ctrl+F1	Select the ***Start*** tab
Ctrl+F2	Select the ***Measure*** tab (If it is visible)
Ctrl+F3	Select the ***Live*** tab (If it is visible)
Ctrl+F4	Select the ***View & Calc*** tab (If it is visible)
Ctrl+F5	Select the ***Waterfall*** tab (If it is visible)
Ctrl+F6	Select the ***Results*** tab (If it is visible)
Shift+F1	Select the ***Home*** navigator page
Shift+F2	Select the ***Wizard*** navigator page
Shift+F3	Select the ***Files*** navigator page
Ctrl+B	Send Table To Clipboard
Ctrl+F	Send Table To File

Mouse Conventions

LMB	Left Mouse Button click
RMB	Right Mouse Button click

Use the LMB to select items.

Use the RMB to open a menu based on the context of the selected item or window location.

EASERA Results Window

The navigator page ***Details*** in the window ***View & Calc*** is too small for representing large tables. These are therefore additionally displayed in the window ***Results***:

	C7	C50	C80	C35	D	L7	L50	L80	L35	otal SPL	iter Time	ST1	ST2	val Time	plit Time
	dB	dB	dB	dB		dBSPL	dBSPL	dBSPL	dBSPL	dBSPL	ms	dB	dB	ms	ms
Impulse Response	14,4	20,1	20,5	19,3	0,990	79,4	79,5	79,5	79,5	79,5	18,46	-19,5	-19,4	1,16	35,00
Average	14,4	20,1	20,5	19,3	0,990	79,4	79,5	79,5	79,5	79,5	18,46	-19,5	-19,4	1,16	35,00
Std. Dev.	0,0	0,0	0,0	0,0	0,000	0,0	0,0	0,0	0,0	0,0	0,00	0,0	0,0	0,00	0,00
Maximum	14,4	20,1	20,5	19,3	0,990	79,4	79,5	79,5	79,5	79,5	18,46	-19,5	-19,4	1,16	35,00
Minimum	14,4	20,1	20,5	19,3	0,990	79,4	79,5	79,5	79,5	79,5	18,46	-19,5	-19,4	1,16	35,00

Results shown may be included in the list of stored results:

V	Table	Add/Set
	STI, MTF, MTI	<< <<
X	Measures	<< <<
	1/1 Clarity Measures	<< <<
	Measures	<< <<
	[Empty]	<< <<

V

Left-clicking on the corresponding line displays the set of results selected from all the stored results into the results shown in the table, and the line gets marked with an ***x***.

Table

Title of the results shown.

Add/Set

Replaces the results of the corresponding line by the results shown currently in the table. For adding the current results of the tab ***View & Calc*** to the list, replace the line ***[Empty]***.

File Menu

Options

Choose this command to display the ***Options*** dialog box, which controls various program-wide settings. See OPTIONS for more information on the dialog box.

Shortcut: **F9**

Send Table To

Allows the currently displayed table to be saved to the clipboard or in a file, in which the individual columns are separated by tabs.

- **Clipboard**

  By using FILE|SEND TABLE TO|CLIPBOARD, you save the currently displayed table to the clipboard.

Shortcut: **Ctrl+B**

- **File**

  By using FILE|SEND TABLE TO|FILE, you save the currently displayed table as a file. EASERA supports the following file format:

  - Text File [ASCII] (txt)

  Shortcut: **Ctrl+F**

Exit

By using FILE|EXIT, you end the program.

View Menu

Show Statistics

Inserts or removes the statistical functions (average, standard variation, maximum and minimum) from the table.

Turn Table

Swaps rows and columns in the table.

Help Menu

Help Topics

With HELP|HELP TOPICS you call up the Online Help.

About

Under HELP|ABOUT you will find the copyright reference and other information.

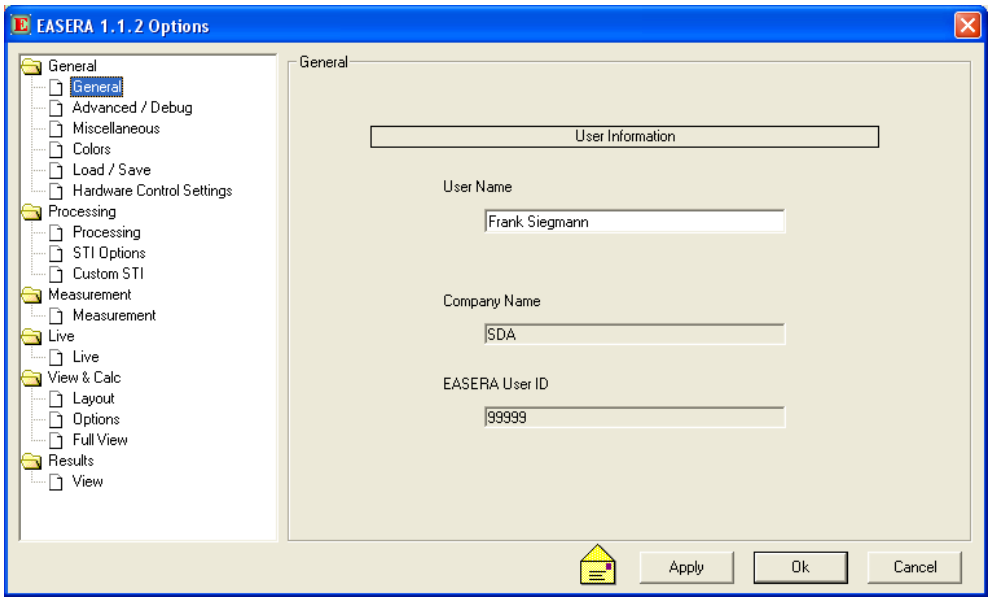
Chapter VII: General Windows

EASERA General Windows

These windows can be opened from multiple places in the program.

EASERA Options Window

The window ***Options*** serves to establish settings which will be valid for the whole of EASERA and for all measurements. The pages on which the individual options are located can be selected in the tree scheme shown on the left-hand side.



Apply

Applies the settings without closing the window ***Options***.

OK

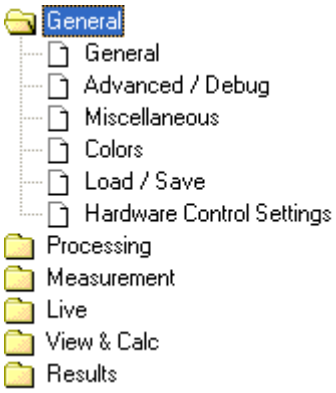
Applies the settings and closes the window.

Cancel

Closes the window Options and rejects all settings which were not yet accepted by means of **Apply**.

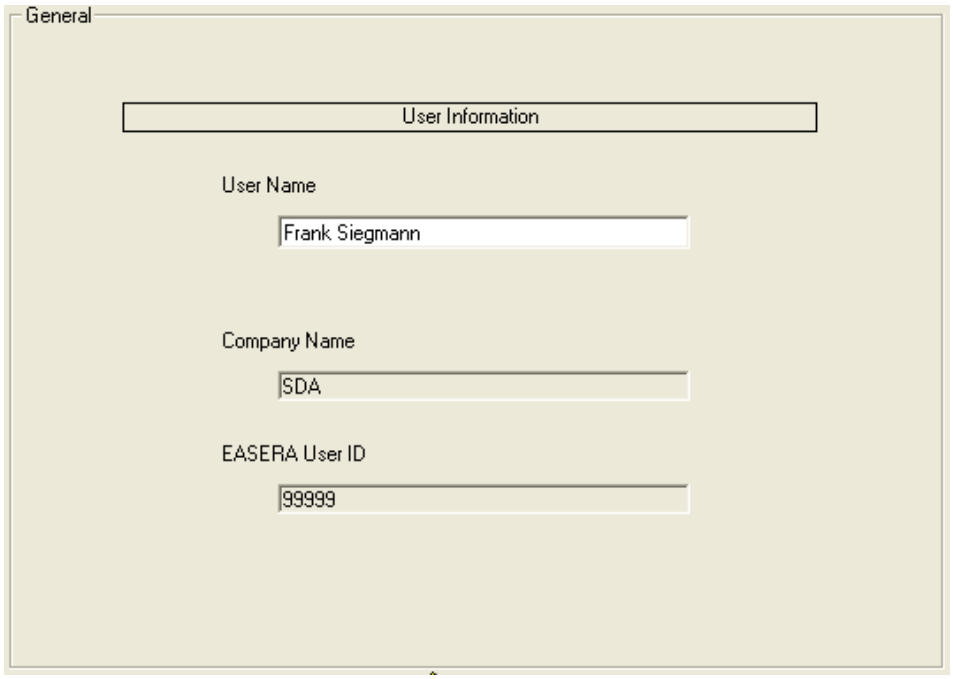
General

The pages under this heading in the tree control the settings that are global in nature and have an effect on the entire program.



General

This page contains information about the user.



User Information

User Name

In the window Measurement Notes on the ***Measure*** tab you can indicate the name of the person performing the measurement. This field is provisionally filled with the name given here.

Company name

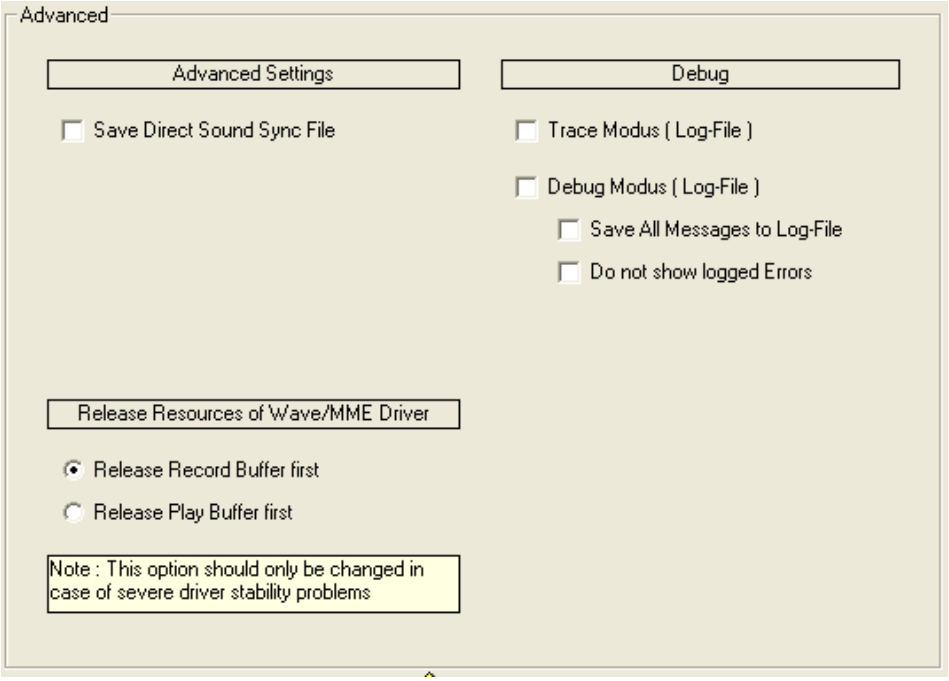
This name is taken from the License File and cannot be changed.

EASERA User ID

This User ID is taken from the License File and cannot be changed.

Advanced / Debug

This page contains options that are useful in troubleshooting problems with the hardware or drivers for the audio device.



Advanced Settings

Save DirectSound Sync File

Stores the time delay between recording and play-back buffers in a log file.

Debug

Trace Modus (Log File)

Writes all user actions into a log file.

Debug Modus (Log File)

Writes all errors into a log file.

Save all messages to log file

Writes all messages and notifications into the log file.

Do not show logged errors

Suppresses the display of logged error messages to avoid message sequences.

Release Resources of Wave/MME Driver

Wave/MME drivers sometimes produce problems with the release of the buffers: normally it is necessary to first release the recording buffer. With some drivers, however, it is the play-back buffer that has to be released first. This can be set here. You should use this option only in case of a serious stability problem.

Release Record Buffer first

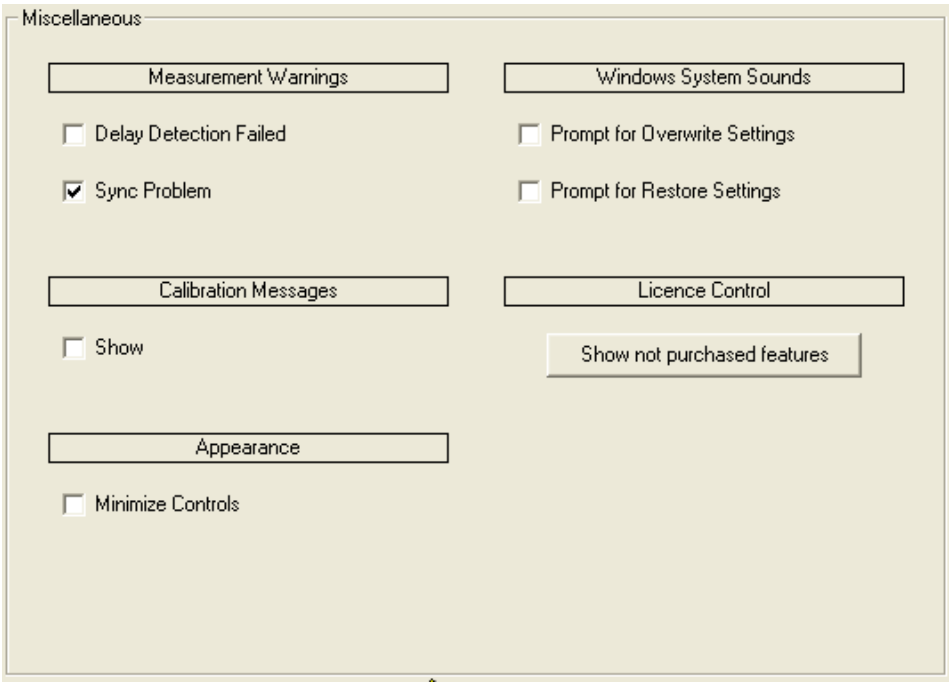
Releases the recording buffer first.

Release Play Buffer first

Releases the play-back buffer first.

Miscellaneous

This page sets the behavior of messages and features.



Measurement Warnings

Delay Detection Failed

EASERA calculates the delay between recording and play-back buffers. When this option is activated, EASERA issues a warning if this delay cannot be reliably determined.

Sync Problem

When this option is activated, a warning is issued if synchronization problems occur.

Calibration Messages

Show

Shows messages arising during calibration.

Appearance

Minimize Controls

Reduce the size of the tab buttons at the top of the EASERA main window as well as the controls on the Measure tab to allow the still very common resolution of 1024x768 pixels to show all four sections on the ***Measure*** tab.

Windows System Sounds

EASERA overwrites the Windows system sound settings so that they do not interfere with the operation of the system. When the program is closed, these system sound settings are restored.

Prompt for Overwrite Settings

When this option is activated, overwriting of the system sound settings has to be confirmed.

Prompt for Restore Settings

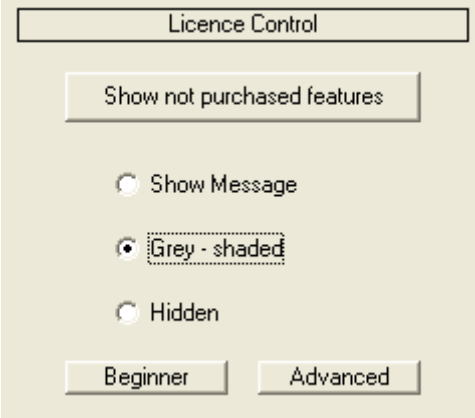
When this option is activated, restoring of the system sound settings has to be confirmed.

License Control

The software control is preset so that functions which are not available in the actual EASERA version are greyed out. A different behavior (e.g. display of the inaccessible menu points) may also be preset.

Show not purchased features

This button will display the three possible options for how features that have not been purchased are presented to the user.



Show Message

This option will show a message box when the feature is not available.

Grey - shaded

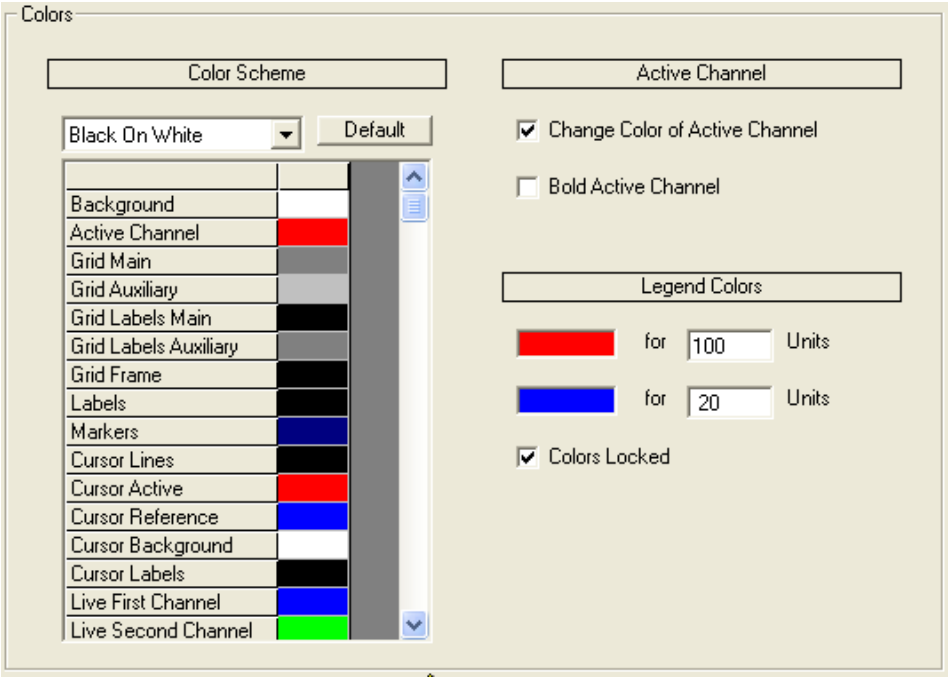
This option displays the feature that is not available, but it is disabled and shown in a shaded grey, indicating that it cannot be selected. This option is selected when the **Advanced** button is pressed.

Hidden

This option does not show any features that have not been purchased. This option is selected when the **Beginner** button is pressed.

Colors

On the *Colors* page, it is possible to set the colors to be used in EASERA.



Color Scheme

EASERA contains five color schemes, which can be individually modified by the user. A color selection dialog is opened by a mouse click on the corresponding color button.

Default

Restores the preset colors for the current color scheme.

Active Channel

Change Color of Active Channel

Changes the color of the active channel to red.

Bold Active Channel

Shows the active channel in bold type.

Legend Colors

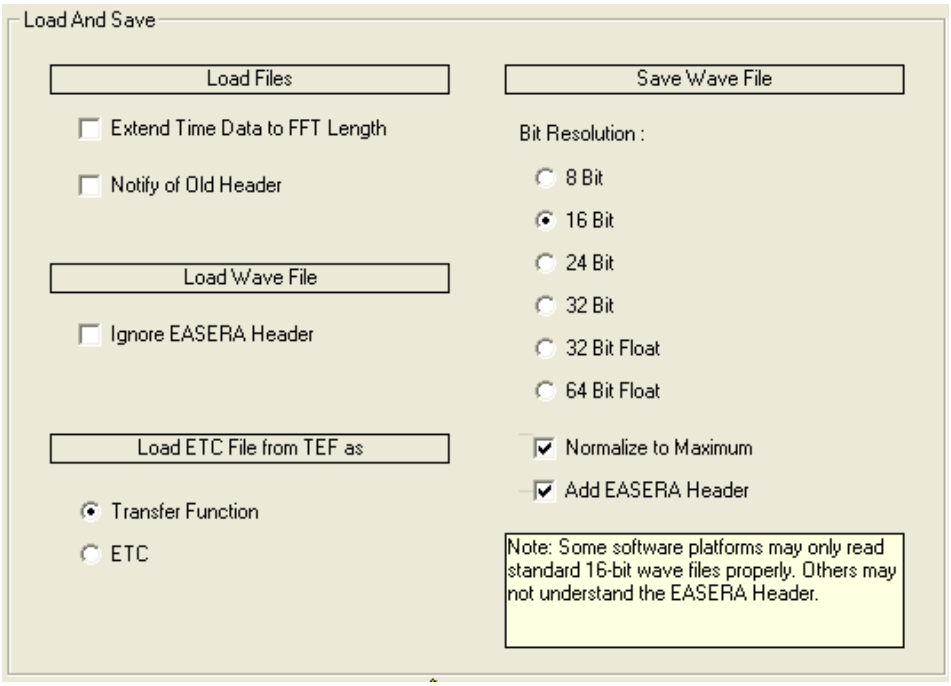
Under *Legend Colors*, you may determine which values the colors red and blue stand for. These colors and their corresponding values serve as the minimum and maximum for colored level displays. Intermediate values will be interpolated on a Hue, Saturation, and Value (HSV) scale.

Colors Locked

When this option is activated, blue stands for the smallest and red for the largest of the values indicated. Otherwise the software will automatically scale to the minimum and maximum of the values shown.

Load / Save

This page sets the options for the way files are loaded and saved.



Load Files

Extend Time Data to FFT Length

Expands loaded time data to a length corresponding to the next power of two. This allows the Fast Fourier Transformation to be carried out, but it can distort the frequency response. Care must be taken when inserting zeros into an impulse response so you do not create artificial step functions in the time domain. These can lead to a frequency response that is different from the original.

Notify of Old Header

Notifies the user about obsolete headers when opening files of older formats.

Load Wave File

Ignore EASERA Header

Ignores the EASERA Header while loading a Wave File. This will read a wave file that was saved with an EASERA header but ignores any header information. The loaded result is just like a regular wave file without a header. Note that if the header is ignored, scaling and additional information are lost.

Load ETC File from TEF as

Specifies the form in which ETC Files (TEF20) are read:

- ***Transfer Function***: This loads the complex time domain data and transforms it into the frequency domain. After this the data is made symmetrical to create a real-valued impulse response. The resulting transfer function can be used for further processing.
- ***ETC***: Similar to TEF20, this loads the magnitude data only, extracted from the complex time domain data in the file. Data saved with TEF20 in the *.etc format appears as an Envelope- or Heyser-

ETC (Log-Squared), therefore the impulse response or the transfer function are not available.

Save Wave File

Specifies the Bit resolution with which the wave files are saved. Bit resolutions other than 16 Bit may not be accepted by other programs.

- 8 Bit
- 16 Bit
- 24 Bit
- 32 Bit
- 32 Bit Float
- 64 Bit Float

Normalize To Maximum

Scales the data up to the clipping limit.

Note that in particular 8bit and 16bit wave files have a very rough resolution. When EASERA converts internal data from 64bit double precision to 8bit or 16bit integers, it is recommended to scale the data for maximum resolution (full scale). The scaling factor used will be stored in the EASERA header of the wave file.

There is one disadvantage however, other programs may not understand the EASERA header and thus the original scale is lost.

On the other hand, not applying the normalization may lead to serious data defects if the numbers to be stored are very small (much smaller than 1). If the numbers are much larger (greater than 1) they will be clipped, which may also seriously damage the data.

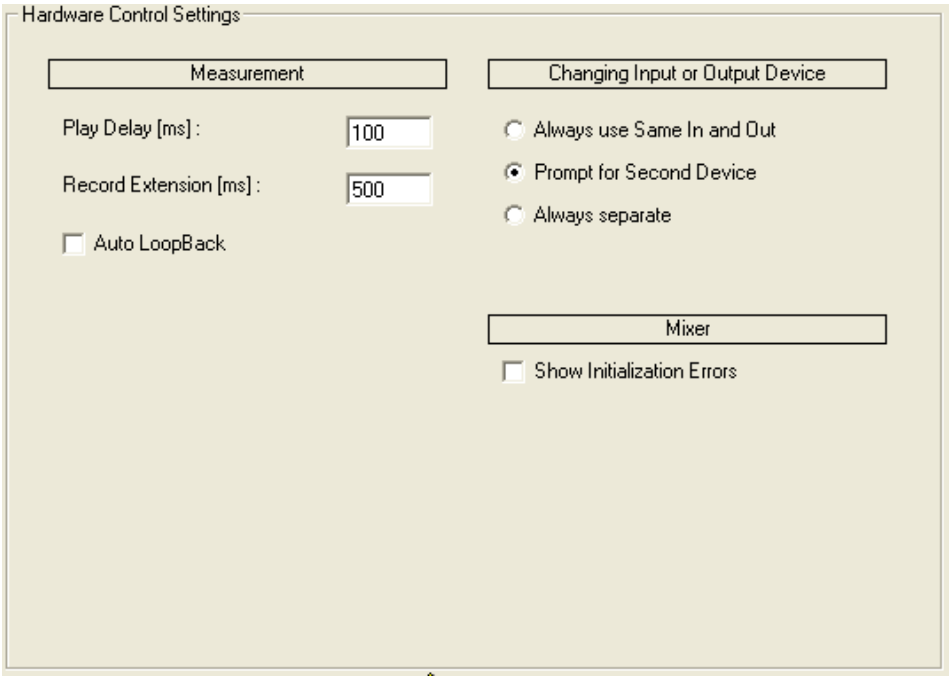
It is strongly recommended to always normalize the data and to add the EASERA header. This will achieve optimal resolution for the resulting wav files. Therefore this option should be switched off only in extraordinary cases.

Add EASERA Header

Adds the EASERA Header to any saved wav file. The EASERA Header contains additional data, such as the software used, the calibration status, the name of the measuring engineer, and so forth. It also contains information about the scaling factor if the data is normalized (see above).

Hardware Control Settings

This page sets the default behavior for the audio device hardware.



Measurement

Play Delay [ms]

Normally the record buffer is started before the play buffer in order to capture the whole signal. But in some cases the initialization of the record buffer may take longer than the original time that was selected as the delay for the play buffer. An indicator for such a problem is that parts of the recorded signal are missing. In this case it is recommended to further increase the delay for the start of the play buffer relative to the recording buffer.

Record Extension [ms]

Normally the record buffer is defined long enough to record the entire signal. But in some cases the initialization of the play buffer may take longer than expected. In such a case the signal may not be recorded completely and a part is missing at the end. In this case it is recommended to further extend the record buffer.

Auto LoopBack

Several sound cards have the possibility to switch the loopback through the driver interface. If this switch is on, EASERA will try to synchronize the driver with the chosen loopback setting in the software.

Changing Input or Output Device

Always use Same in and Out

This option selects the same device for the output after selecting a different input device, or selects the same device for the input after selecting a different output device.

Prompt for Second Device

This option always prompts for the output or input device when a different input or output device has been chosen.

Always separate

This option only changes the input or output device that has been selected.

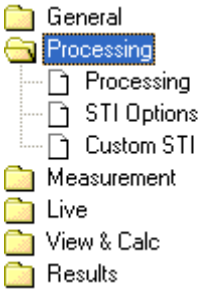
Mixer

Show Initialization Errors

During startup EASERA tries to read out and initialize all Windows mixers. In some cases there may be inconsistencies in the driver interface, leading to errors. This switch must be on in order to display such errors to the user.

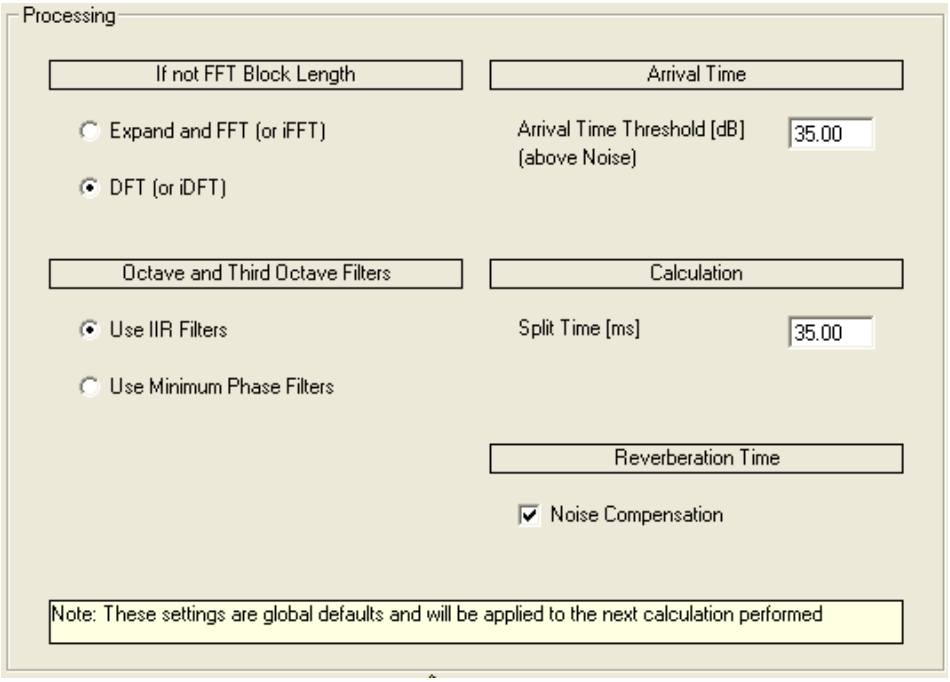
Processing

The pages under this heading in the tree control how the raw data will be processed.



Processing

This page contains the settings for how the impulse response is processed.



If Not FFT Block Length

To enable a Fast Fourier Transformation to be carried out, the number of samples has to correspond to a power of two. Select one of these two options to determine the procedure to be applied if this condition is not met.

Expand and FFT (or iFFT)

The number of samples is expanded by introducing zero values. This implies value corruption, but is faster than a discrete Fourier Transformation. Care must be taken when inserting zeros into an impulse response so you do not create artificial step functions in the time domain. These can lead to a frequency response that is different from the original.

DFT (or iDFT)

A discrete Fourier Transformation is carried out.

Octave and Third Octave Filters

Select one of these options to specify the types of filters to be used for the octave and third-octave filters.

See also: EaseraAppendix.pdf

Use IIR Filters

This option selects IIR filters (infinite impulse response filters) to be used. Such filters correspond to filters built of analog components and show the same effect on the phase response.

Use Minimum Phase Filters

This option selects so-called minimum-phase filters to be used.

Arrival Time

Arrival Time Threshold [dB] (above Noise)

EASERA assumes the arrival of the impulse (of the signal) to occur at the time where the signal exceeds the noise background by a defined value. This level can be set here, the default value being 35 dB.

Calculation

Split Time [ms]

Set this value to the time to be used for computing Csplit or Lsplit. This is the dividing time between the Direct and Reverberant sound.

Reverberation Time

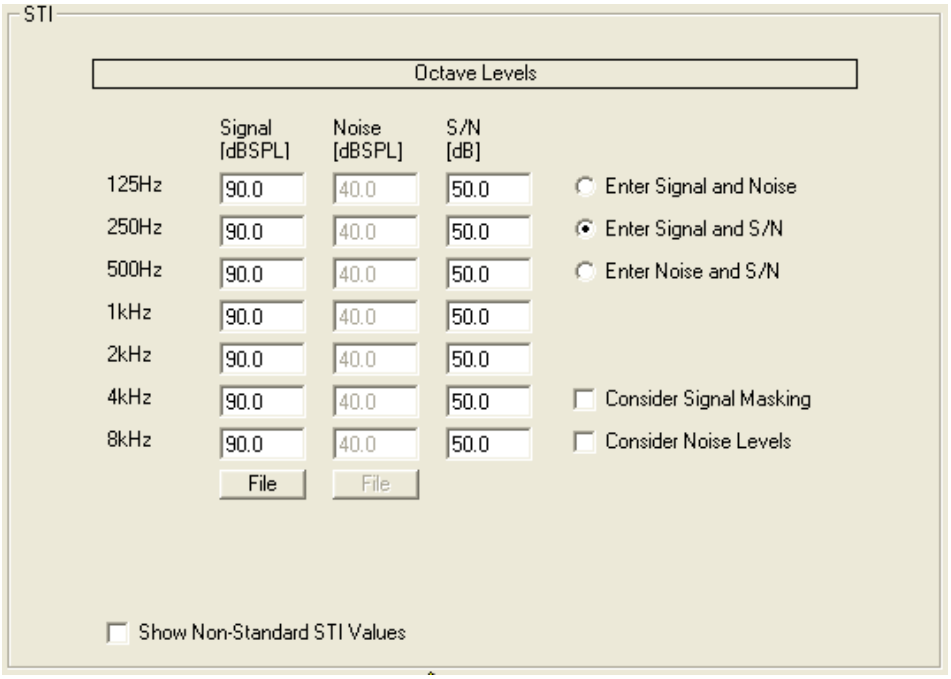
Noise Compensation

To calculate the reverberation time, it is possible to activate noise compensation. This normally improves the accuracy, but may, in some situations produce incorrect values. This option allows the noise compensation to be disabled. It determines whether noise compensation will be used for succeeding calculations.

See also: EaseraAppendix.pdf

STI Options

This page contains settings for how the STI is calculated from the impulse response.



Octave Levels

Signal [dBSPL]

When considering masking effects with the calculation of speech intelligibility, it is necessary to indicate the octave-averaged sound pressure level in dB here.

Noise [dBSPL]

When considering noise levels with the calculation of speech intelligibility, it is necessary to indicate the octave-averaged sound pressure level of the ambient noise in dB here.

S/N [dB]

When considering the influence of ambient noise or masking effects on speech intelligibility, it is possible to enter the octave-averaged signal-to-noise ratios in dB here.

Enter Signal and Noise

Enable the **Signal [dBSPL]** and **Noise [dBSPL]** columns. The **S/N [dB]** is calculated from the data in those columns.

Enter Signal and S/N

Enable the **Signal [dBSPL]** and **S/N [dB]** columns. The **Noise [dBSPL]** is calculated from the data in those columns.

Enter Noise and S/N

Enable the **Noise [dBSPL]** and **S/N [dB]** columns. The **Signal [dBSPL]** is calculated from the data in those columns.

Consider Signal Masking

Select this option to consider masking effects with the calculation of speech intelligibility.

Consider Noise Levels

Select this option to consider ambient noise with the calculation of speech intelligibility.

File

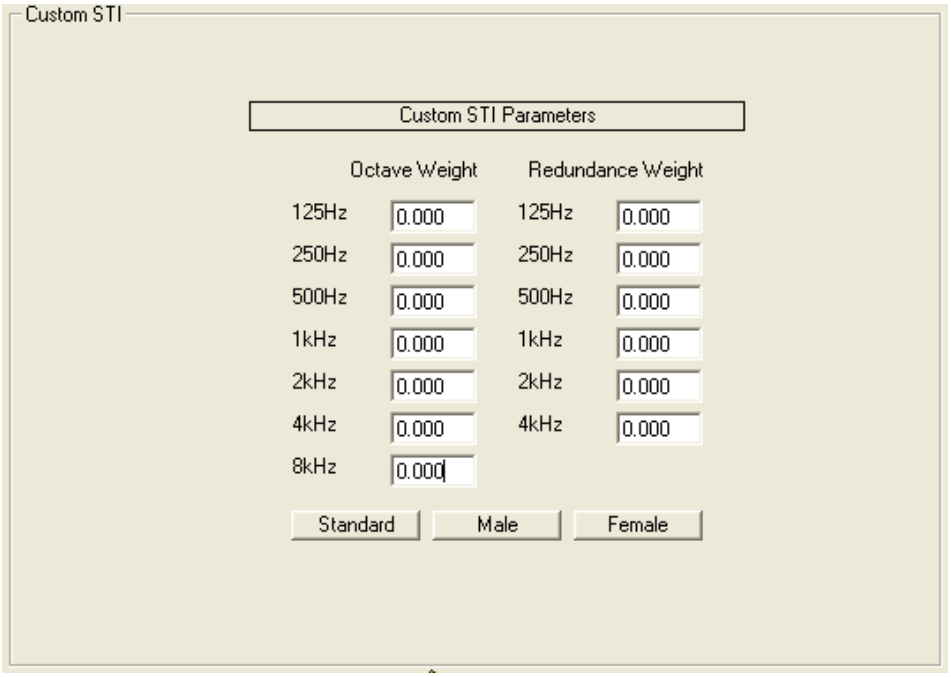
Load octave spectra in the EASE Live Spectrum (*.els) format. In practice one would normally first measure the desired signal (e.g. using the Live module of EASERA) and then the ambient noise and save the data as a file. Then use the button under **Signal [dBSPL]** to select the signal file and the button under **Noise [dBSPL]** to select the noise file.

Show Non-Standard STI Values

In addition to the standard speech intelligibility values, also show those, which are not (yet) standardized.

Custom STI

This page allows the user to enter non-standard values for weighting to be used to calculate STI.



Custom STI Parameters

Octave Weight

The weighting factors for the individual octave bands are entered here. These are used only for *Custom STI*, whereas the weighting factors for all other speech intelligibility values are determined from the IEC 60268-16 (2003) standard.

Redundancy Weight

The redundancy weighting factors for the individual octave-band pairs are entered here. The values each refer to the indicated band and the following octave band and are used only for *Custom STI*.

Standard

Allocates the standard values established by IEC 60268-16 to the Octave and Redundancy Weights.

Male

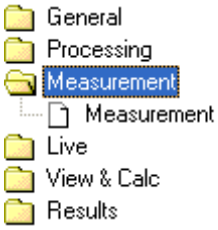
Allocates the standard values established by IEC 60268-16 for the male voice to the Octave and Redundancy Weights.

Female

Allocates the standard values established by IEC 60268-16 for the female voice to the Octave and Redundancy Weights.

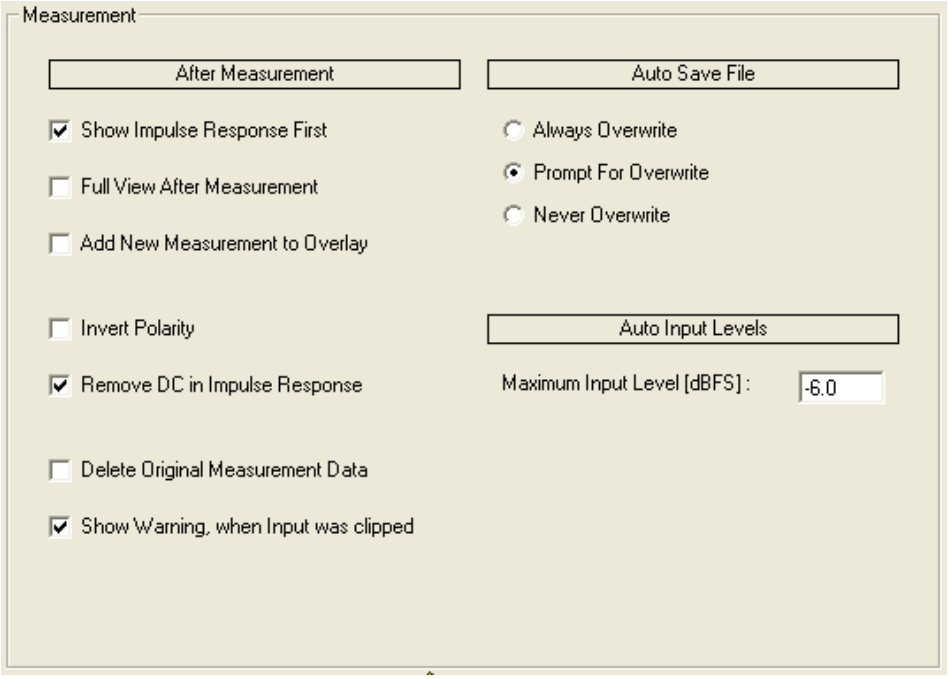
Measurement

The pages under this heading in the tree control the settings for the ***Measure*** tab.



Measurement

This page controls how the measurements are made and saved.



After Measurement

Show Impulse Response First

When this option is activated, the impulse response is shown first after completion of the measurement or opening of a file. Otherwise show the raw data first.

Full View After Measurement

The first diagram shown after measurement is zoomed in such a way that the data is shown completely.

Add New Measurement to Overlay

A new measurement is always added as an overlay.

Invert Polarity

Inverts the signs of the time data, which corresponds to mirroring the impulse response along the horizontal time axis.

Remove DC in Impulse Response

Removes the direct-current component contained in the impulse response.

Delete Original Measurement Data

Deletes the raw data of the measurement.

Show Warning when Input was clipped

Produces a warning if an input was clipping during the measurement.

Auto Save File

In the ***Start Measurement*** frame on the ***Measure*** tab you may activate the option **SaveTo**, which will automatically save the measurements as they are made. **Auto Save File** specifies the behavior used if a file already exists with the same name and would be overwritten.

Always Overwrite

The existing file is always overwritten.

Prompt For Overwrite

The user is asked by a prompt whether the file is to be overwritten.

Never Overwrite

The existing file is never overwritten.

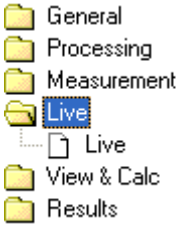
Auto Input Levels

Maximum Input Level [dBFS]

In the ***Adjust Levels*** frame on the ***Measure*** tab there is an **Auto Input Level** button. The maximum value for this automatic level adaptation can be preset here.

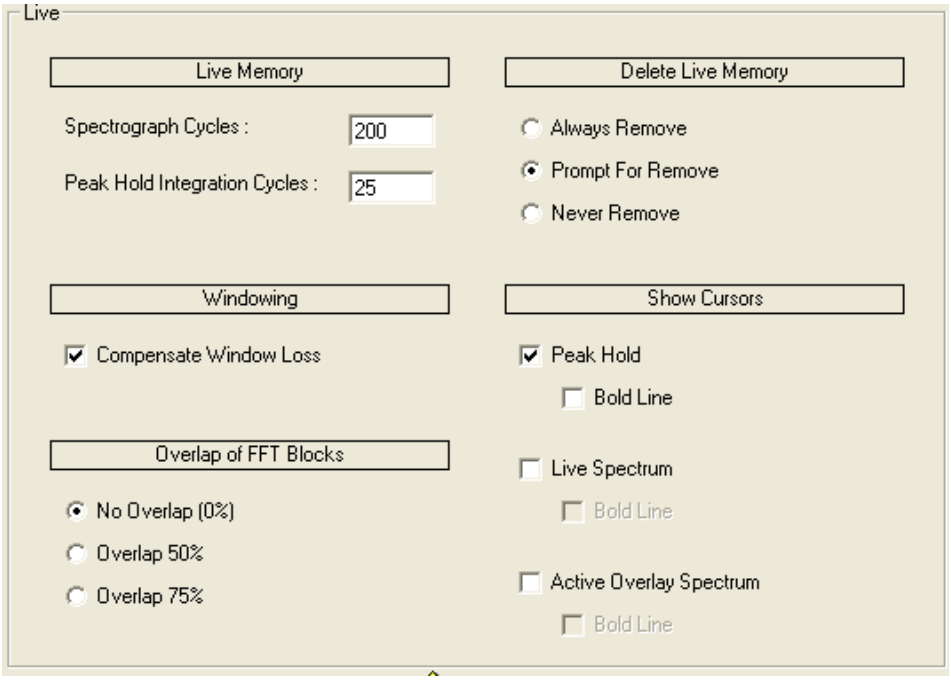
Live

The pages under this heading in the tree control the settings for the ***Live*** tab.



Live

This page controls the options for the Live memories.



Live Memory

Spectrograph Cycles

Determines the length of the spectrogram shown as the number of measuring cycles.

Peak Hold Integration Cycles

Determines the number of measuring cycles used for establishing the **Peak Hold**.

Windowing

Compensate Window Loss

Each FFT window type (Triangle, Blackman, etc.) varies in the amount of overall loss caused by the window in the time domain. Check this box to compensate for these variations. For example a sine wave signal will then show the same value for any window type that is selected.

Overlap of FFT Blocks

To prevent artifacts in the time domain due to FFT windowing, the FFT blocks can be defined to overlap to a given extent. However, this method will require a higher computer performance due to the increased computation load.

No Overlap (0%)

Each FFT block beginning starts where the previous FFT block ended. So for a time length of 2 FFT sizes there are 2 FFT blocks evaluated.

Overlap (50%)

Each FFT block beginning overlaps the previous FFT block by 50%. So for a time length of 2 FFT sizes there are 3 FFT blocks evaluated.

Overlap (75%)

Each FFT block beginning overlaps the previous FFT block by 75%. So for a time length of 2 FFT sizes there are 5 FFT blocks evaluated.

Delete Live Memory

On the ***Live*** tab it is possible to add the current display to the overlay list. *Delete Live Memory* specifies the behavior of EASERA if such an overlay entry is to be deleted by means of the right mouse button.

Always Remove

The entry is always deleted.

Prompt for Removal

The user is asked by a prompt whether the entry is to be deleted.

Never Remove

The entry is never deleted.

Show Cursors

Peak Hold

Show the cursor for the *Peak Hold* in the diagram.

Live Spectrum

Show the cursor for the *Live Spectrum* in the diagram.

Active Overlay Spectrum

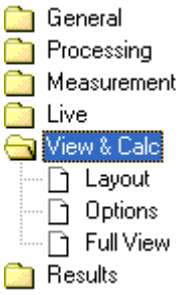
Show the cursor for the *Active Overlay* in the diagram.

Bold Line

For each of the *Show Cursors* options above, show the cursor as a bold line.

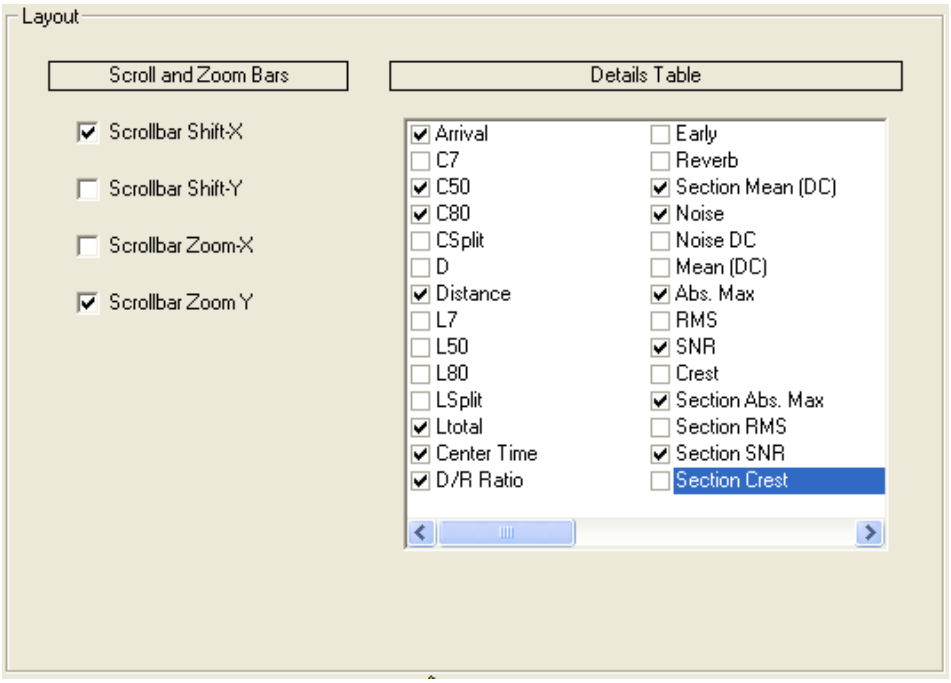
View & Calc

The pages under this heading in the tree control the settings for the ***View & Calc*** tab.



Layout

This page contains the settings for the graph zoom and scroll bars and determines what will be displayed on the Details navigator page.



Scroll and Zoom Bars

At the edges of the diagram scroll bars may be inserted, allowing the diagram to be zoomed or shifted. In the window *Options* you can determine which of these scroll bars are visible.

Scrollbar Shift-X

Show a scroll bar below the diagram for horizontal shifting of the view.

Scrollbar Shift-Y

Show a scroll bar to the left of the diagram for vertical shifting of the view.

Scrollbar Zoom-X

Show a scroll bar above the diagram for zooming on the horizontal or X-axis.

Scrollbar Zoom-Y

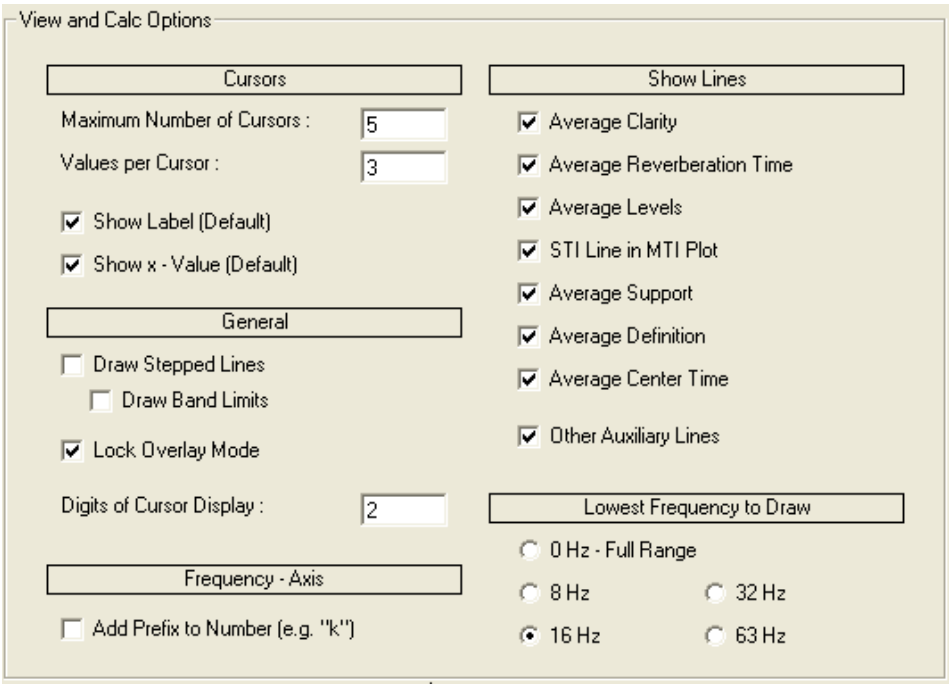
Show a scroll bar to the right of the diagram for zooming the vertical or Y-axis.

Details Table

The ***Details*** navigator page on the ***View & Calc*** tab shows a series of computing results like *Arrival*, *C50*, *D/R*, and *SNR* in a table. You can specify which measures are to be shown by checking the boxes next to the desired items.

Options

This page contains settings for the cursors, and for how the graph is displayed.



Cursors

These settings allow you to specify the modes in which saved cursors will be shown.

Maximum Number

Maximum number of saved cursors.

Values per Cursor

Number of Y values shown per cursor.

Show Label (Default)

The name of the cursor is shown along with the Y values.

Show x-Value (Default)

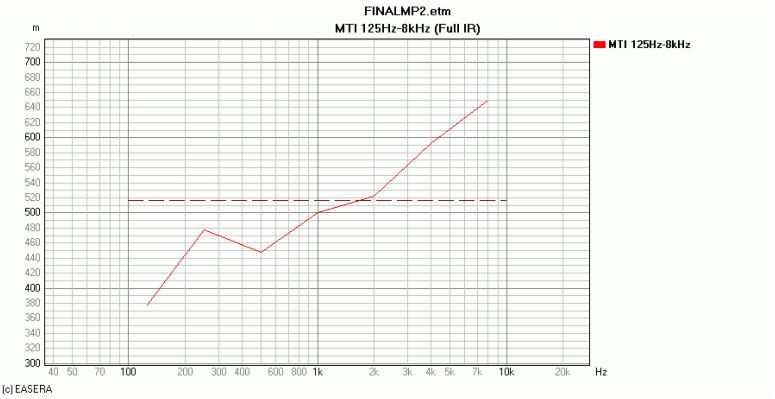
The X value of the cursor is shown along with the Y values.

General

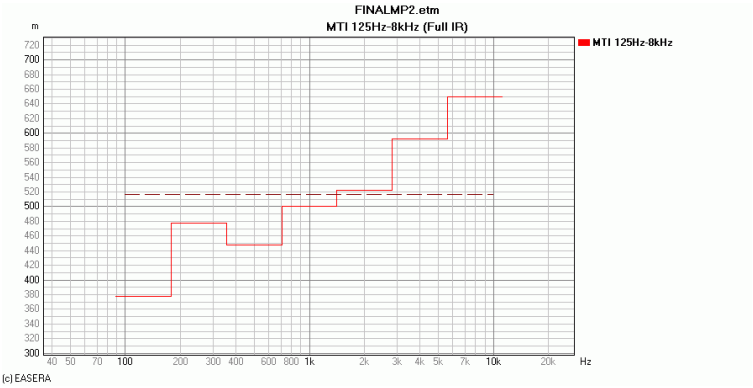
These settings control the display of the lines, the overlay mode and the resolution of the displayed values.

Draw Stepped Lines

When this option is not activated, the individual Y values are linked by means of diagonal lines:

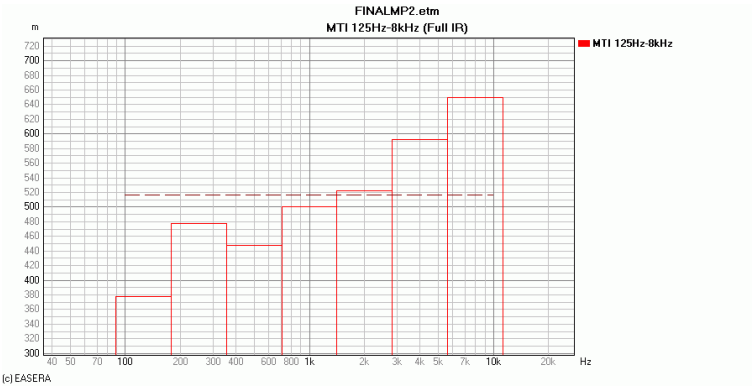


When this option is activated, the Y values are linked by means of horizontal lines of corresponding width of the band limits:



Draw Band Limits

When the option *Draw Stepped Lines* is activated, *Draw Band Limits* enables the band limits to be marked by means of vertical lines:



Lock Overlay Mode

This option determines if the **Add To Overlay** toolbar button on the ***View & Calc*** tab will stay selected. When this option is not activated, each curve that is to be added to the overlay will require you to click the button **Add To Overlay** before selecting the curve. When this option is activated, then curves are constantly added to the overlay until the **Add To Overlay** button is clicked again to deactivate the overlay mode.

Digits of Cursor Display

This controls the number of digits displayed for the cursors, as well as the status bar display of the mouse coordinates.

Frequency Axis

Add Prefix To Number (e.g. “k”)

When this option is chosen, the decimal prefixes relating to the frequency axis are shown with the numbers in the axis. If the axis contains values above 1000Hz, for example, “1k” will be shown instead of “1”, and “Hz” will be the units shown for the horizontal axis rather than “kHz”.

Show Lines

For diverse calculated curves it is possible to show the average value as a horizontal line. EASERA also shows other auxiliary lines, e. g. such representing the different T-lines of the Schroeder integral. You can use this option to select whether such lines are to be shown or not.

Each of the following functions can be separately selected as to whether these lines are shown:

Average Clarity

C50, C80 (Octave), C50, C80 (1/3rd)

Average Reverberation Time

EDT, RT (Octave), EDT, RT (1/3rd)

Average Levels

L50, L80 (Octave), L50, L80 (1/3rd)

STI Line in MTI Plot

MTI and STI

Average Support

Support ST (Octave)

Average Definition

Definition (Octave), Definition (1/3rd)

Average Center Time

Center Time (Octave), Center Time (1/3rd)

Other Auxiliary Lines

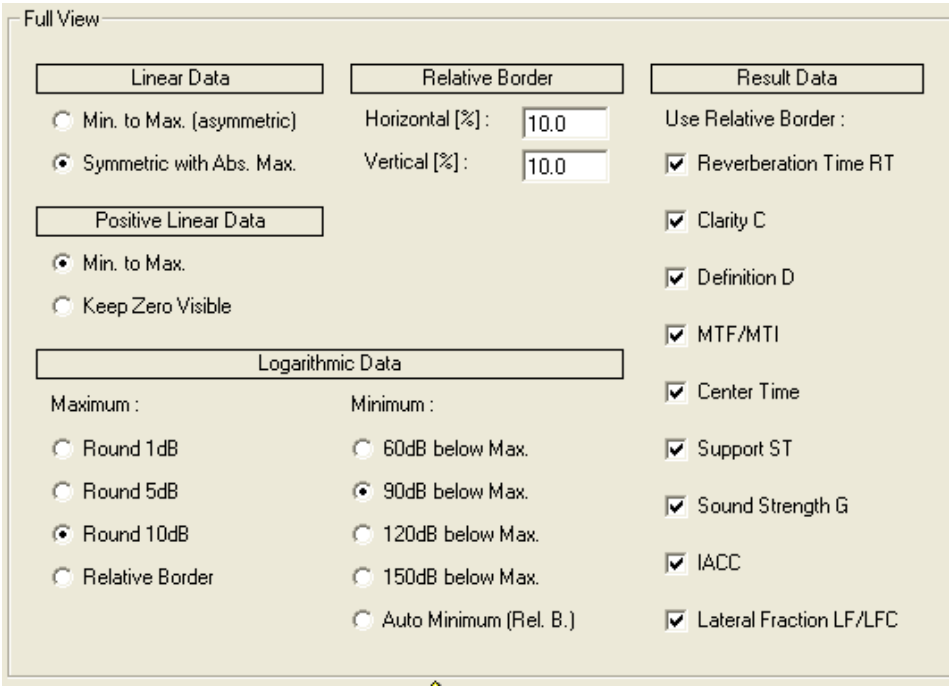
Schroeder, Schroeder RT

Lowest Frequency to Draw

The upper frequency of a **Full View** display is determined by the sampling rate. The lower frequency may be set here. EASERA is able to calculate results down to 0 Hz, but the frequency response of the soundcard used normally prevents obtaining practical results for very low frequencies.

Full View

This page explains specifically what EASERA understands by a “**Full View**”.



Linear Data

These options are for linear Y data – e.g. impulse response.

Min. to Max. (asymmetric)

The diagram borders are aligned with the maximum and the minimum and behave asymmetrically to the zero axis.

Symmetric with Abs. Max.

The absolute maximum determines the diagram borders, which are set symmetrically with the zero axis between positive and negative.

Positive Linear Data

These options are for positive linear data – e.g. reverberation times.

Min. to Max.

The diagram borders are aligned to maximum and minimum, the zero axis is not necessarily visible.

Keep Zero Visible

Zero is the lower diagram border; the upper diagram border is determined by the maximum.

Logarithmic Data

These options are for logarithmic Y values – e.g. frequency response.

Maximum

The maximum can be rounded up to the following values:

- ***1 dB***
- ***5 dB***
- ***10 dB***
- not at all (***Relative Border***).

Minimum

The minimum lies by the following levels below the maximum:

- ***60 dB***
- ***90 dB***
- ***120 dB***
- ***150 dB***
- The minimum adapts itself to the smallest level calculated (***Auto Minimum***).

Relative Border

With some diagrams it is possible to adjust the diagram borders (selected under *Result Data*) relatively to the overall magnitude of the values. The desired fraction can be set here:

Horizontal [%]

The border in horizontal direction will be this percentage of the display.

Vertical [%]

The border in vertical direction will be this percentage of the display.

Result Data

Specifies which diagrams will use relative borders. Diagrams that are not selected will set the borders according to the other settings on this page (e.g. *Logarithmic Data*).

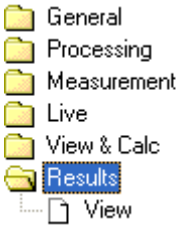
Use Relative Border

For the selected diagrams use relative borders:

- ***Reverberation Time RT***
- ***Clarity C***
- ***Definition D***
- ***MTF/MTI***
- ***Center Time***
- ***Support ST***
- ***Sound Strength G***
- ***IACC***
- ***Lateral Fraction LF/LFC***

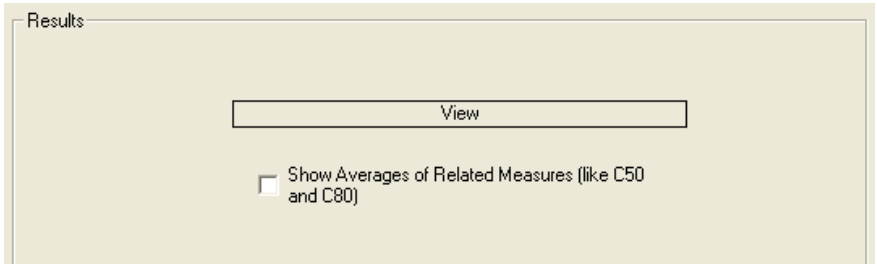
Results

The pages under this heading in the tree control the settings for the ***Results*** tab.



View

This page controls the view settings for the tabular displays on the ***Results*** tab.



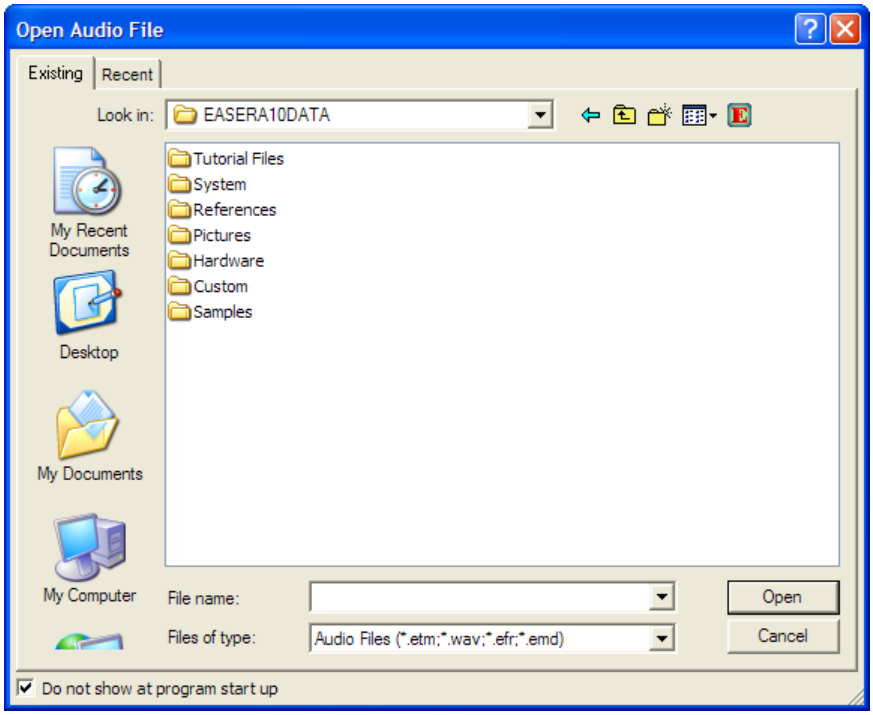
Show Averages of Related Measures (like C50 and C80)

Show the average, standard deviation, maximum and minimum values for related measures as shown below.

	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	250Hz-2kHz	500Hz-4kHz
	s	s	s	s	s	s	s	s	s
T10 (1/1 Oct.)	3.11	3.68	4.38	3.91	2.68	1.50	1.55	3.66	3.12
T20 (1/1 Oct.)	3.65	4.39	4.52	4.35	3.77	2.06	0.98	4.26	3.68
T30 (1/1 Oct.)	3.51	4.13	4.32	5.00	3.71	2.11	1.01	4.29	3.79
Average	3.42	4.07	4.41	4.42	3.39	1.89	1.18	4.07	3.53
Std. Dev.	0.23	0.30	0.08	0.45	0.50	0.28	0.26	0.29	0.29
Maximum	3.65	4.39	4.52	5.00	3.77	2.11	1.55	4.29	3.79
Minimum	3.11	3.68	4.32	3.91	2.68	1.50	0.98	3.66	3.12

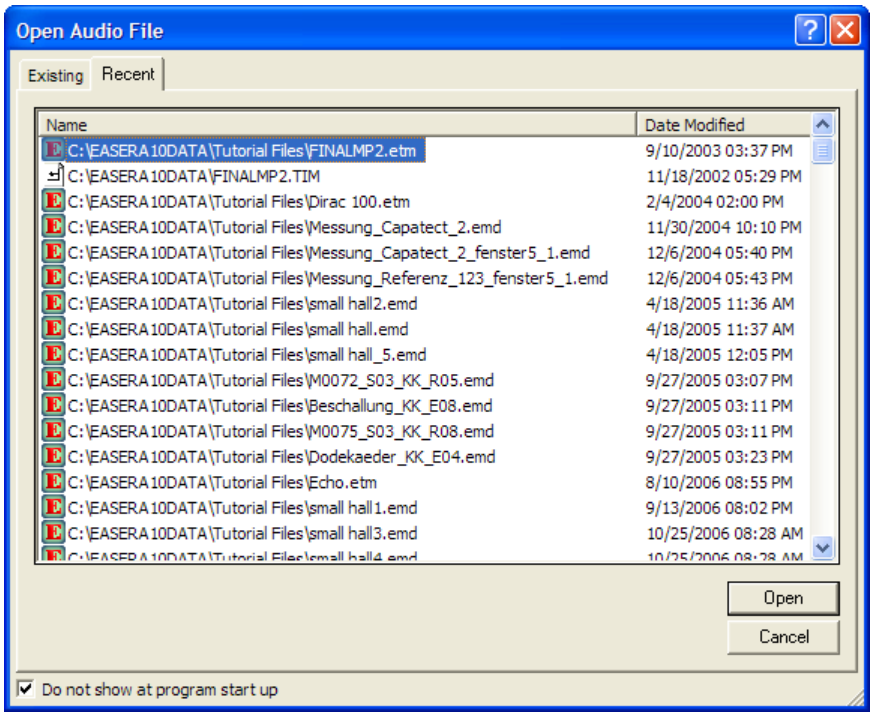
EASERA Open Audio File Window

This dialog box is opened whenever an audio file needs to be opened.



Existing

This tab displays a normal Windows open file dialog. Select one or more files and press *Open* to view the files in EASERA. You can use the small EASERA icon to the far right of the *Look in:* toolbar to return to the default EASERA measurement data folder (EASERA10DATA).



Recent Files

On the tab ***Recent Files*** there is a file select box where the recently used files are listed allowing them to be found more rapidly. Select one or more files to be opened.

They are listed in descending order of the files most recently opened. Click on the *Name* or *Date Modified* header in the list to sort by either of those columns.

Do not show at program start up

When this option is not activated, the dialog is shown during start-up of EASERA.

Open

Closes the dialog and opens the selected file.

Cancel

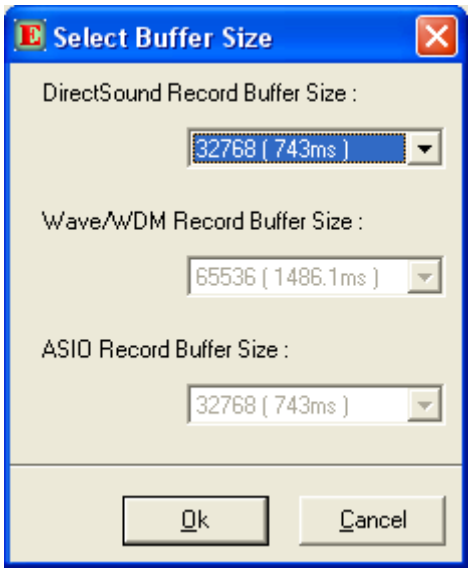
Closes the dialog without opening a file.

Select Buffer Size Window

Use the ***Select Buffer Size*** window to adjust the internal buffer size used by EASERA. In general the default settings are sufficient for normal applications of the software.

It should only be necessary to change the buffer size for a driver if it does not work properly. Shorter buffer sizes may lead to a smaller latency but increase the demand for CPU performance. Longer buffer sizes may be necessary for very slow PC hardware where not all data can be captured in the time available.

Be careful with changing these settings. Depending on driver performance changes may affect the program stability. It is recommend to restart EASERA afterwards.



Direct Sound Record Buffer Size

Selects the buffer size for the *Direct Sound* driver recording buffer.

Wave/WDM Record Buffer Size

Selects the buffer size for the *Wave/WDM* driver recording buffer.

ASIORecord Buffer Size

Selects the buffer size for the *ASIO* driver recording buffer.

OK

Accepts the changes and closes the window.

Cancel

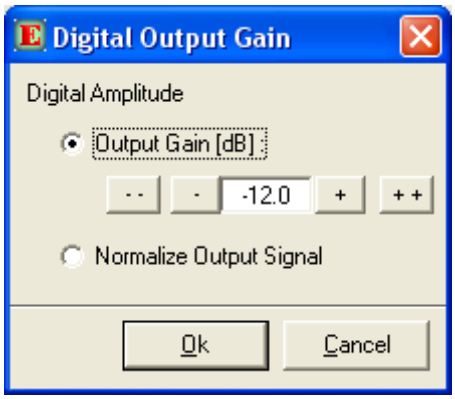
Discards the changes and closes the window.

Digital Attenuation Window

Use the ***Digital Attenuation*** window to set the gain applied to the output signal before it is sent to the DA-converter.

In some cases it is necessary to slightly reduce the amplitude of the output signal in order to prevent overflows in the anti-aliasing filter of the DA-converter and thus avoid problems due to clipping. This must be taken into account particularly for an output signal with amplitudes that vary greatly over time, such as MLS stimulus signals.

Note that applying a negative output gain on the digital side will also reduce the signal dynamic range. For example, using 8bit resolution, the dynamic range is 48dB. Choosing a digital attenuation of –10dB will leave only 38dB available for the signal dynamic range.



Digital Amplitude

Output Gain

Enter a value for the output gain. Only zero or negative dB values are allowed. The maximum value of 0dBFS is equivalent to Full Scale. The **[-]** and **[+]** buttons decrement or increment the magnitude values by 1dB. The **[- -]** and **[+ +]** buttons decrement or increment the magnitude values by 6dB.

Normalize Output Signal

Activating this option will always normalize the signal to full-scale.

OK

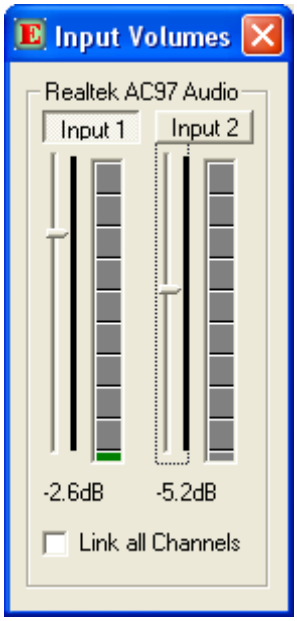
Accepts the changes and closes the window.

Cancel

Discards the changes and closes the window.

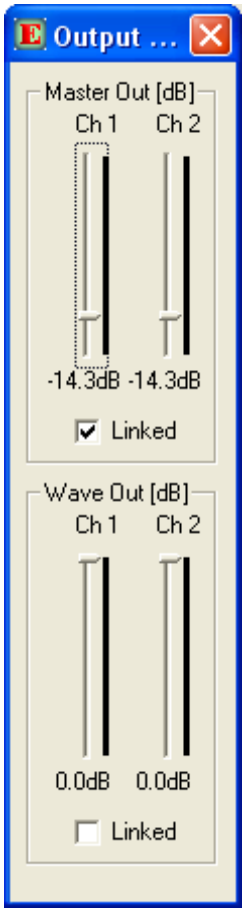
Input Volumes Window

Use the ***Input Volumes*** window to separately adjust the current input levels. The volume controls available correspond to the volume controls of the Windows mixer.



Output Volumes Window

Use the ***Output Volumes*** window to separately adjust the current output levels. The volume controls available correspond to the volume controls of the Windows mixer.


Output ...
Master Out [dB]
Ch 1
Ch 2
-14.3dB
-14.3dB
Linked
Wave Out [dB]
Ch 1
Ch 2
0.0dB
0.0dB
Linked