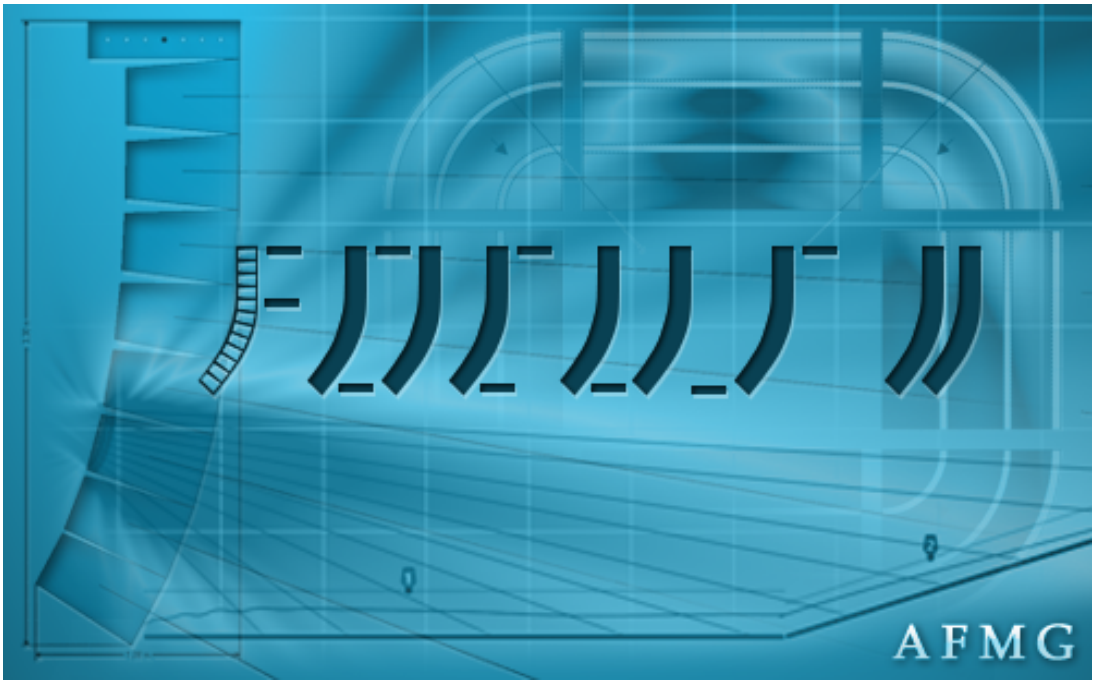
EASE Focus

Version 2



Developed by

AFMG Ahnert Feistel Media Group

The creators of EASE, EASERA, SysTune

www.afmg.eu

Software Manual, Rev. 1, October 2010
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1. Introduction to EASE Focus 2

1.1. Software Overview

EASE Focus 2 is a three-dimensional, acoustic simulation software for the configuration and modeling of line array systems and of adjustable loudspeakers, such as digitally steered columns. The software is publicly available and it is free.

In EASE Focus 2, each line array or column loudspeaker is described by a so-called system definition which contains the mechanical, electronic and acoustic properties of the loudspeaker system. This system definition is stored in an EASE GLL file which can be compiled with the EASE SpeakerLab software.

GLL data files are created and supplied by loudspeaker manufacturers. Any GLL file can be loaded into the EASE acoustic modeling software. However, in order to create a GLL that can be used in EASE Focus 2 a loudspeaker company needs to be licensed by AFMG.

The EASE Focus 2 software program was developed over a period of more than 2 years and is related to EASE Focus 1. However, EASE Focus 2 takes a large step forward towards more realistic modeling of complex sound systems by including the following major features:

- 3D modeling of direct sound, displayed in horizontal and vertical cutting planes.
- Full support for EASE GLL files and data exchange with EASE and other AFMG software packages.
- Capability to use multiple line array systems in a single project.
- Virtual equalizer for tuning a line array in the simulation.
- Support for digitally steered columns and other configurable loudspeakers; this requires an additional proprietary DLL that can provide e.g. beam steering filters.
- Full frequency range from 20 Hz to 20 kHz.
- High accuracy due to high internal data resolution and GLL data format. See AFMG white papers and AES articles for details.

Great efforts have been made to keep EASE Focus intuitive and easy-to-use while introducing three-dimensional coordinates and many new features. It can be considered a tool for both the end user, who needs to set up the sound system for a show, as well as for the R&D engineer, who is interested in the acoustic qualities of the array design. EASE Focus is the optimal tool for easy and quick prediction of the sound system performance in a given venue.

Compared to conventional aiming software the applicability of EASE Focus is much larger. It is not fixed to a single loudspeaker product. System definition files for different types of line arrays can be created and added to the software database at any time and without changing a single line of code.

As an outlook, future versions of EASE Focus are planned to provide simulation capabilities for subwoofer arrays and to take into account wind effects. Also, a separate version for Apple Macintosh computers is being discussed, as well.

EASE Focus is developed by Ahnert Feistel Media Group. Located in Berlin, Germany, AFMG is a worldwide leader in software for the pro-audio industry and has created the industry standards EASE and EASERA software for acoustic simulation and measurement as well as their related products EASE Focus, SysTune, EASE Address and EASE SpeakerLab. AFMG works closely with leading university faculties, manufacturers and

design clients to apply the latest developments in acoustical research and computer technology. For more information, including the latest news and forum posts, visit http://afmg.eu.

1.2. System Requirements

Minimum software requirements

- Microsoft Windows 2000, XP, Vista or 7.
- Acrobat Reader 5.0 (or later).
- Microsoft .NET Framework v 2.0 or 2.0 SP1, which can be downloaded here:

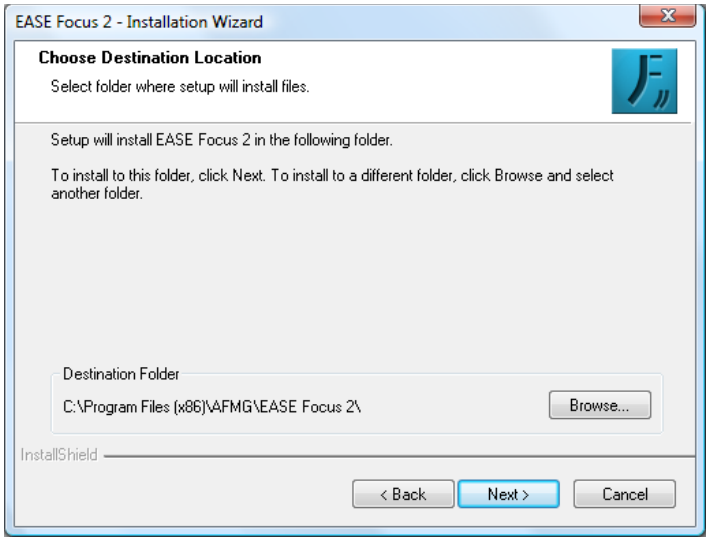
http://www.microsoft.com/downloads/details.aspx?displaylang=en&FamilyID=0856eacb-4362-4b0d-8edd-aab15c5e04f5

Minimum hardware requirements

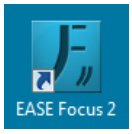
- 1 GB RAM (2 GB or more recommended, especially for Vista and 7)
- 990 x 600 display resolution (1024 x 768 or higher recommended display resolution)
- 1.5 GHz processor speed or higher (multiple cores are supported and recommended)

1.3. How to Install

To install EASE Focus 2, unpack the ZIP file and double click on the executable named "setup". This will launch the setup utility that will install the program in a few easy steps. Note that for the installation you will need administrator rights on your computer.



EASE Focus 2 can be installed on a computer that already has Focus 1 installed. By default it will be installed to a new location. While you can change the suggested target location, it is strongly recommended that you **do not** install Focus 2 in the same folder as Focus 1.



After the installation has completed successfully you can launch EASE Focus 2 using the desktop icon or the Windows Start menu. The software can be found in the AFMG folder. If you should experience problems with EASE Focus 2 at any time later, try starting the software with its default settings. This option is available as a command from the Windows Start menu.

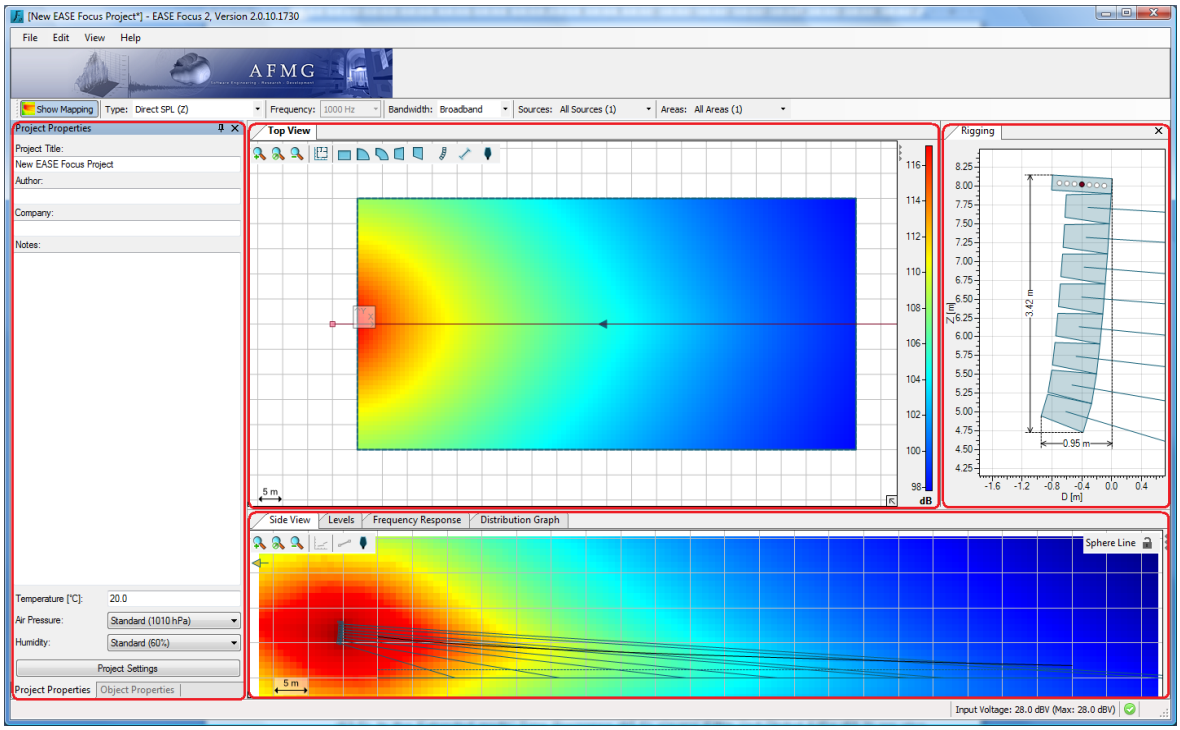
Initial Setup of the Program

Upon start-up, the software will prompt you with the question if you would like to sign up for the AFMG newsletter in order to be informed about program updates and other AFMG news. We strongly recommend subscribing to the newsletter. You can do that by either pressing YES on the initial dialog window or by selecting the command SIGN UP FOR NEWS from the HELP menu. This will take you to the AFMG registration website where you can enter personal details as needed and make your choice about which news you would like to receive.

EASE Focus ships with a number of language options: English, German, Spanish, Italian and Portuguese. Normally the first time EASE Focus 2 is run it will detect the language of your operating system and use it automatically. If you wish to change the default language, press F9 for the OPTIONS window and switch to the ENVIRONMENT page. Then select the desired language from the LANGUAGE drop-down list at the very top. (See §4.3)

The installation package of EASE Focus 2 includes a number of line array types and digitally steered columns by default. But if you have new or updated system definition files, that is, GLL or DLL files, you may want to add them to your local database in order to make them available in EASE Focus 2. To do that press Ctrl+I or select IMPORT SYSTEM DEFINITION File from the EDIT menu. A file dialog will open which allows you to select the GLL file of interest. Note that the program will make a full copy of this file so you don't have to worry about removing it from the original location after the import. (See §2.9)

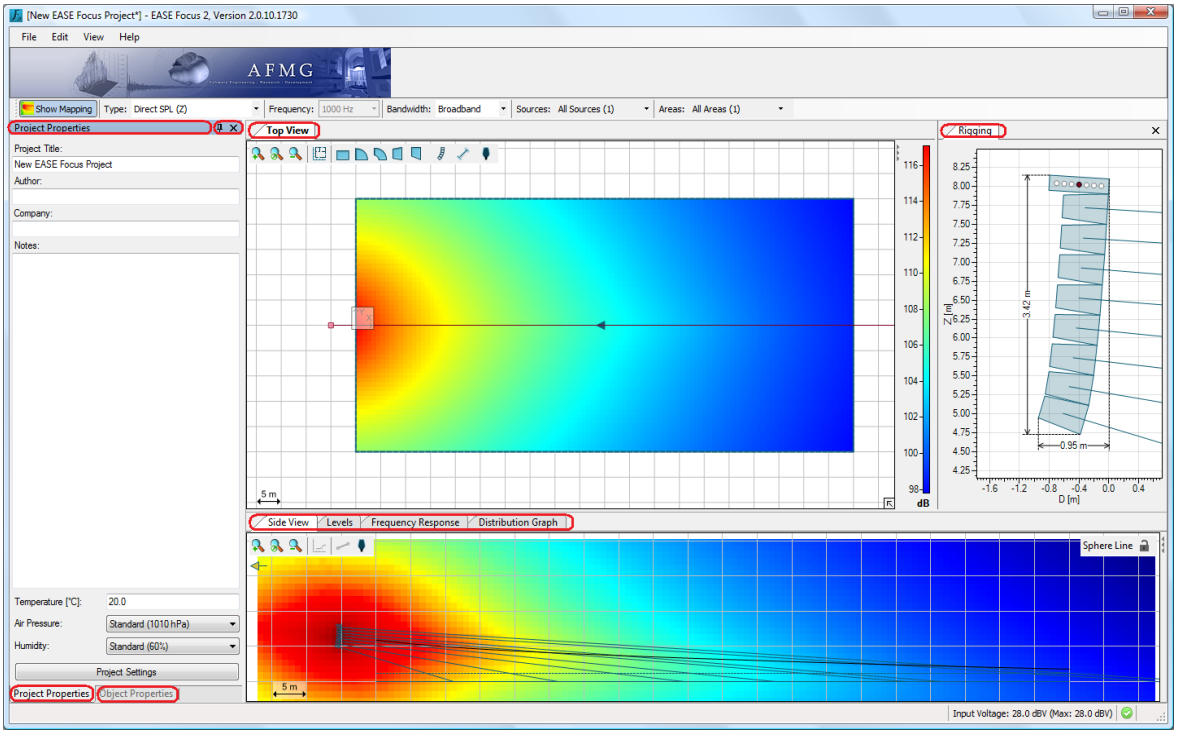
1.4. User Interface



If you are familiar with Focus 1, you will notice that, due to the fact that the 3rd dimension was added to the software and that multiple line arrays can now be configured, the user interface had to be extended to support both top view and elevation view. Generally, objects are added and selected in the Top View. Their properties can be viewed and modified in the Properties window as well as in the Side View. The Object Properties window displays the properties of the selected object or, if no object is selected, a list of the objects in the project. You can select an object directly from the list, and then see its properties with the SHOW PROPERTIES button, or go back to the list with the SHOW OBJECT LIST button.

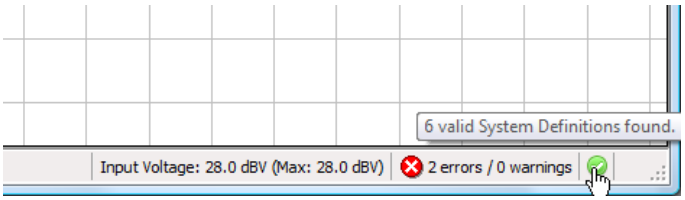
The software GUI is subdivided into 4 screen areas:

- Left: Project Properties (§2.1) and Object Properties, used for editing Line Arrays (§2.11) and Loudspeakers/Columns (§2.14), Audience Zones (§2.5), Receivers (§3.6) and Section Planes (§5.2).
- Top: Top View (§2.2), horizontal coverage. This allows selecting, entering and modifying Audience Zones, Receivers, Line Arrays, Loudspeakers/Columns and Section Planes in the X-Y-domain.
- Bottom: Side View (§2.3), vertical coverage. This allows entering and modifying Audience Areas for the selected Zone or changing the aiming and position of the selected Line Array system. Additional tabs can be used to select Frequency Response (§3.7), Levels (§3.4) and Distribution (§3.5). In the Extended mode, Time Response (§5.5), source Filter and Global Filter (§5.3) are also available. For information on how to activate the Extended mode, see §4.3.
- Right: Rigging view.



At the top of the main window you can find the menu bar, a panel displaying the manufacturer's logo and the Mapping Toolbar (§3.1).

At the bottom is the status bar. On its left side readouts for mouse position are shown as you navigate maps and graphs of many windows in Focus (see §1.5 for more). On its right side you find the input voltage for the selected Sound Source (§3.2), error and warning count relative to Sound Sources (§2.11) and Audience Zones (§2.5), and an icon showing the status of system definitions (it should be green, if there is no error; red otherwise). Clicking on the errors and warnings you can open a window listing them in detail; clicking on the system definitions status icon you can restart scan or open ENVIRONMENT options (§4.3).



Note that you can move windows by grabbing their title bar or tab caption. You can also change their size relative to the other windows. Use the command VIEW | RESET LAYOUT to return to the original settings. Use the STORE and RESTORE commands in the VIEW menu to create and recall your own window layouts.

1.5. Program Conventions

Definition of Terms

There are four major types of objects in EASE Focus:

- Audience Zones (§2.4): Audience Zones are two-dimensional shapes roughly circumscribing the audience in one direction when looking from the stage. They contain one or more Audience Areas

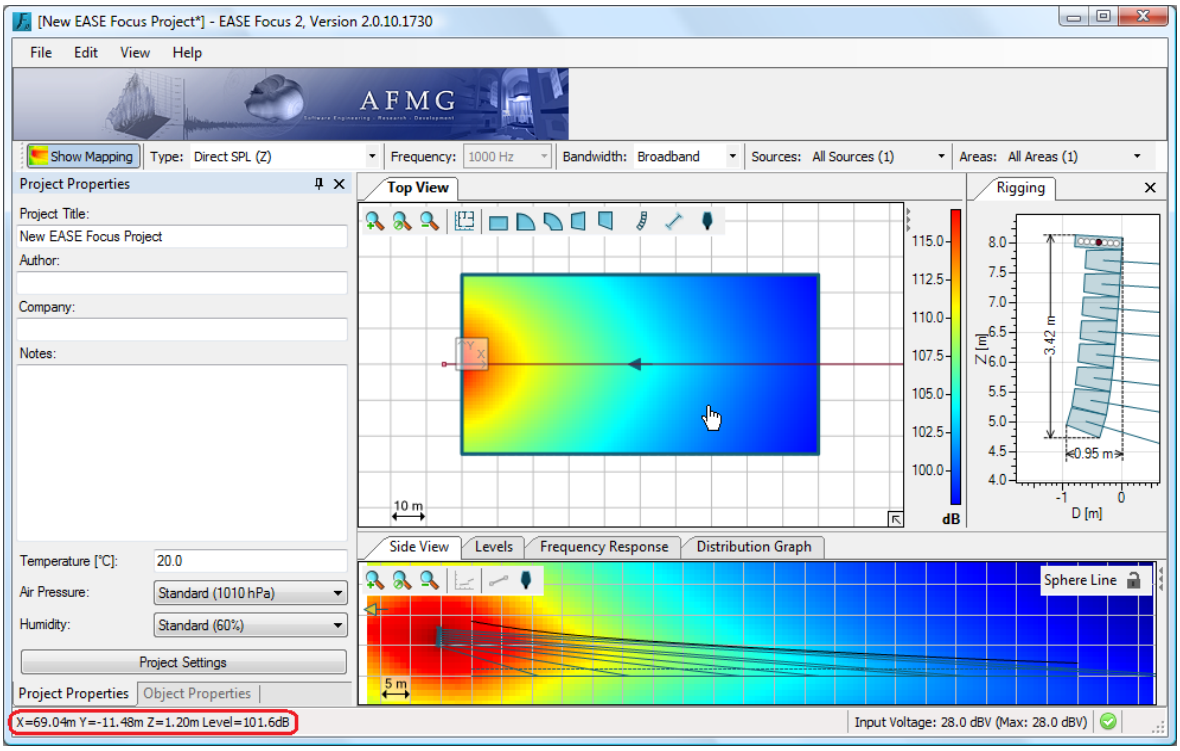
(§2.5). An Audience Area is always part of a Zone; it is defined by starting and ending points and is stretched out over the width of the Zone: this is the actual area where the audience is located.

- Sound Source: Based on the related system definition (GLL), a Sound Source consists of one or multiple point sources each of which is considered the origin of a sound wave. Technically, a Sound Source can be one of two types, either a Line Array (§2.10) or a Loudspeaker/Column (§2.14). Depending on the properties of the Sound Source, the respective GUI elements may be different.
- Receiver (§3.6): A Receiver is a representative point for detailed acoustic analysis, such as with respect to the local time or frequency response. This item has no acoustic relevance.
- Section Plane: A Section Plane is a user-defined, virtual surface that can be added to the project in order to view mapping data in an arbitrary vertical cutting plane (see §5.2). Like the Receiver, this item is purely virtual and has no effect on the computational results.

A Project is the set of all objects as defined before combined with the settings associated with the project such as regarding height limits or noise levels. Projects can be loaded from and saved to files with the extension .fc2.

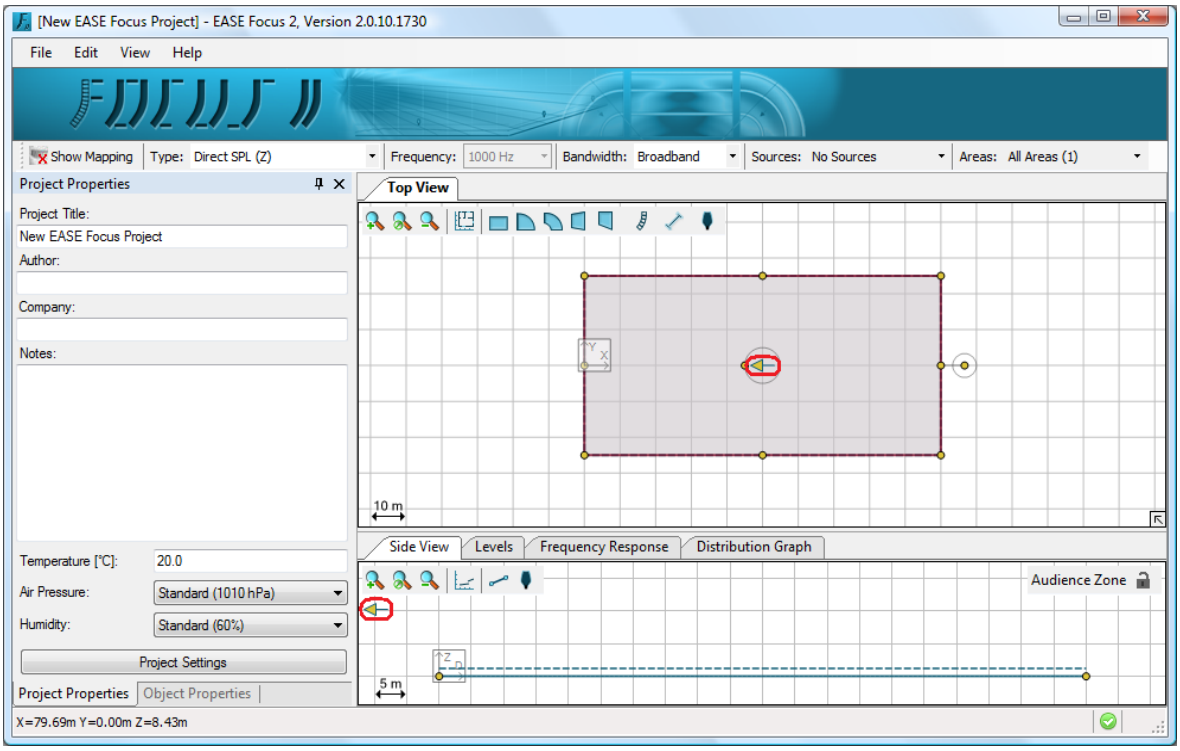
Coordinate System

The main coordinate system in EASE Focus uses XYZ coordinates. The origin marker is displayed by default in the Top View (but can be hidden, see §4.1) and can be moved to another location (§5.6). XYZ coordinates are used in the Object Properties window to indicate the position of all objects. The current mouse location in Top View, Side View and Rigging windows is shown in the status bar, along with the SPL value at that point, if an active Sound Source exists. For all other windows that display a plot you can also see current mouse coordinates in the status bar.



Another important coordinate system is DZ coordinates, used in Side View, Rigging and Levels windows. The DZ origin marker can be optionally hidden in Side View as well. While Z still refers to the elevation from the ground, D is relative to the position of the object whose section is displayed in Side View, and reflects the distance, along the object's main axis, from its reference point: the location for Sound Sources (§2.10, §2.14)

and Receivers (§3.6), the front center point for Audience Zones (§2.4), or the starting point for Section Planes (§5.2). You can see how relative D values relate to XY coordinates in the status bar, while you move your mouse over Side View, Rigging and Levels windows.



The difference between positive and negative D values is given by a simple convention of EASE Focus 2 that descends from Focus version 1: in short, Sound Sources are expected to be radiating from left to right in Side View, and the audience is expected to face from right to left. For this reason, the Side View relative to Sound Sources is always showing them pointing right, while relative to Receivers, Audience Zones and Section Planes it shows them pointing left. If you have any doubt when using Audience Zones or Section Planes, refer to the yellow arrow appearing in the middle of those objects when they are selected, and pointing to their front center point (for Audience Zones) or starting point (for Section Planes): this is the same arrow that appears in the Side View, pointing left, and these two arrows are oriented in the same direction.

1.6. Shortcut List

Here is a list of all keyboard shortcuts available in Focus, for quick reference.

Main window (always active):

F1	Help; opens this User's Guide
F4	Show Object Properties or Object List
F9	Options (see Chapter 4)
F10	Scale to Fit (both Top View and Side View)
F11	Select Previous Object
F12	Select Next Object
Ctrl+N	New Project
Ctrl+O	Open Project (§2.8)
Ctrl+S	Save Project (§2.7)
Ctrl+Shift+S	Save Project As (§2.7)
Ctrl+Z	Undo
Ctrl+Y	Redo
Ctrl+Alt+L	Add Sound Source (§2.10, §2.14)
Ctrl+I	Import System Definition (§2.9)
Ctrl+T	Change System (when a Sound Source is selected)
Ctrl+Shift+J	J-Array setup (when a Line Array is selected, see §2.11)
Ctrl+Shift+L	Lined setup (when a Line Array is selected, see §2.11)
Ctrl+Shift+C	Curved setup (when a Line Array is selected, see §2.11)
Ctrl+Shift+A	Auto Splay (when a Line Array is selected, see §2.12)
Ctrl+F1 … F12	Activate a stored layout: individual layout names and shortcuts can be seen in the View menu (§1.4)
Ctrl+Alt+C	The automatic mapping color legend is by default optimized for Top View: use this shortcut to switch optimization between Top View and Side View

Top View (§2.2):

Ctrl+C	Copy selected object
Ctrl+V	Paste copied object
Ctrl+Shift+C	Copy Areas (for Audience Zones, see §2.6), Copy Setup (for Sound Sources, see §2.13)
Ctrl+Shift+V	Paste Areas (for Audience Zones, see §2.6), Paste Setup (for Sound Sources, see §2.13)
Del	Delete selected object

Modifier keys (to be held while performing a mouse action):

Shift	Measure distance (when dragging between two points in Top View or Side View)
Alt	Ignore snapping in Top View and Side View (see §4.2 about snap settings)
Ctrl	Free the Receiver currently being edited, ignore auto-anchoring (§3.6)

2. Venue Definition and Line Arrays

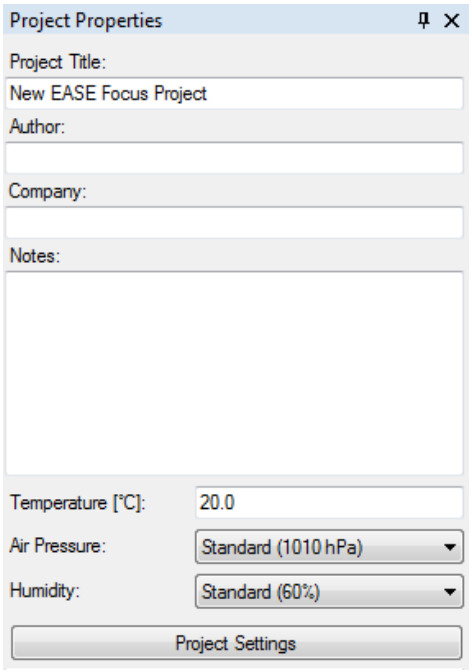
This section gives a brief introduction into the main features you need to know in order to model a small project with EASE Focus 2. We will explain how to enter a simple venue and then add line array systems to it. More advanced topics will be covered in the subsequent chapters.

The next chapters will guide you through the main steps of editing a project. Whenever you make a mistake, you can revert any modification to the project, or recover a reverted modification, with the menu items EDIT | UNDO (Ctrl+Z) and EDIT | REDO (Ctrl+Y).

> *In this chapter and in the following ones you will find some yellow frames along the way, just like this one. These contain simple examples to help you learn how to use EASE Focus 2. You can choose to create your own project, or to work on this tutorial project and learn as you progress.*

2.1. Project Properties

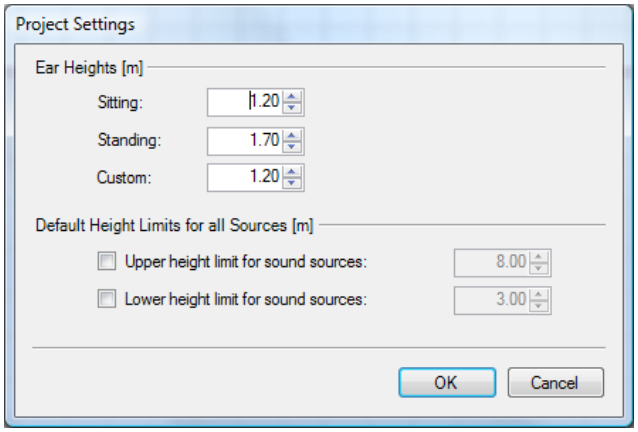
The Project Properties window is located on the left side of the main window. It contains basic information about the project (title, company, author, notes) as well as some settings that are relevant for calculations (temperature, air pressure, humidity).



From here you can also access the PROJECT SETTINGS window, where you can edit ear height values for Audience Areas. Three values are available: SITTING, STANDING and CUSTOM. When editing Audience Zones, you will be able to choose one of these values for each Area (§2.5). In the PROJECT SETTINGS window you

can also define default project-wide height limits for Sound Sources. When editing a Source you can choose whether to apply project limits or to define individual limits (§2.11).

When working in Extended mode, you can access the NOISE SETTINGS from a button within the Project Properties window as well (§5.7). See §4.3 to learn how to activate Extended mode.

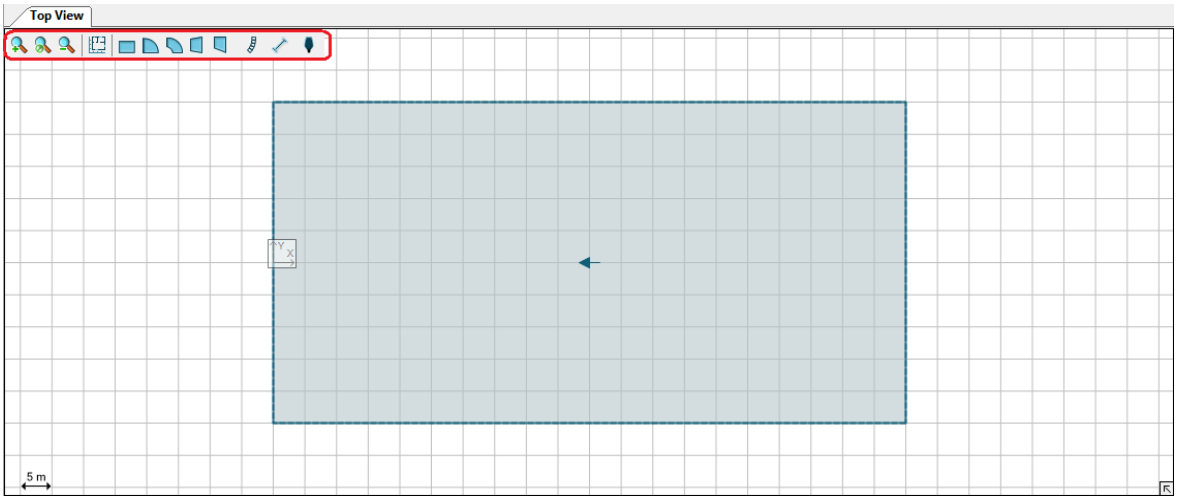


2.2. Top View

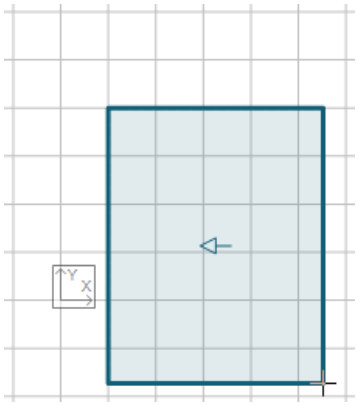
The Top View displays a plan of the venue, and contains all objects in the project: Audience Zones, Sound Sources, Receivers and Section Planes. To select an object, click on it with the left mouse button; to move it, just drag it around the window. In addition, objects have either aiming lines (Sound Sources and Receivers) or yellow handles (Audience Zones, Section Planes) to rotate them and resize them with a simple mouse drag.

The Top View toolbar is located on the top left corner of this window. It includes the following buttons:

- Zoom in
- Fit the zoom to the project
- Zoom out
- Add Layout Picture (§5.1)
- Add Audience Zone (Rectangle) (§2.4)
- Add Audience Zone (Circular Sector) (§2.4)
- Add Audience Zone (Annular Sector) (§2.4)
- Add Audience Zone (Trapezoid) (§2.4)
- Add Audience Zone (Right-Angled Trapezoid) (§2.4)
- Add Sound Source (§2.10, §2.14)
- Add Section Plane (§5.2)
- Add Receiver (§3.6)



To add an object, first click on the button in the toolbar corresponding to the desired object. Then move the mouse to the desired location in the drawing, click the left button and drag with your mouse until you are satisfied with the size and orientation of the object. If you click without dragging, the object will be centered on mouse location and take on the default size and orientation, which you can then modify later.

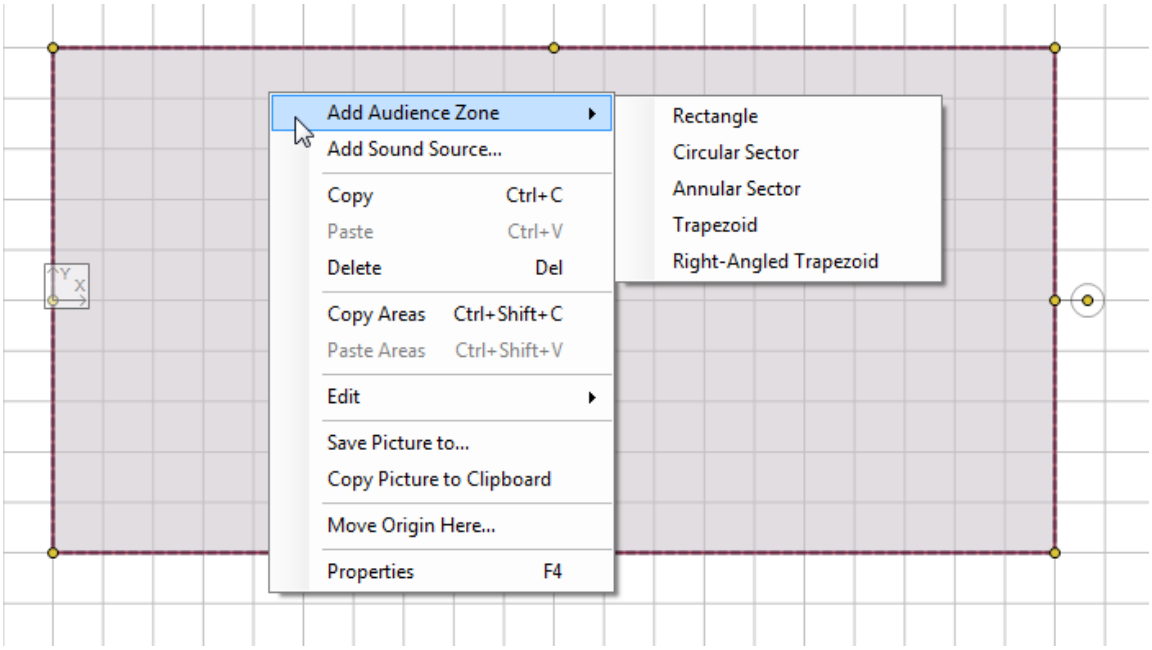


Clicking anywhere in the Top View with the right mouse button will open the context menu, where you can perform any of the following actions:

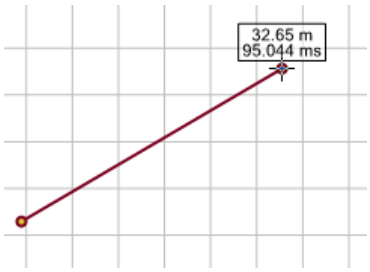
- ADD AUDIENCE ZONE: inserts a new Audience Zone into the Project (RECTANGLE, CIRCULAR SECTOR, ANNULAR SECTOR, TRAPEZOID, RIGHT-ANGLED TRAPEZOID), as an alternative method to the toolbar buttons (§2.4).
- ADD SOUND SOURCE: inserts a Line Array (§2.10) or a Loudspeaker/Column (§2.14) into the Project, as an alternative method to toolbar buttons.
- COPY (Ctrl+C): copies the selected object to the clipboard.
- PASTE (Ctrl+V): pastes any previously copied object into the Project.
- DELETE (Del): removes the selected object.
- COPY AREAS (Ctrl+Shift+C): when an Audience Zone is selected, stores its Audience Areas to be subsequently applied to another Audience Zone (§2.6).
- PASTE AREAS (Ctrl+Shift+V): when an Audience Zone is selected, and Audience Areas have been copied from another Zone, pastes them to the selected Zone (§2.6).
- COPY SETUP (Ctrl+Shift+C): when a Sound Source is selected, stores its setup to be subsequently applied to a compatible Source (§2.13).
- PASTE SETUP (Ctrl+Shift+V): when a Sound Source is selected, and a setup has been copied from a compatible Source, applies it to the selected Source (§2.13).

Please note that copying objects, copying Audience Areas and copying Sound Source setups are three independent functions that do not override or affect each other. However, copying objects and copying pictures (see below) both use the Windows clipboard, and will override each other.

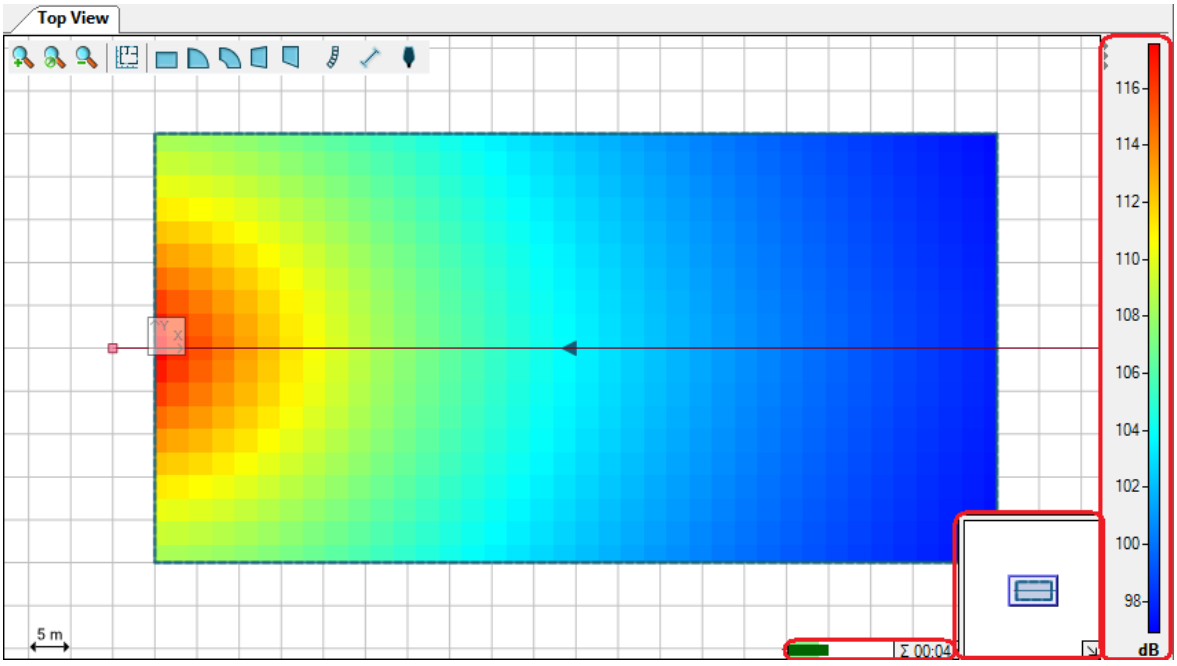
- EDIT: performs an action affecting the selected object. You can FLIP HORIZONTALLY, FLIP VERTICALLY, ROTATE CLOCKWISE, ROTATE COUNTERCLOCKWISE.
- SAVE PICTURE TO: saves the content of the Top View as an image file (§3.10).
- COPY PICTURE TO CLIPBOARD: copies the content of the Top View as an image in the Windows clipboard, to be pasted into any Windows application that supports it.
- MOVE ORIGIN HERE: specifies a new origin for the Project coordinates (§5.6).
- PROPERTIES (F4): when an object is selected, shows the Object Properties window for that object if it is hidden and brings it to the top.
- OBJECT LIST (F4): when no object is selected, shows the object list if it is hidden and brings it to the top.



Note that all drawing and editing options snap by default to the displayed grid; this can be changed in the options (§4.2). Holding the Alt key will also temporarily deactivate the snap to the grid. Holding the Shift key before dragging with the mouse will measure any distance in length and time delay.



On the bottom right corner you can see a miniature map of the whole project, displaying the portion currently being viewed: this small frame can be collapsed if you don't need it. To the left of it, a Mapping Progress Bar will appear whenever mapping data are being calculated. The Mapping Legend appears by default on the right edge of the Top View whenever color mapping is active and visible, but it can also be collapsed by clicking on the three small triangles in the upper left of its window.

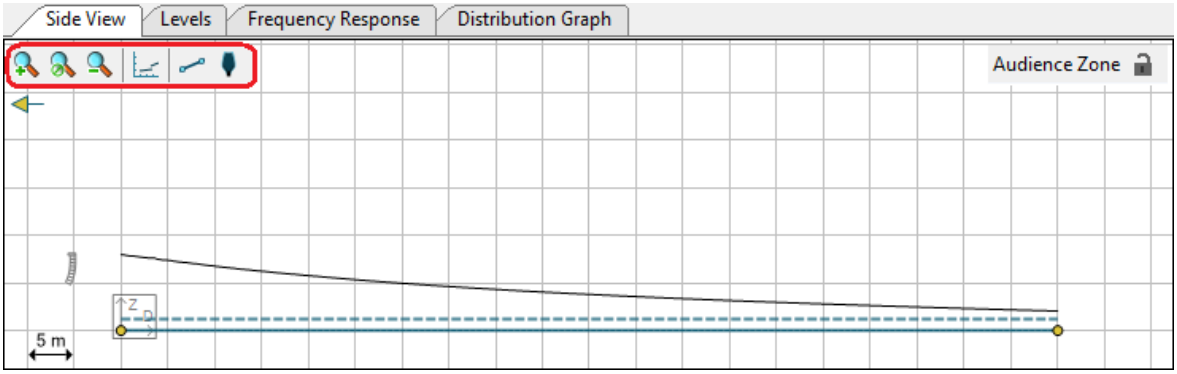


2.3. Side View

The Side View has an interface similar to the Top View, except it will not show the whole project, but only a vertical section of it, referring in general to the selected object. The section is taken along the central axis of the object: for Audience Zones this is the line going through the orientation arrow displayed in the Top View, for Sound Sources and Receivers it is the aiming line, and for Section Planes the plane itself.

To understand in which direction you are looking when an Audience Zone or a Section Plane is selected, use the yellow arrow in the top left corner: it replicates the arrow appearing on these two types of objects when they are selected, and points in the same direction. When a Sound Source is selected, the Side View displays it to the left, with the aiming line oriented rightwards; the aiming line points leftwards instead, in the case of Receivers.

You can also see the related Side View of an object which is not selected. Use the Lock symbol  in the upper right corner of the Side View window to keep the side view of an object while manipulating another one. This is helpful, for example, when you want to adjust the location of a Receiver in the Side View of a Line Array or change the splay angles of a Line Array while viewing an audience zone.



Just like the Top View, the Side View has its toolbar in the top left corner as well. It displays these buttons:

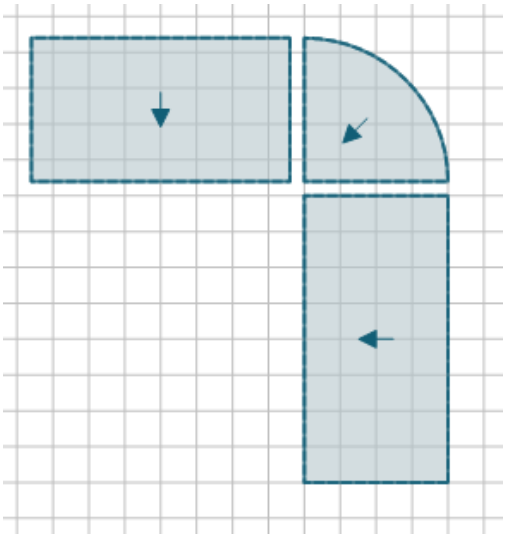
- Zoom in
- Fit the zoom to the project
- Zoom out
- Add Layout Picture (when an Audience Zone or a Section Plane is being displayed) (§5.1)
- Add Audience Area (when an Audience Zone is being displayed) (§2.5)
- Add Receiver (§3.6)

A Mapping Progress Bar will appear in the bottom right corner whenever mapping data are being calculated.

The Side View window is particularly useful to edit Audience Zones (§2.6), Line Arrays (§2.11) and Loudspeakers/Columns (§2.14) with a graphical interface.

2.4. Adding Audience Zones

Audience locations are defined on two levels. First, Audience Zones are entered in the Top View and should include all particular seating areas in one direction looking towards the center or stage of the venue. In a second step, a profile consisting of one or multiple Audience Areas is defined for each Zone.

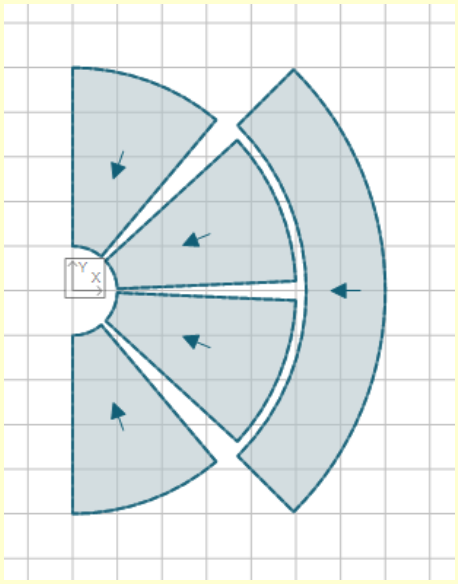


A Zone is basically a simple 2D shape that can be understood as the circumjacent projection of the seating areas in one part of the venue on the horizontal plane. It is defined by a location, orientation and properties specific to the shape, such as the width and depth of a rectangle.

Use the shape icons in the top view to select a particular shape for insertion:



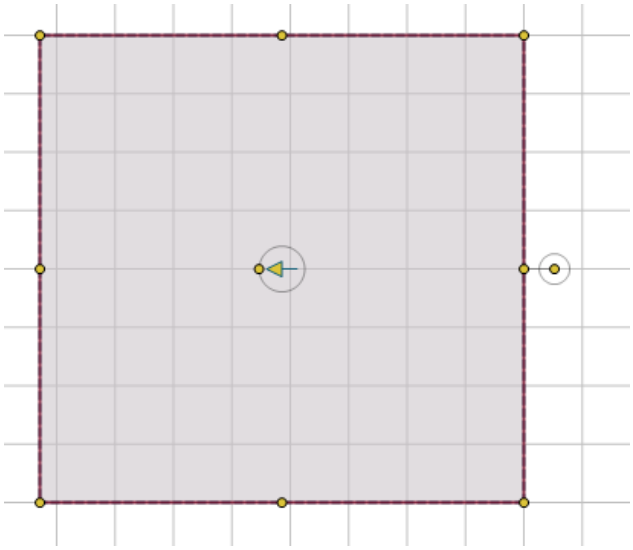
Then add an Audience Zone by clicking or dragging.



Draw an amphitheater similar to the one shown above. You will need five Annular Sectors. Give them meaningful names like "Floor Left", "Floor Middle Left", "Floor Middle Right", "Floor Right", "Balcony".

2.5. Editing Audience Zones

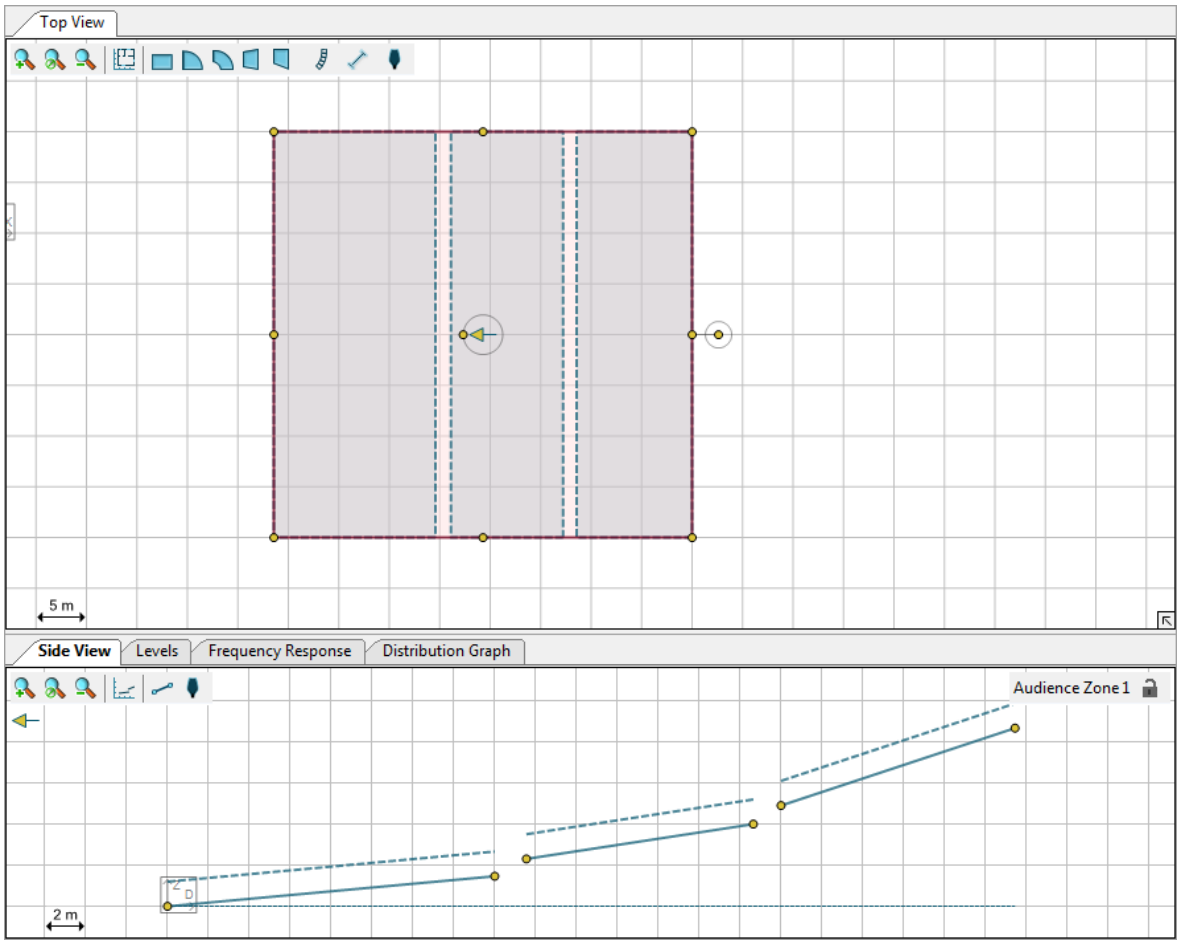
Select a Zone by simple left-click.



When active, the Zone will be highlighted in dark red. It will also show yellow handles that allow you to resize, rotate or change the shape of the Zone. A Zone can be moved relative to other objects by simply left-dragging it with the mouse. The yellow arrow (blue when the Zone is deselected) indicates the viewing direction of the spectators.

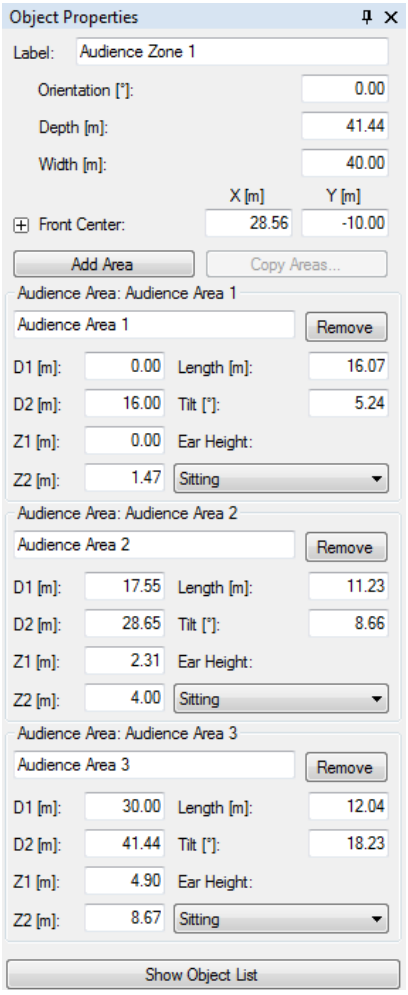
An Audience Area is always part of a Zone and is defined by a starting point and an ending point relative to the Zone. There can be multiple Areas inside a Zone. In 3D, these Areas are assumed to be stretched out over the width of the entire Zone, depending on the symmetry of the shape.

Selecting a Zone will show the Zone's profile in the side view.



Use the line icon to enter a new Area for this Zone. Note that you can also left-drag the yellow handles at the ends of an Area to resize it or left-drag the center of an Area to move it. Left-drag the white background of the drawing to move the objects relative to the screen.

The horizontal dotted line at the bottom of the Side View indicates the Audience Zone. The Audience Zone above consists of three Audience Areas denoted by the solid lines with the yellow handles. The dotted lines that are parallel to the Audience Areas indicate the selected listening heights.



Properties of Audience Zones can also be modified from the Object Properties window. Below is a short description of all Audience Zone types and of the attributes available for each one.

Rectangle: a rectangular Zone, with the audience facing one of the edges

- ORIENTATION: the direction the Audience Zone is facing (0° = facing left)
- DEPTH: the size of the Zone along its axis
- WIDTH: the size of the Zone across its sides
- FRONT CENTER, FRONT LEFT, FRONT RIGHT, BACK LEFT, BACK RIGHT: position of the main reference points

Circular Sector: a Zone whose shape is a circular sector (like a piece of pie), with the audience facing the corner point

- ORIENTATION: the direction the Audience Zone is facing (0° = facing left)
- DEPTH: the size of the Zone along its axis
- SWEEP ANGLE: the angular width of the sector
- FRONT CENTER, BACK LEFT, BACK RIGHT: position of the main reference points

Annular Sector: a Zone whose shape is an annular sector (a portion of a ring), with the audience facing the center of the circle

- ORIENTATION: the direction the Audience Zone is facing (0° = facing left)
- DEPTH: the size of the Zone along its axis

- INNER RADIUS: distance between the inner circle and the center of the circle (outer radius = inner radius + depth)
- SWEEP ANGLE: the angular width of the sector
- FRONT CENTER, FRONT LEFT, FRONT RIGHT, BACK LEFT, BACK RIGHT: position of the main reference points

Trapezoid: a Zone whose shape is an isosceles trapezoid, with the audience facing one of the parallel edges

- ORIENTATION: the direction the Audience Zone is facing (0° = facing left)
- DEPTH: the size of the Zone along its axis
- FRONT WIDTH: the size of the parallel edge faced by the audience
- BACK WIDTH: the size of the parallel edge behind the audience
- FRONT CENTER, FRONT LEFT, FRONT RIGHT, BACK LEFT, BACK RIGHT: position of the main reference points

Right-Angled Trapezoid: a Zone whose shape is a right-angled trapezoid, with the audience facing one of the parallel edges

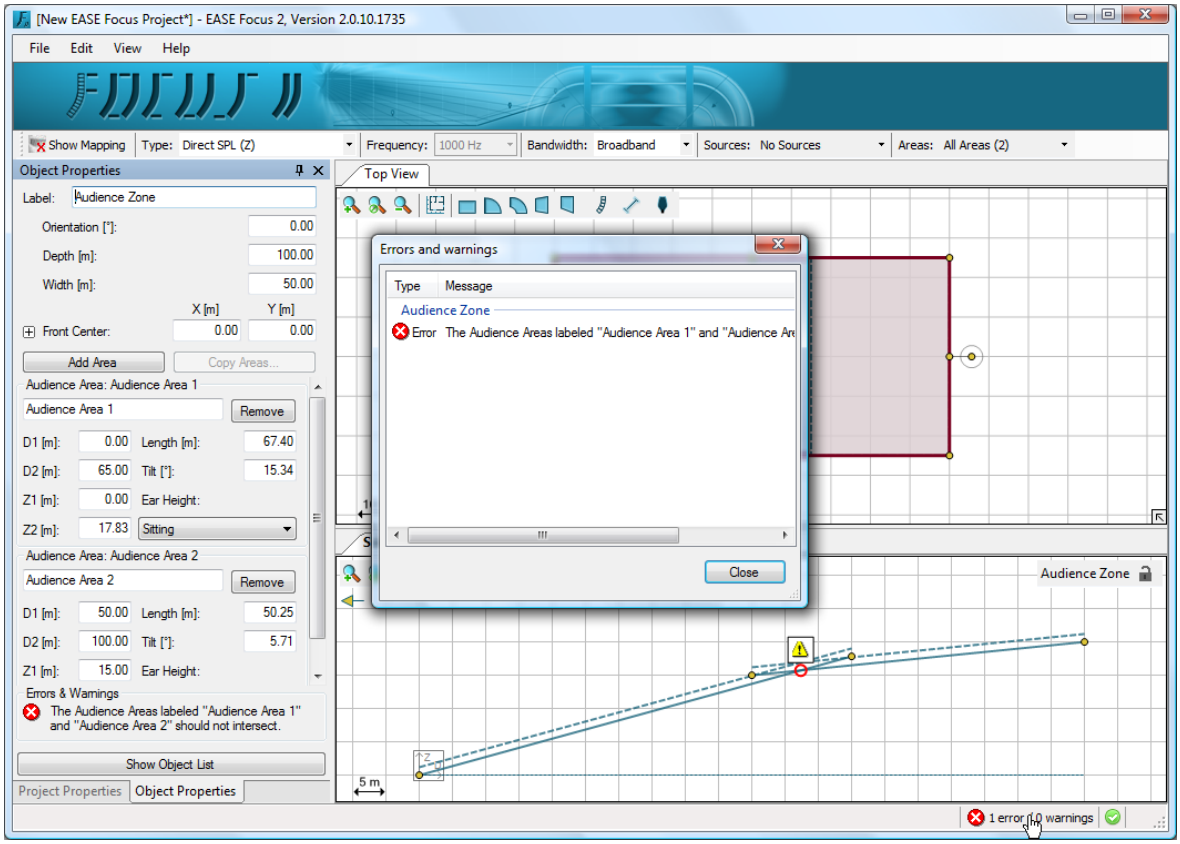
- ORIENTATION: the direction the Audience Zone is facing (0° = facing left)
- DEPTH: the size of the Zone along its axis
- FRONT WIDTH: the size of the parallel edge faced by the audience
- BACK WIDTH: the size of the parallel edge behind the audience
- ORTHOGONAL SIDE: specifies which of the two non-parallel edges is orthogonal with respect to the parallel edges (left or right, with respect to the audience)
- FRONT CENTER, FRONT LEFT, FRONT RIGHT, BACK LEFT, BACK RIGHT: position of the main reference points

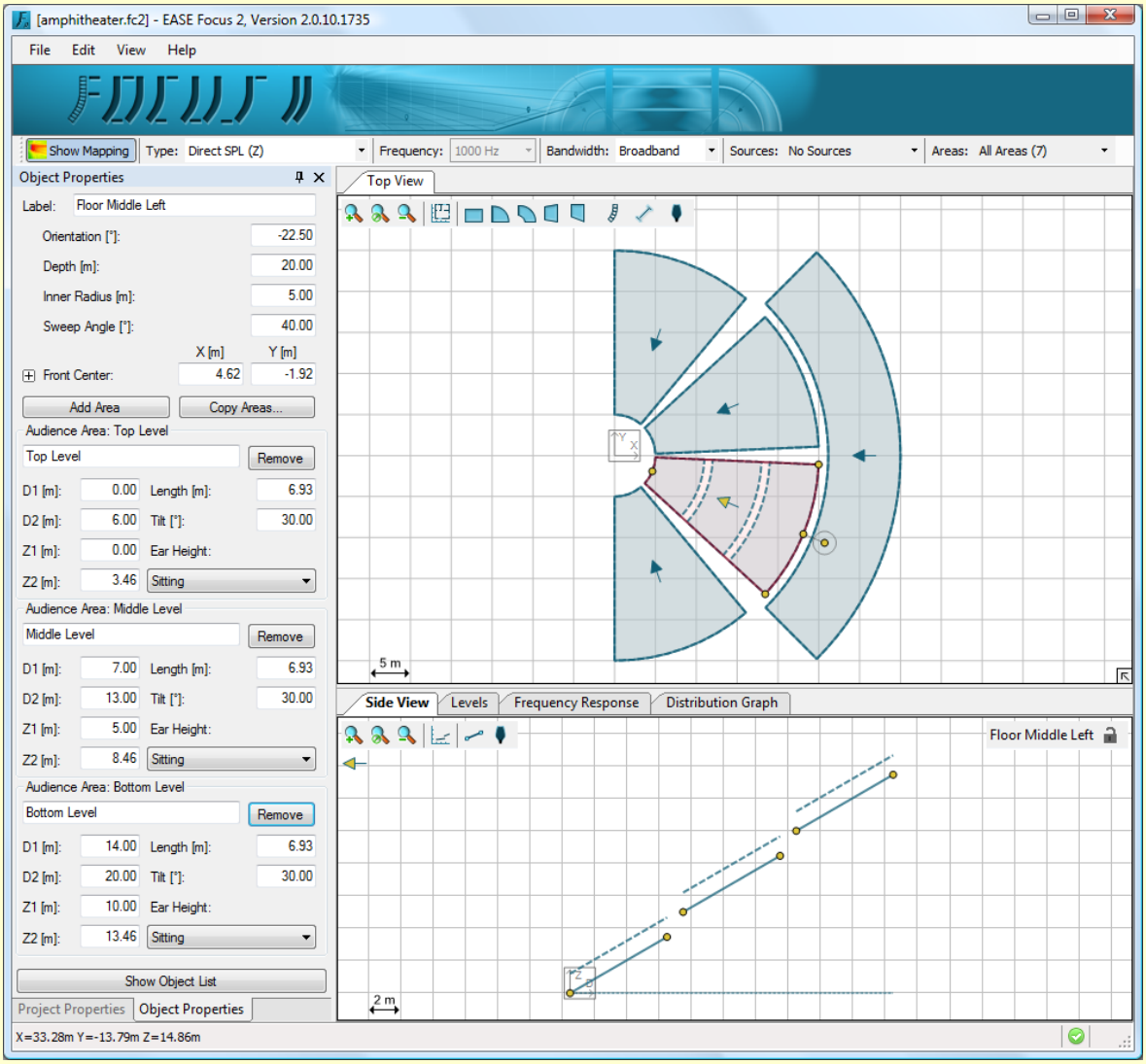
Audience Areas can even be added or removed from the Object Properties window, and their profile can be copied to other Zones (§2.6). For every Audience Area you can set the following attributes:

- D1: distance between the front side of the Area and the front side of the Zone
- D2: distance between the back side of the Area and the front side of the Zone
- Z1: height of the front side of the area
- Z2: height of the back side of the area
- LENGTH: size of the Audience Area along its axis (diagonal, accounting for height difference between front and back)
- TILT: angle between the Audience Area and the horizontal plane
- EAR HEIGHT: ear height of the audience, selected from three pre-defined values (see §2.1)

Note that D2 / Z2 and LENGTH / TILT are redundant. If you change one of the numbers, the program will automatically compute the other quantities.

If two Audience Areas intersect, error messages will be shown, both in the Audience Zone related Object Properties and Side View and in the status bar.


[New EASE Focus Project*] - EASE Focus 2, Version 2.0.10.1735
File Edit View Help
Show Mapping
Type: Direct SPL (Z)
Frequency: 1000 Hz
Bandwidth: Broadband
Sources: No Sources
Areas: All Areas (2)
Object Properties
Label: Audience Zone
Orientation [°]: 0.00
Depth [m]: 100.00
Width [m]: 50.00
X [m] Y [m]
Front Center: 0.00 0.00
Add Area
Copy Areas...
Audience Area: Audience Area 1
Audience Area 1
Remove
D1 [m]: 0.00 Length [m]: 67.40
D2 [m]: 65.00 Tilt [°]: 15.34
Z1 [m]: 0.00 Ear Height:
Z2 [m]: 17.83 Sitting
Audience Area: Audience Area 2
Audience Area 2
Remove
D1 [m]: 50.00 Length [m]: 50.25
D2 [m]: 100.00 Tilt [°]: 5.71
Z1 [m]: 15.00 Ear Height:
Errors & Warnings
The Audience Areas labeled "Audience Area 1" and "Audience Area 2" should not intersect.
Show Object List
Project Properties
Object Properties
Top View
Errors and warnings
Type Message
Audience Zone
Error The Audience Areas labeled "Audience Area 1" and "Audience Ar
Close
Audience Zone
5 m
1 error, 0 warnings



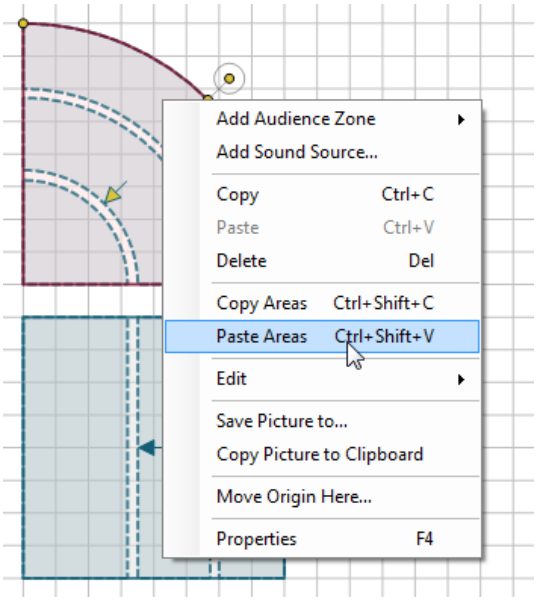
Select one of the floor Audience Zones that you have entered in the previous section, and draw three Audience Areas in it, as shown in the picture. These will be the levels of the amphitheater. Name the Areas "Top Level", "Middle Level" and "Bottom Level." In the next paragraph we will see how to extend levels to other Audience Zones.

2.6. Copying Areas between Zones

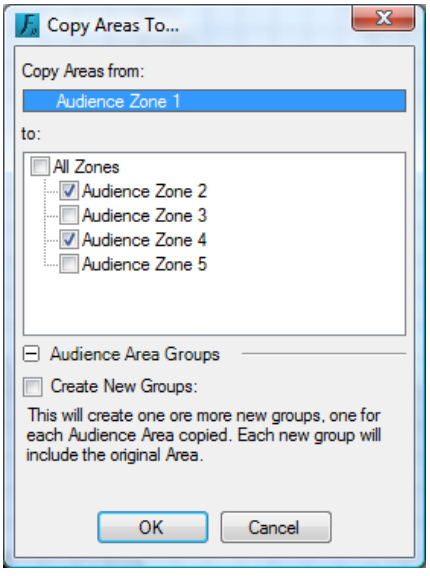
You might find yourself drawing a venue where several Audience Zones have a similar profile. A typical example is a stadium where all Zones could form a loop consisting of rectangles, annular and circular sectors, but circles extend across all these Zones. The solution for this situation is the "Copy Areas" operation. It can be performed in two ways:

- **Context menu in Top View**: the Audience Areas must of course be defined for one of the Audience Zones. Then click with the right mouse button on that Zone: a menu will appear. Select the item COPY AREAS; then right click on one of the target Zones and select PASTE AREAS. Repeat this operation for

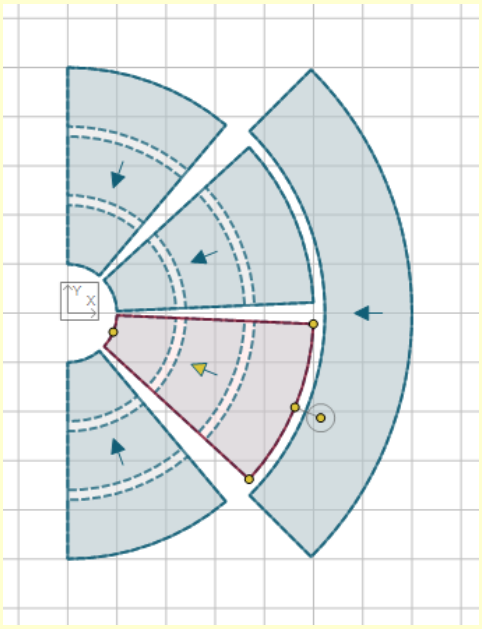
all target Zones (you do not have to re-copy Areas every time, as they will be kept in memory until they are overwritten by another COPY AREAS operation).



- **Object Properties window**: once you have defined the Audience Area profile for one Zone, when this is selected, open the Object Properties window (if it is not showing already: either from menu VIEW | OBJECT PROPERTIES, or right clicking in the Top View and selecting PROPERTIES, or just hitting F4) and click on the COPY AREAS TO OTHER ZONES button. A dialog will appear listing all Audience Zones in the Project; click on any of them in the list to identify it in the Top View. Check all target Zones for your copy operation. Additional options on Area groups are available in the expandable section on the bottom (§3.9). Click OK to validate the selection and run the operation.



Please note that copied Areas will be adapted to the size of target Zones. However, if your Audience Zones have about the same length, no unexpected results will happen.



Make sure that all your floor Zones have the same depth, as it is logical in an amphitheater. Then select the Zone in which you have drawn the levels, and copy them to all other floor Audience Zones. Try both methods to do so.

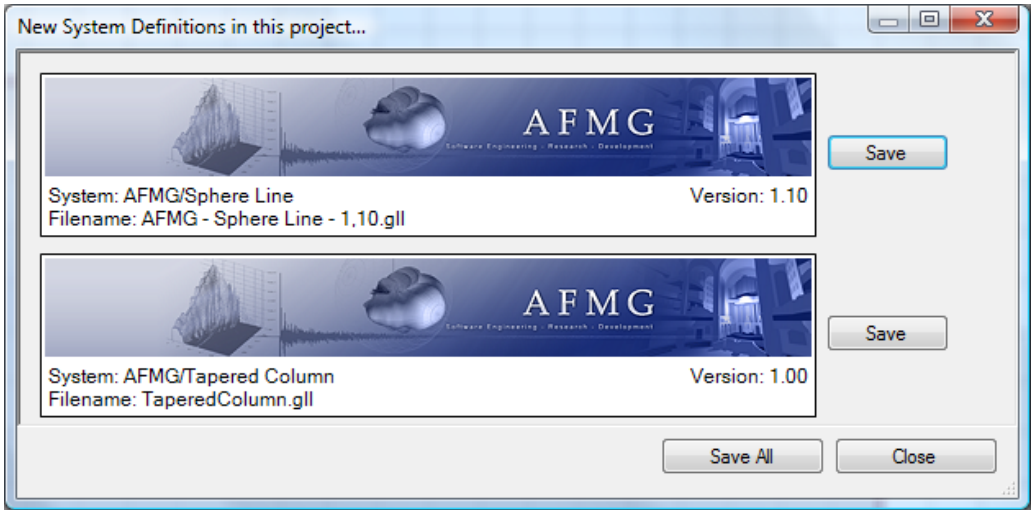
2.7. Saving Projects

To save a project, click on FILE | SAVE (Ctrl+S); FILE | SAVE AS (Ctrl+Shift+S) will save the current project to a new file, similar to most other programs. Saving a project will also pack GLL and DLL files into the file, so that it can be passed on to other EASE Focus users without having to worry about other files that are needed to open it. However, note that this could lead to quite large project files.

When a project is modified after saving, a star (*) symbol will appear next to its file name in the main window title bar. This indicates that the current project contains unsaved changes. In this case, if you try to quit EASE Focus, you will be asked if you want to save all changes. The same is true for new projects.

2.8. Loading Projects

To load a project, click on FILE | OPEN (Ctrl+O). Before loading, if the project contains system definitions, that is GLL or DLL files, that are not present on your hard disk, they will be listed in the Import System Definitions window and you will have the possibility to save every single file to a location of your choice. Alternatively you can click SAVE ALL, which will save all definition files to the default system definitions location with their default name.



2.9. Importing System Definitions

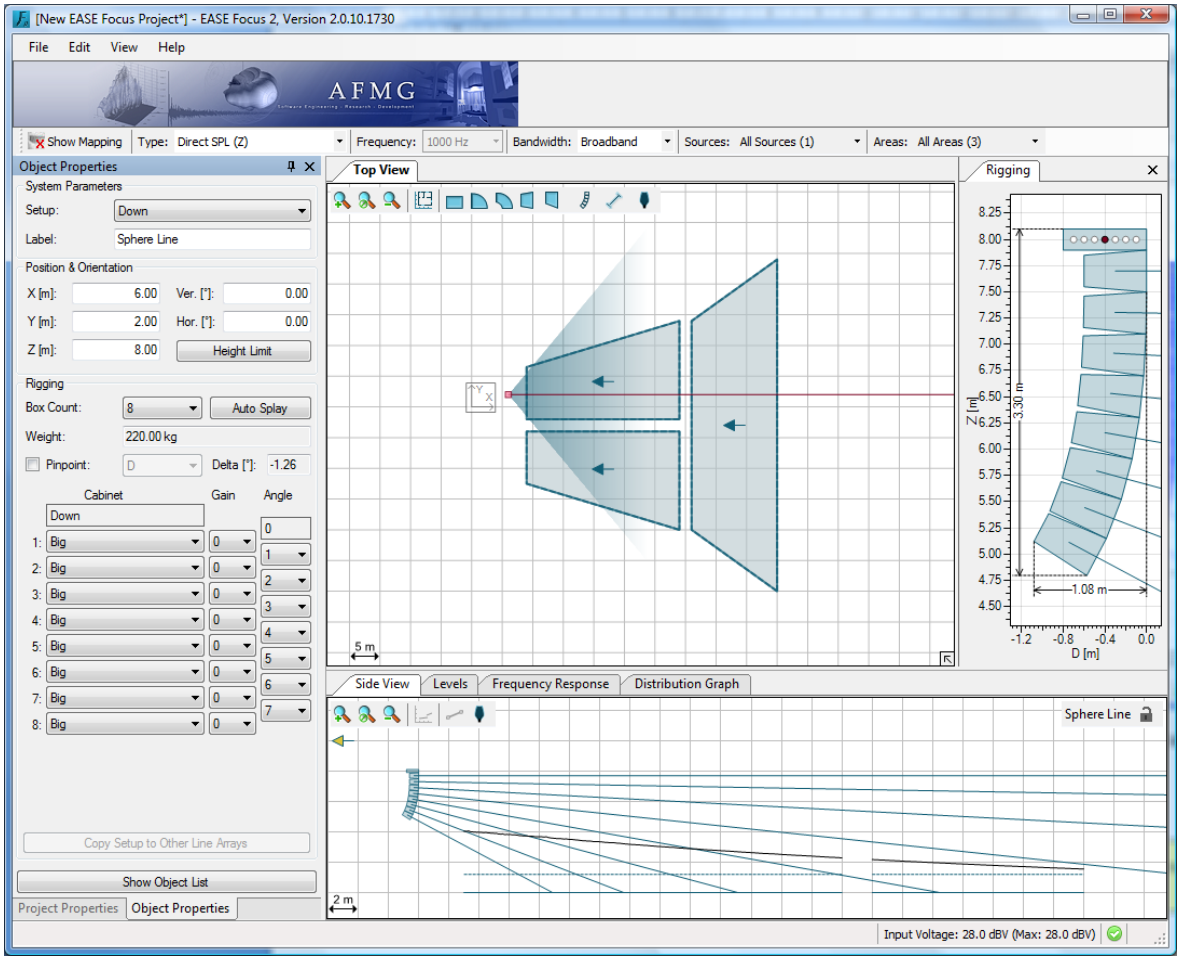
Besides loading a project, there is another way to add compatible system definitions to the EASE Focus database. If you have one or more GLL files which are compatible with EASE Focus, you can click EDIT | IMPORT SYSTEM DEFINITION FILES: this will open a dialog window where you can select one or more GLL files. After that, all valid sound sources will be listed in the Import System Definitions window where you have the same options described in §2.8.

Please note that GLL files must be compatible with EASE Focus in order to be usable: this means they must be line arrays, or alternatively a column loudspeaker with a valid Focus binary file with the same name and .dll extension in the same directory, and, of course, they must have been authorized by AFMG for EASE Focus.

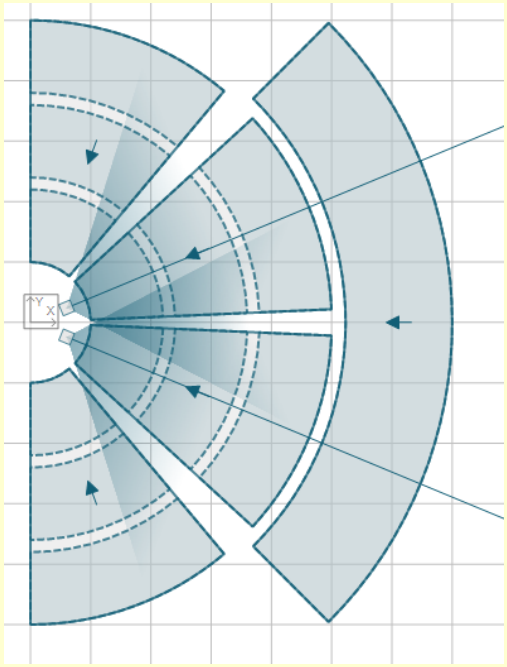
2.10. Adding Line Arrays

To enter a Line Array use the insert icon or use the RMB menu that opens when right-clicking the white background of the drawing.

This will bring up a list of available Line Array types. Select one of them and then left-click or drag to insert it into the top view.



Note that for performance reasons the number of line arrays and loudspeaker columns is limited to 8 Sound Sources overall.



Add two Line Arrays pointing towards the two middle floor Audience Zones, as shown in the picture. You can name them after the zones where they are aimed.

2.11. Editing Line Arrays

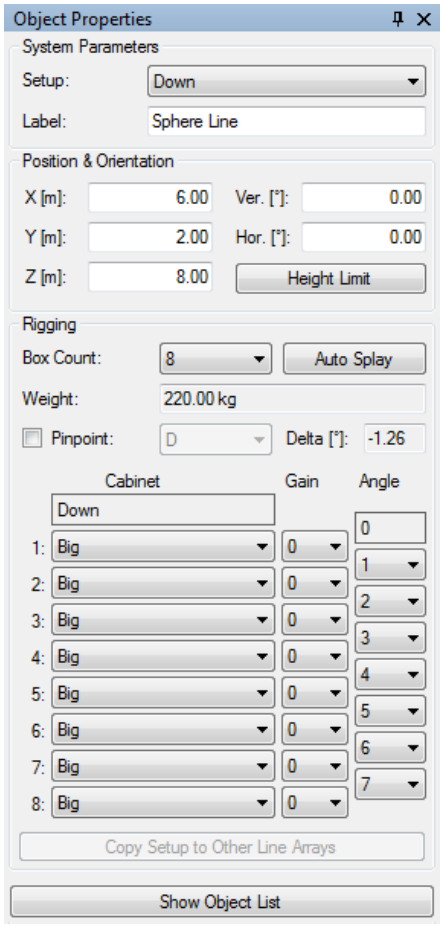
In the Top View you can change the location of a Line Array by left-dragging the symbol; or its orientation by left-dragging the aiming line. You can do the same in the Side View, where you can also edit the height of the Array and the tilt angle of the single boxes using their aiming lines.

The same parameters can be fine-tuned in the Object Properties window, where you can define the following attributes:

- SETUP: lets you choose between manufacturer-defined setups. A setup can be hanging (flown) or groundstacked
- X, Y, Z: coordinates of the array's reference point
- VER: vertical tilt angle of the frame
- HOR: horizontal aiming angle of the Line Array (0° = pointing right)
- HEIGHT LIMITS: height limits for the current Line Array. Limits can be set to Project default (§2.1) or individual for a specific Line Array.

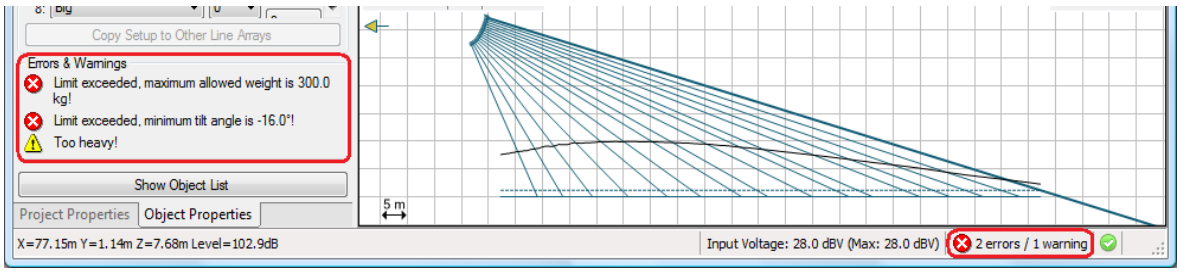
In the RIGGING frame you can also change the box number and types and edit the pinpoint mode: you can set one or two pinpoints (manual) or define an angle and let Focus find the best fitting pinpoint (automatic). You can also access the AUTO SPLAY function (§2.12) which can help you defining an initial array configuration for a given venue, or copy the setup to other similar Line Arrays (§2.13).

If the system definition supports input filters, you will see two buttons in the Line Array properties: RIGGING and FILTERS. Selecting FILTERS, you will be able to simulate the effect of manufacturer-defined filters for specific elements of the line array (§5.4).



EASE Focus also supports Line Array presets: if a System Definition contains presets, these can be applied under the menu EDIT | LINE ARRAY PRESETS; otherwise, only default presets (J-ARRAY, LINED, CURVED) will be available.

Limits of various types (e.g. weight, angle) are normally specified in every system definition. If those limits are violated, errors or warning messages will be shown, both in the Line Array related Object Properties and in the status bar.



2.12. Auto Splay

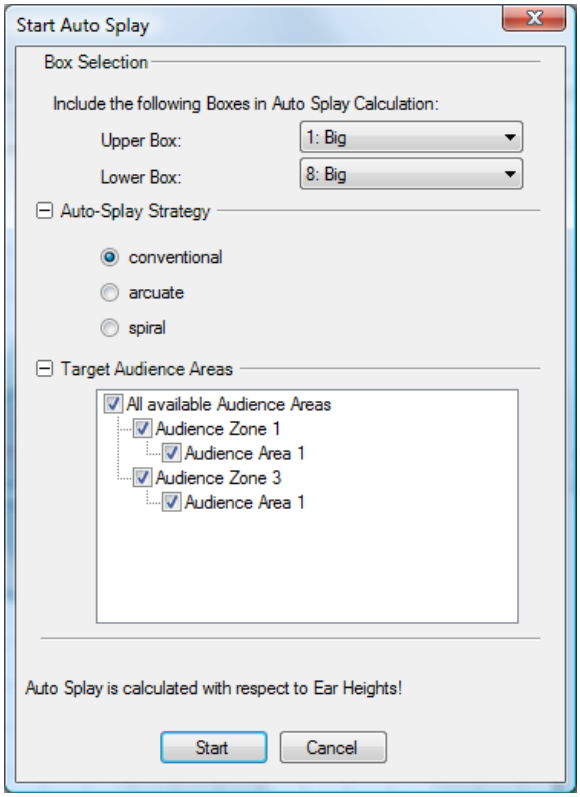
The Auto Splay function is a valuable tool of EASE Focus that can save you a lot of time when starting to set up your system. Auto Splay optimizes SPL levels produced by the Line Array along its aiming axis, on the Audience Areas that are crossed by it. Levels are calculated at ear height.

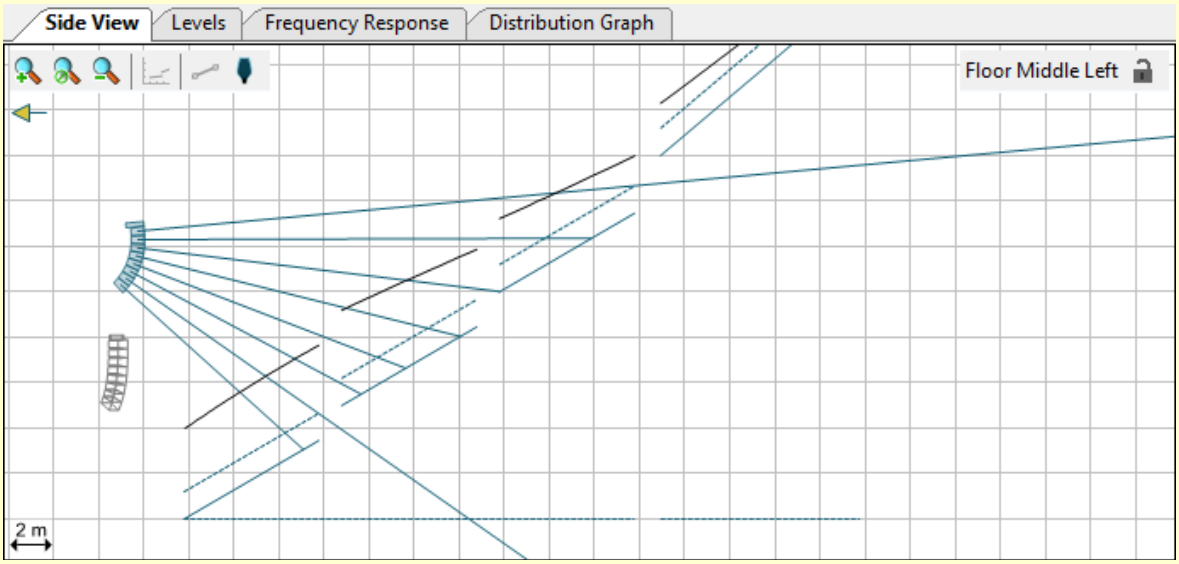
However, note that Auto Splay will only give you a starting point for your system configuration. Depending on the particular system, this function may not yield optimal results. Consult the respective system manual and contact the manufacturer's technical support for more information.

To use Auto Splay, select the Line Array, go to the Object Properties (F4) and click on AUTO SPLAY. A dialog window will show, making options available about the boxes to be considered. One additional expandable section of the dialog window can be used to select Audience Areas to be optimized.

Another section can be used to define the Auto Splay strategy:

- CONVENTIONAL (default) runs the Focus Auto Splay algorithm with no constraints
- ARCUATE applies a constant opening angle between adjacent boxes, if possible
- SPIRAL applies a constantly increasing opening angle between adjacent boxes, if possible.



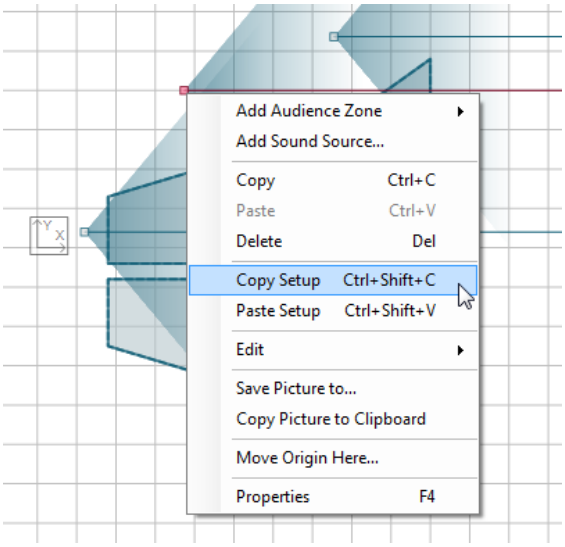


Select one of the two Line Arrays you have placed. Adjust its height, so that it is just above all levels of the floor. Set the number of boxes to 8. Now perform an Auto Splay for all boxes with all floor Audience Areas as the target (conventional strategy). Pay attention to exclude the balcony from the optimization.

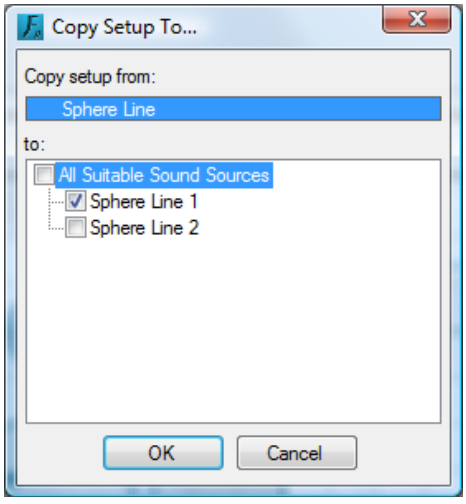
2.13. Copying Setups between Similar Line Arrays

In a situation where you have, for example, two Line Arrays in a stereo configuration, you may have to make sure that they are identical. This is why the Copy Setup function exists. Similar to the Copy Areas function between Audience Zones (§2.6), it can be performed in two ways, but only between Line Arrays of the same type.

- **Context menu in Top View**: the rigging must be defined for one of the Line Arrays. Then click with the right mouse button on that Source, and select the menu item COPY SETUP; then right click on each one of the target Sources and each time select PASTE SETUP. A copied setup will be kept in memory until it is overwritten by another "Copy Setup" operation.



- **Object Properties window**: once you have defined the rigging setup on a selected Line Array, open the Object Properties and click on the COPY SETUP TO OTHER LINE ARRAYS button. A dialog will appear listing all similar Line Arrays in the Project; click on any of them in the list to identify it in the Top View. Check all desired target Line Arrays for your copy operation, and click OK to validate.



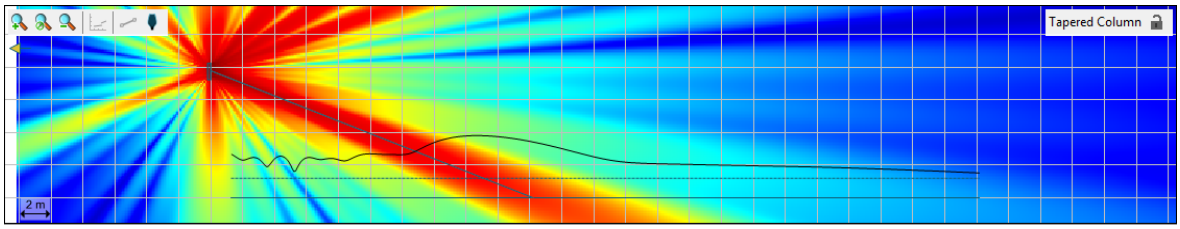
Note that the copied information will include box count and types, tilt angles and filters along with global tilt angle and height of the Line Array: this is all the information that has to do directly with rigging setup. Horizontal angles and XY position will not be copied.

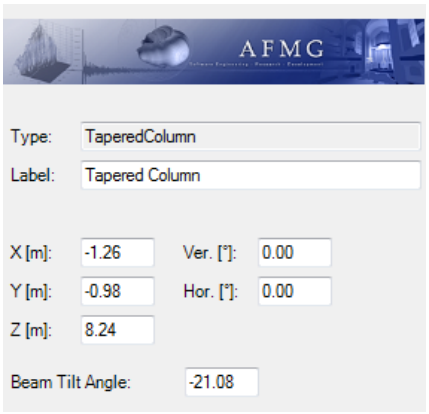
Setups can also be copied between Configurable Loudspeakers, such as steerable columns (§2.14): in this case, height and tilt angle will be copied, along with all setup information internal to the loudspeaker library.

Copy the setup you created to the other Line Array. Try it first with the context menu method, then undo the operation (Ctrl+Z) and try it again from the Object Properties.

2.14. Configurable Loudspeakers, Steerable Columns

Focus 2 also supports Configurable Loudspeakers, such as digitally steered columns, which typically work with a filter/delay system applied to their acoustic transducers. This is possible thanks to an external DLL file, which ships together with the GLL and implements all that is needed to display the graphical aiming interface and the custom mask, and to communicate to Focus the information about filters in the acoustic sources.





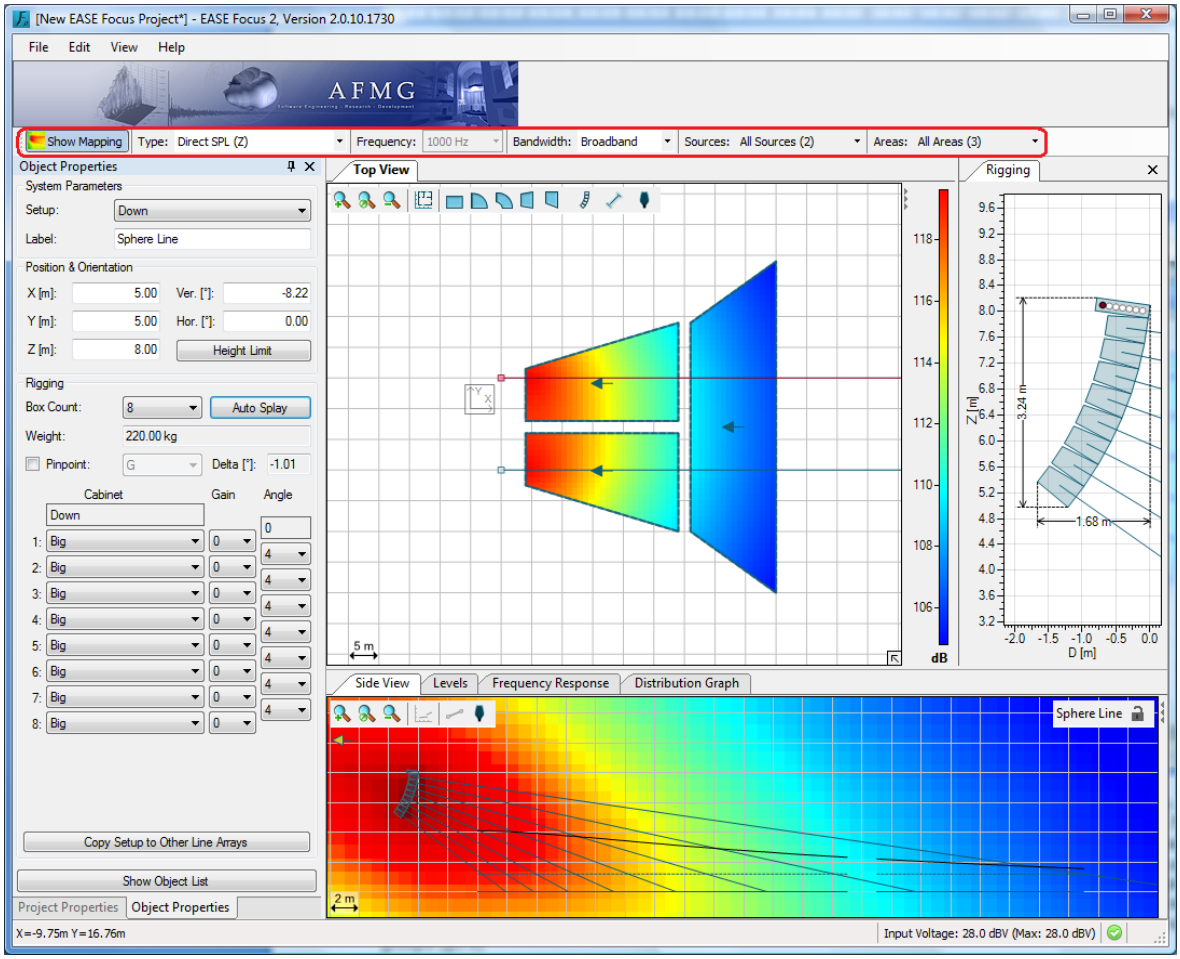
3. Mapping and Calculation Results

This chapter explains how to exploit the calculation and mapping capabilities of EASE Focus, in order to have an optimal view of how your setup works in the field.

3.1. Mapping Toolbar

The Mapping Toolbar is located by default on top of the main window, just beneath the Logo panel. This is the place where you can edit the main parameters about how mapping is calculated and drawn.

To enable the SPL mapping display, select SHOW MAPPING.



Use the TYPE dropdown menu to select the weighting (Z – none or A-WEIGHTING) or the SIGNAL TO NOISE mapping (only in Extended mode, see §4.3 on how to activate it; NOISE SETTINGS that are defined will apply, see §5.7). Use the FREQUENCY and BANDWIDTH dropdown menus to select the kind of mapping to be shown, either broadband or band-limited (1/3 octave, 1 octave, 3 octaves) and in the latter case the center frequency. You can use the RELATIVE option and menu to highlight areas whose pressure value lies outside a certain tolerance margin from the average value. Finally, you can use the SOURCE and AREAS menus to select

which Sound Sources and Audience Areas are to be included in the mapping, and to store and recall Source groups (§3.8) and Area groups (§3.9).

3.2. Calculations Background

All SPL calculations in EASE Focus 2 are limited to the direct field. Also included in the calculation are air attenuation effects according to ISO 9613. Shadowing and ground or side wall reflections are not considered. Wind effects are also not taken into account.

EASE Focus 2 is using a simplified model of treating combinations of sound sources. Elements of a line array or column are always summed in a complex manner, which means that full signal coherence is assumed. However, multiple line arrays or columns are combined using power summation which is based on a random-phase assumption.

The first assumption may overestimate pressure summation and cancellation effects among elements of the array, especially for very tall systems and windy environments. But it has turned out to be a good approximation in practice. The second assumption will underestimate the level of coherence among several line arrays, especially when they have the same configuration and are placed very close to each other. Nevertheless, for most practical setups this approximation is feasible.

Absolute SPL calculations in EASE Focus 2 assume a broadband excitation with a signal that is like program material. You can choose among three different types of input signal, see §3.3. Level values displayed in the mapping or in the frequency response are sum levels. This representation is equivalent to the readings one can take from real-time analyzers (RTA) and sound level meters (SLM).

Note that in EASE Focus 2 each sound source is always driven at its maximum input level. This means that if you assign a gain of -6 dB to each cabinet of the array, the output SPL will be unchanged. That is because the maximum input voltage is increased by 6 dB while the sensitivity of the system is decreased by 6 dB. The only exceptions from this are the Filter and Global Filter functions. They can be employed to adjust output levels of different arrays relative to each other. The current input voltage and the maximum input voltage for the selected line array system are shown in the status bar.

Be aware that the maximum input levels displayed in EASE Focus are only estimates based on the manufacturer specification and an ideal input signal. Just like the SPL prediction for the receive location these results should be considered with care and are only accurate under the given limitations and uncertainties.

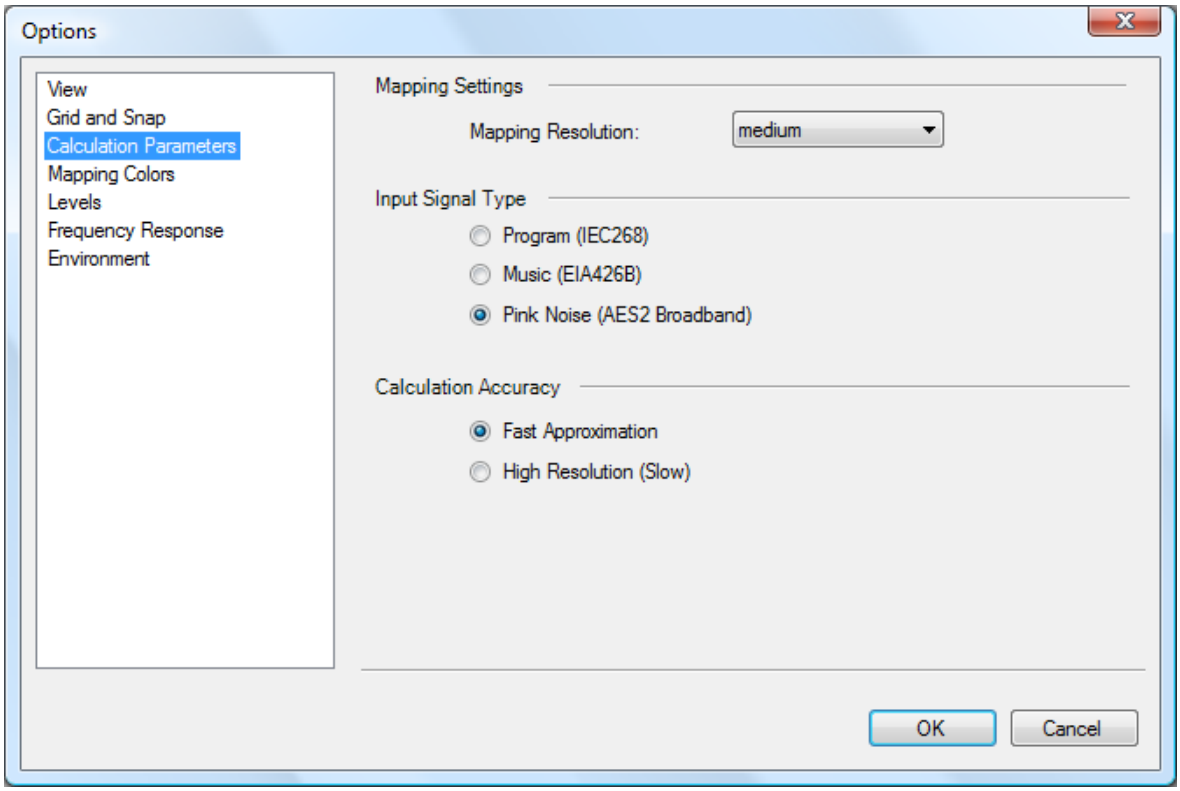
For more detailed investigations please consider using the EASE software instead. Also consult the publications by AFMG for more information about the theoretical background and the computational models. Keep in mind that EASE Focus is just a tool implementing an acceptable compromise between ease-of-use, calculation speed and accuracy based on its main purpose of use.

3.3. Mapping Options

To access mapping options, select the menu FILE | OPTIONS or hit F9. Then select the CALCULATION PARAMETERS list item. Here you can choose the calculation resolution for your mappings: this will affect the patch size of your calculations. Note that the number of points to be calculated increases by about 10 times for every resolution level. Lower resolutions are computed first, and their result displayed while higher

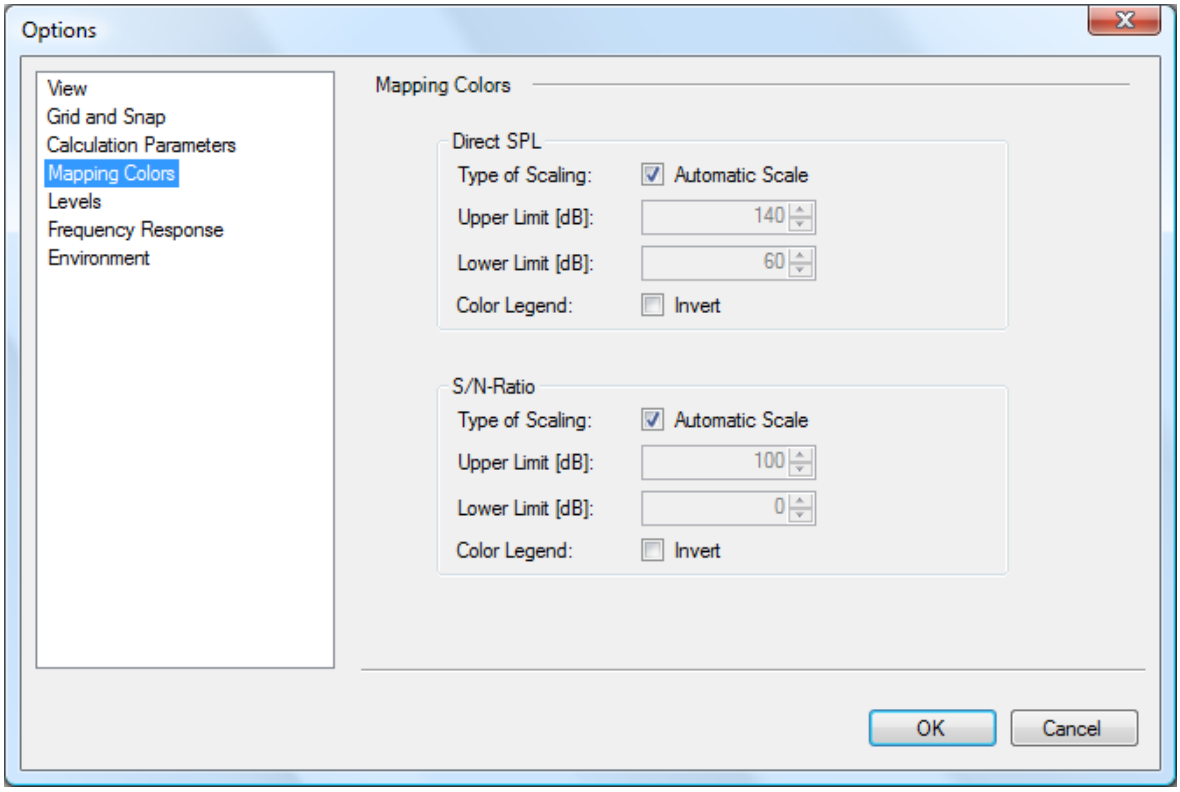
resolutions are being processed. You can click on the mapping progress bar located bottom right of Top View and Side View to read alternatively the remaining time until the current resolution is completed or the total time until calculations are finished.

On the same page you can also edit the type of input signal to be played from sound sources (see previous paragraph) and the accuracy of calculations (FAST APPROXIMATION will compute values with an internal resolution of 1/3 octave, HIGH RESOLUTION will use an internal resolution of 1/24 octave).



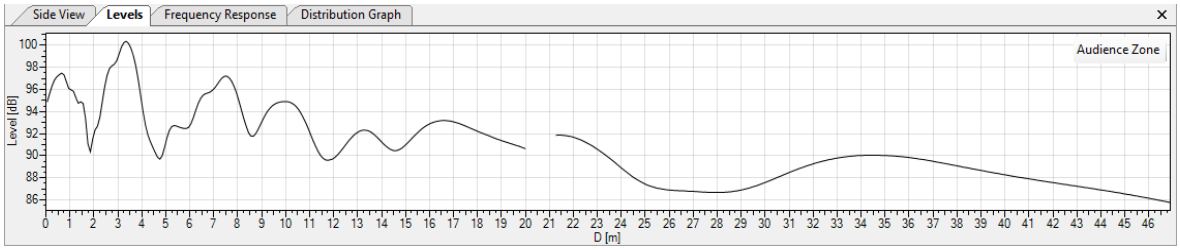
If you select the MAPPING COLORS page, you will be able to choose between an automatic color scale (default) or a scale constrained between values that you define. You can do this separately for SPL and Signal-to-Noise mappings, and you can even choose to invert the scale with respect to default colors.

You can also access this option page directly by clicking on the mapping scale on the right side of the Top View or of the Side View.

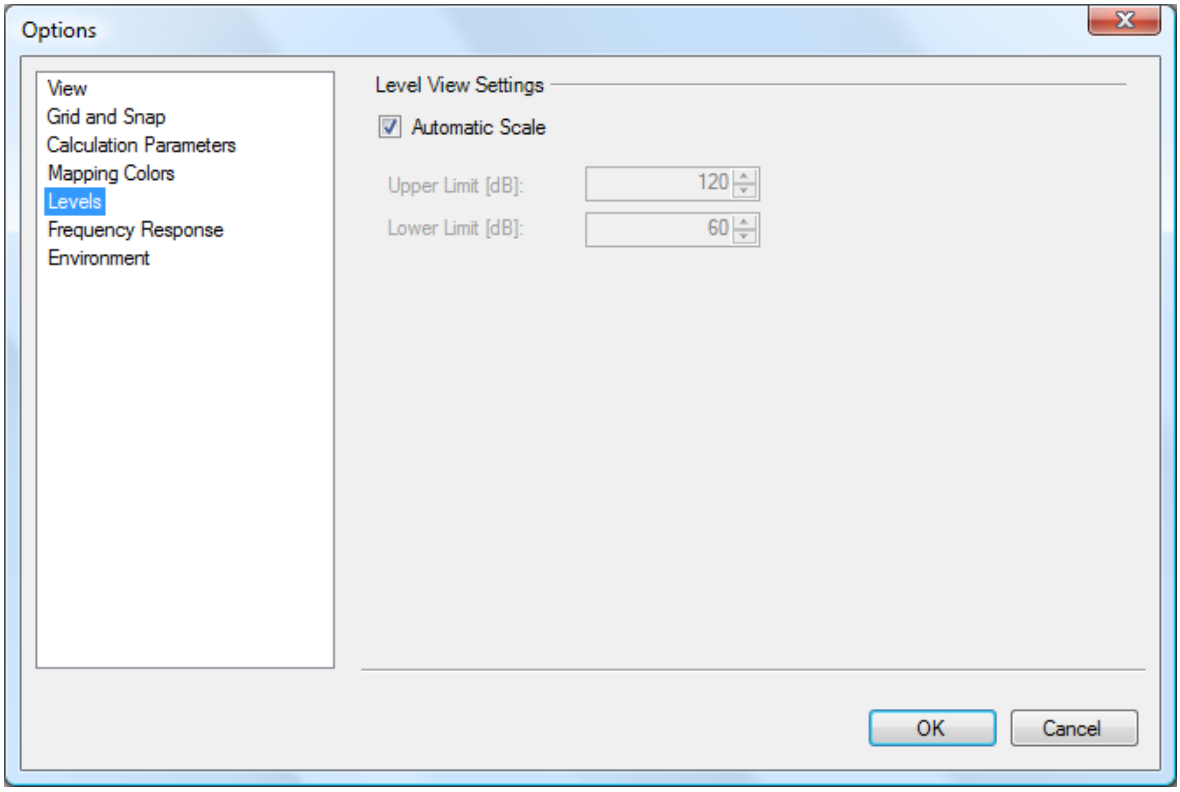


3.4. Levels

If you need to check accurate level readings along one direction, you can use the Levels window for that. It will consider exactly the same section that is used for the display in Side View, and show all level lines on Audience Areas that intersect with it. If an Audience Zone is selected (or locked in Side View), its Audience Areas are cut along the median axis; for Sound Sources, all Areas that intersect with the aiming axis will be shown. The same holds for Receivers (§3.6) and Section Planes (§5.2). Note that this information is also visible in Side View, only you don't have the Z coordinate in the Levels window, but rather a dB scale, so you can have a more accurate idea on how to interpret level lines.



Clicking on the dB scale on the left will directly open the LEVELS page in the Option window. An alternative to that is selecting FILE | OPTION or hitting F9 and then opening the LEVELS page manually. You can choose here to have an automatic scale (default) or define a manual scale.

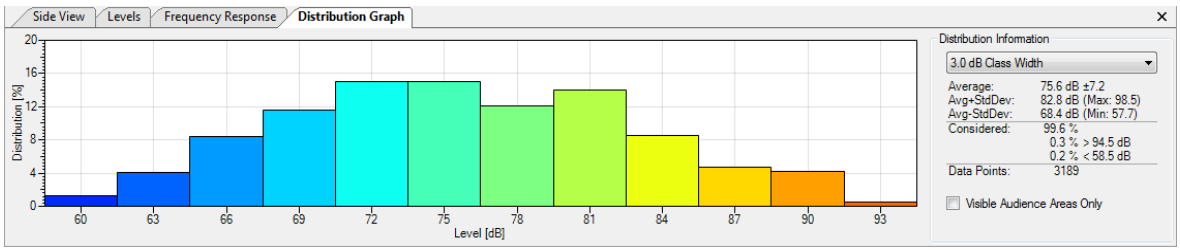


3.5. Distribution Graph

When mapping is active, the Distribution Graph window is available as a tool to check the acoustic coverage on your project. You can view statistics on pressure levels over all mapped points, and see a bar chart that summarizes all results. The width of the bars can be adjusted. Displayed are the average SPL or S/N value, the standard deviation, information on which percentage of all calculation points has been included in the graph, and the total number of points.

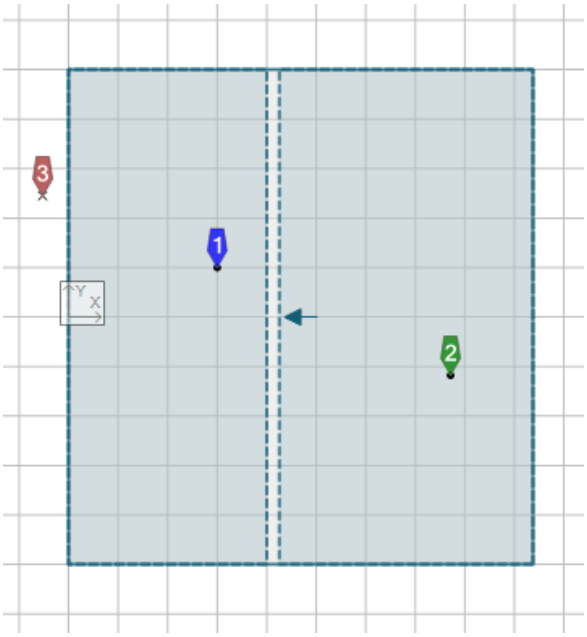
The distribution function is especially powerful to optimize the uniformity of SPL coverage and S/N. Select a class width of 3 dB or 6 dB to see the percentage of all mapping points within that range relative to the average. Typically, system designs try to optimize coverage in a way that, for example, 90% of the audience is within a range of +/- 6 dB.

There is another option that you can check: VISIBLE AUDIENCE AREAS ONLY which will exclude invisible Areas from the statistics computed. See also §3.9.

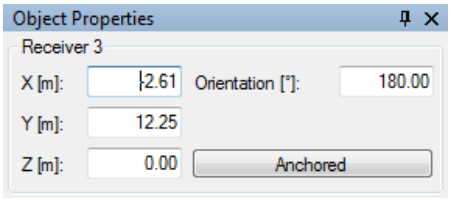


3.6. Adding Receivers

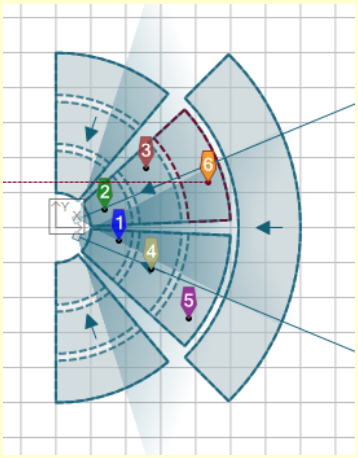
To add a Receiver, use the icon and then simply click on the location where you would like to place it, or click and drag to adjust its viewing orientation. There are mainly two types of Receivers: anchored and unanchored (free). Anchored receivers are bound to a specific Audience Area, and move along with it; free Receivers preserve their original position independently of all other objects in the project. Anchored Receivers can be recognized from a dot on their bottom end, free Receivers from a cross.



Receivers can be added both in the Top View and in the Side View, by just clicking (or dragging in Top View) after you select the toolbar button. A Receiver added or moved inside an Audience Area will be automatically anchored to that Area, and its height will be the corresponding audience ear height at that point. To add or move a free Receiver over an Audience Area, hold the Ctrl key while performing the operation with your mouse.



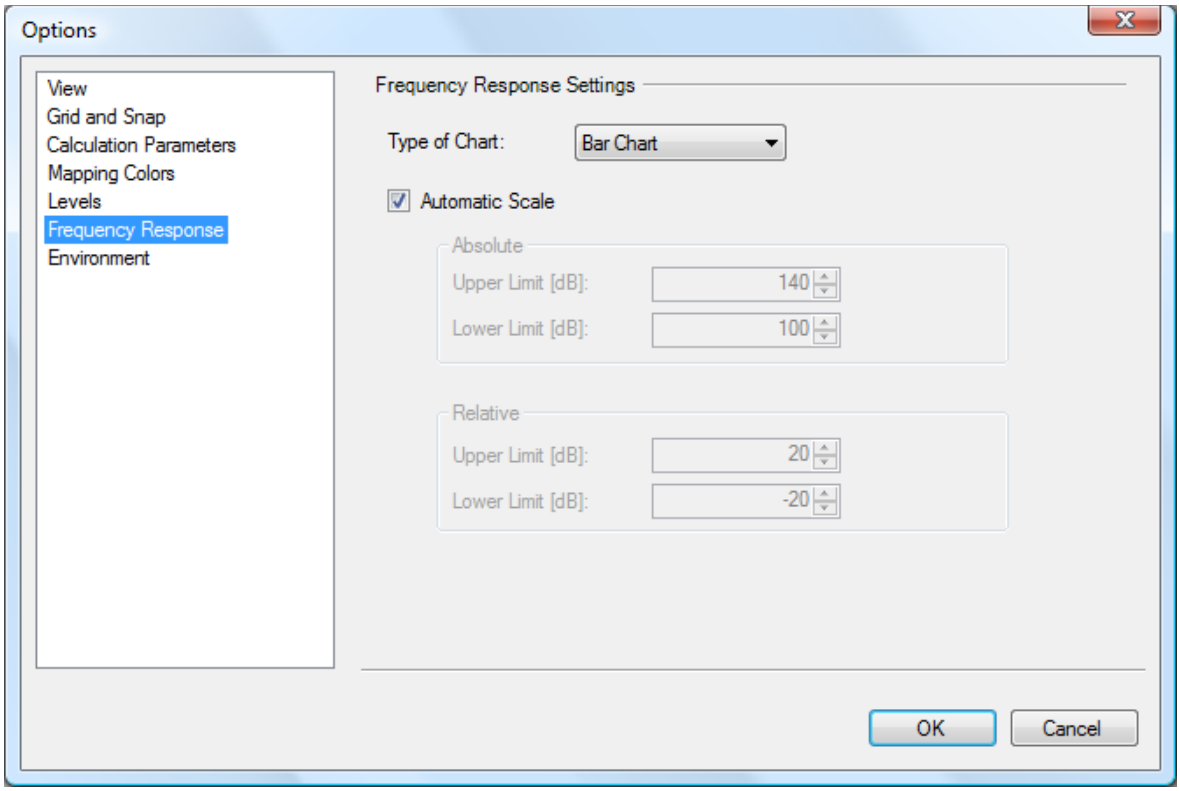
As seen for other objects, you can edit the properties of a Receiver in the Object Properties window (if it is not visible already, select the Receiver and choose VIEW | PROPERTIES, or alternatively right click on it in the Top View and select PROPERTIES, or just hit F4). The properties of a Receiver consist primarily of its coordinates. You can also toggle the ANCHORED property, or define its orientation (corresponding to the aiming line shown in Top View): this will determine what will be displayed in the Side View when this Receiver is selected.



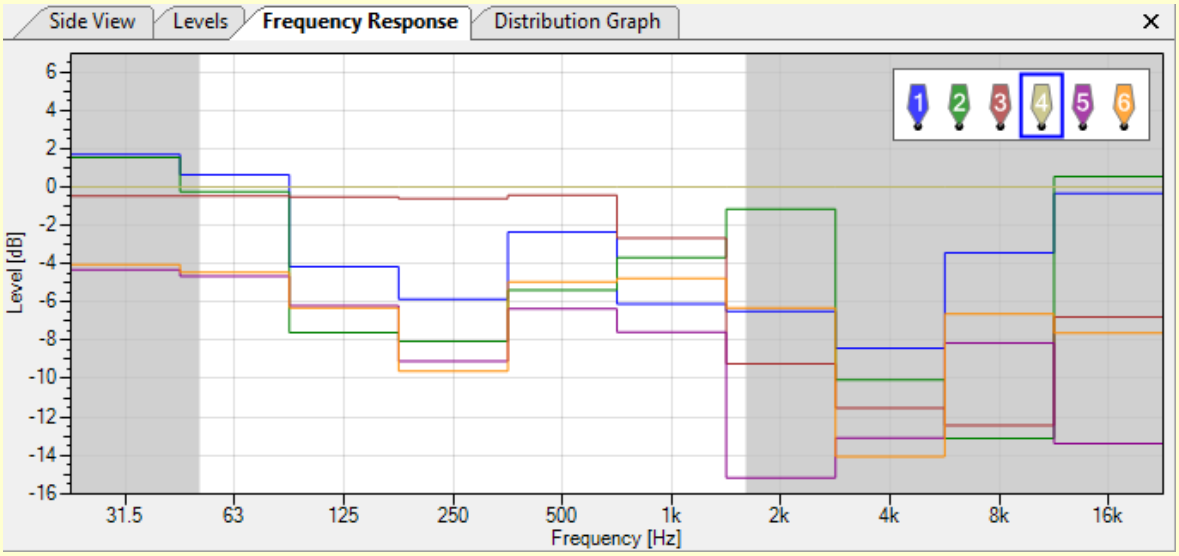
Add a Receiver to each of the Audience Areas of your "Floor Middle Left" and "Floor Middle Right" Audience Zones (the ones you pointed your line arrays towards). Place them at random positions.

3.7. Frequency Response

The response at Receiver points can be monitored with the Frequency Response window. The type of graph (Direct SPL, A-Weighted, S/N Ratio) reflects the settings in the Mapping toolbar. The resolution will be one octave, unless you selected a mapping resolution of 1/3 octave (available in the Extended mode, see §4.3). You can use the legend in the top right of the Frequency Response window to show or hide plots for specific receivers (by right-clicking on their symbols) or to display relative values to a specific Receiver (by left-clicking on the Receiver that you want to use as a reference).



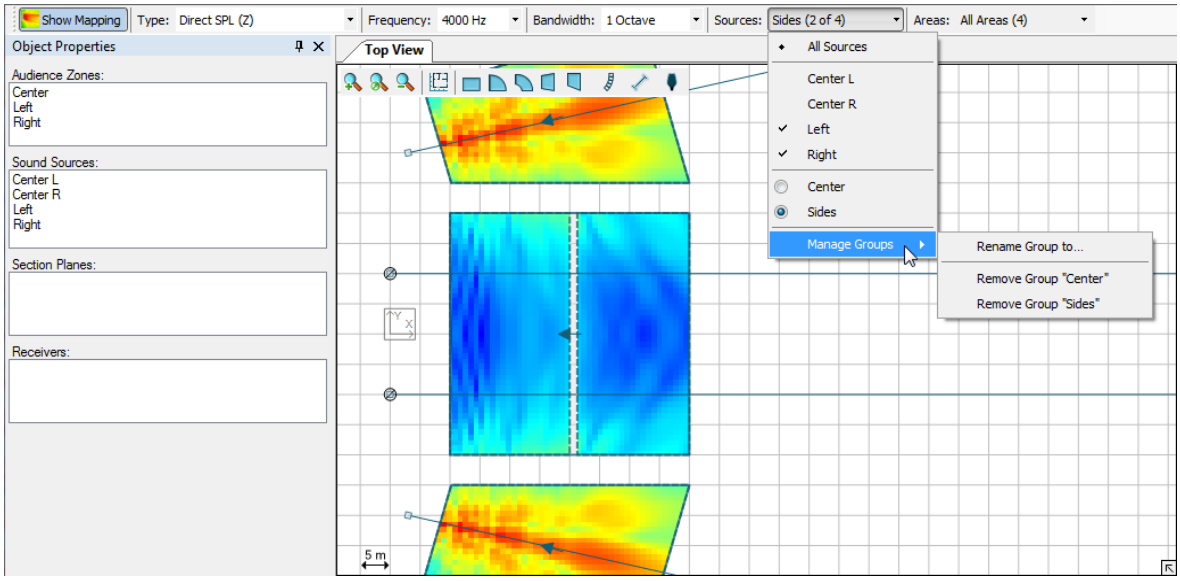
Clicking on the dB scale on the left will directly open the FREQUENCY RESPONSE page in the Option window. Alternatively you can select FILE | OPTION or press F9 and then open the FREQUENCY RESPONSE page manually. Here you can choose between displaying an automatic scale or defining a manual scale, both for the absolute and for the relative plot.



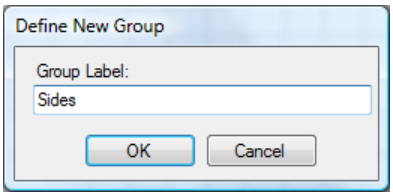
Check the response at the Receivers that you set. Is it uniform enough for all of them? Select one Receiver in the "bottom level" as your reference. How do other Receivers differ from it?

3.8. Sound Source Groups

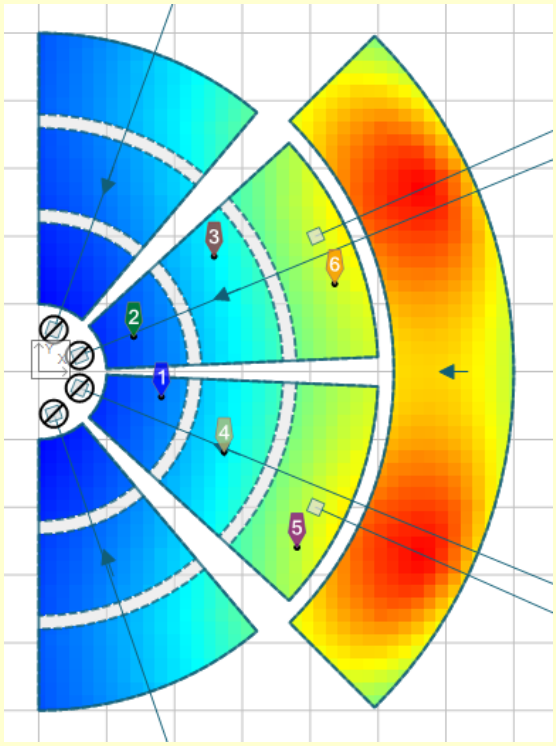
When working on complex projects, you may often want to optimize smaller audience portions and single systems separately. If you find yourself in this situation, you will appreciate Focus' ability to toggle every single Sound Source in your project. This can be done in the Mapping Toolbar: here you find a dropdown menu after the label SOURCES, listing all sound sources in the project. The default text will be ALL SOURCES followed by the number of Sources in your project. To switch a Source off, click on the menu and select its name from the list. The Source that you turned off will display a black icon as shown in the figure below. If you want to switch a source on when it is turned off, just perform the same operation again. You can switch all sources on or off at anytime by clicking on "All Sources" on top of the menu.



If you need to constantly switch between different source on/off combinations in your project, you want to avoid doing this operation every time: you need Sound Source groups for that. Switch all sources off except the ones that you want to include in your group. Then, still in the SOURCES menu in the Mapping Toolbar, select MANAGE GROUPS | STORE CURRENT SELECTION AS A GROUP. You will be asked to enter a name for your new group.



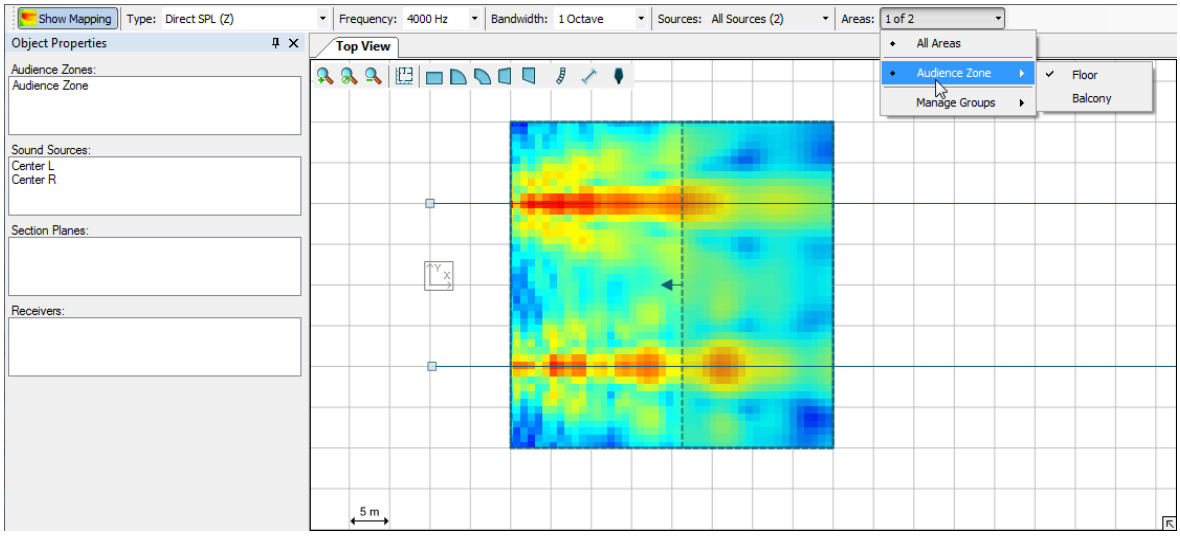
You can then recall a group at anytime from the SOURCES menu. When a group is active, you can also rename it or delete it from the submenu MANAGE GROUPS.



Place two Line Arrays in front of "Left" and "Right" Audience Zones, as you did in §2.10 for the middle Zones, and two for the balcony (see figure). Configure all new Sources. Then create a group for floor Line Arrays and a group for balcony Line Arrays.

3.9. Audience Area Groups

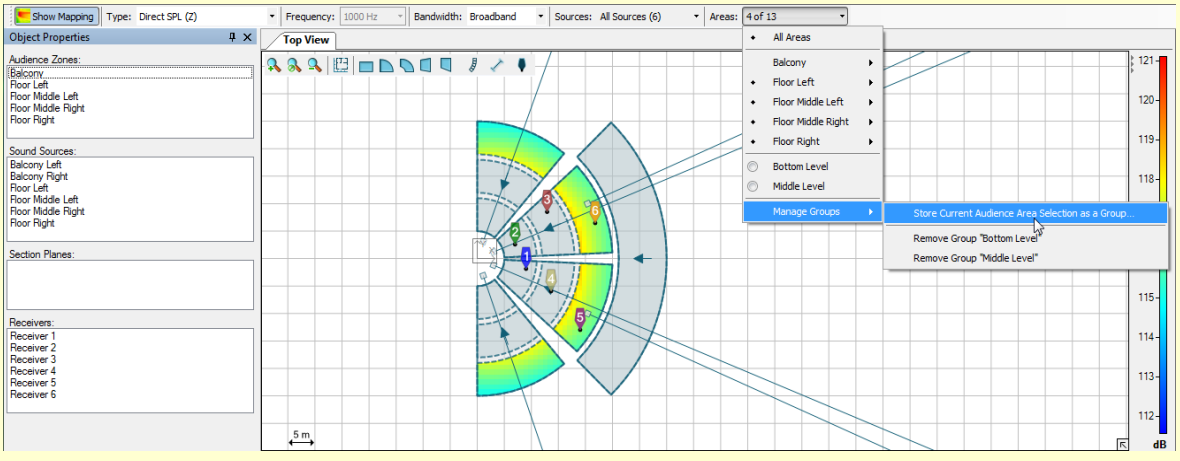
As explained for Sound Sources in the previous paragraph, Audience Areas can also be hidden from the mapping. This is especially useful when two Areas are partly overlapping, and one is hiding the other one's mapping. Toggling mapping for Areas works just like for Sources: In the AREAS menu in the Mapping Toolbar, you can see a list of all Audience Areas divided by Audience Zone, and turn single Areas or whole Zones on and off.



For Audience Areas you can also create groups, as already described for Sound Sources: switch on all the Areas you want to include, and select MANAGE GROUPS | STORE CURRENT SELECTION AS A GROUP. You can then use the submenu MANAGE GROUPS to rename it or delete it.

Note that you can create or edit Audience Area groups when copying Audience Areas between Zones as well (§2.6). If you want to do so, you need to perform this operation from the COPY AREAS button in the Object Properties window of your Audience Zone. Here you can pick one of two options: CREATE NEW GROUPS will make from scratch a new group for every Audience Area to be copied, including the original Area and all its copies across all Zones. If you already have one or more groups including some of the areas that you want to copy instead, and you want to include their copies in the same groups, you need to check EXTEND EXISTING GROUPS. You can even choose which specific groups you want to extend.

Please note that the Distribution Graph (§3.5) will continue to include hidden Audience Areas in its statistics. This can be changed by checking the box VISIBLE AUDIENCE AREAS ONLY under the statistics.



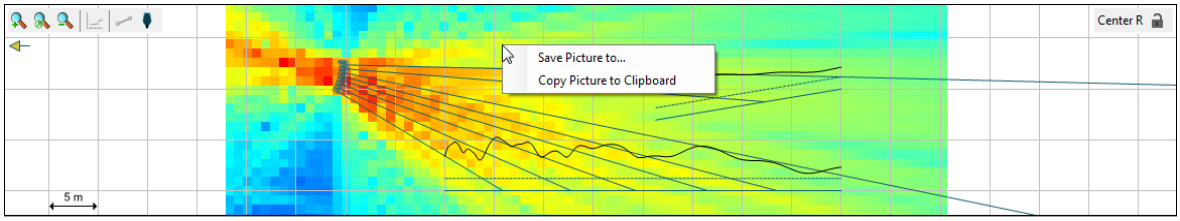
Create an Area group for every level of your amphitheater. Do this by selecting all areas one by one first.

You could have done this quicker when you copied your Audience Areas to all floor Zones of your project. If you want to try this, delete the groups you just created. Then select one of the Zones and perform the Copy Areas operation again, from the COPY AREAS *button in the Object Properties window. Select all other Zones, expand the* AUDIENCE AREA GROUPS *panel and check* CREATE NEW GROUPS*, then click* OK*.*

3.10. Exporting Pictures

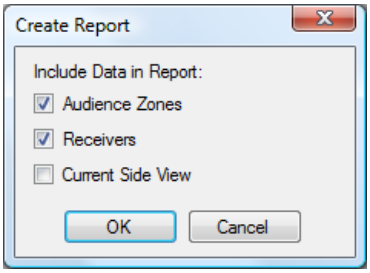
Once you finish working on your project and you are satisfied with the results you have obtained, you can show them to the people you are working with or take them to the venue. One simple way to do this is by exporting pictures from windows. All Focus windows that display pictures, maps or plots are able to export them to files as well: to do that, use the menu item FILE | EXPORT PICTURE. This will open a submenu with a list of all available windows: those which cannot export a valid picture are grayed out, the others are enabled. If you select one of the enabled items, a dialog will appear asking where you want to save the picture and offering different formats to choose from. Once the picture has been saved, it will be opened automatically with your default program.

Another way to export pictures is by right-clicking on them. This will open a popup menu with two options. Choosing SAVE PICTURE TO… will save it to a file, equivalently to the procedure described above. Selecting COPY PICTURE TO CLIPBOARD will store it in the Windows clipboard, so you can paste it in any software program that supports it.



3.11. Creating Reports

The easiest way to generate an overview of your project, however, is the report feature. This can be accessed by selecting FILE | CREATE REPORT. A small window will be displayed asking which details you want to include in the report; then you will be asked for the location where you want to save it and which format you want to use: you can choose between PDF, which will produce a file readable with Adobe Reader or similar software and ready to print, and RTF, which you can edit with Microsoft Word or other word processors. The result is a document containing all the details from EASE Focus that you need to install your sound reinforcement system at the event location.



Congratulations! You now have sufficient knowledge to take full advantage of EASE Focus 2 for your projects. You can still play around with your amphitheater project, for example adding more receivers, trying to tune your line arrays or to displace them, and generating pictures and reports. If you want to discover the advanced features in Focus, you can go to chapter 5 and start with a new project. But first we suggest that you read chapter 4 to learn more about the options available in Focus.

4. Options

In this chapter we will briefly examine the OPTIONS window. You can open it from the menu FILE | OPTIONS or by hitting F9.

In the previous chapter we have already discussed the option pages for CALCULATION PARAMETERS and MAPPING COLORS (§3.3), LEVELS (§3.4) and FREQUENCY RESPONSE (§3.7). The TIME RESPONSE page, available in the Extended mode (§4.3), will be discussed in §5.5.

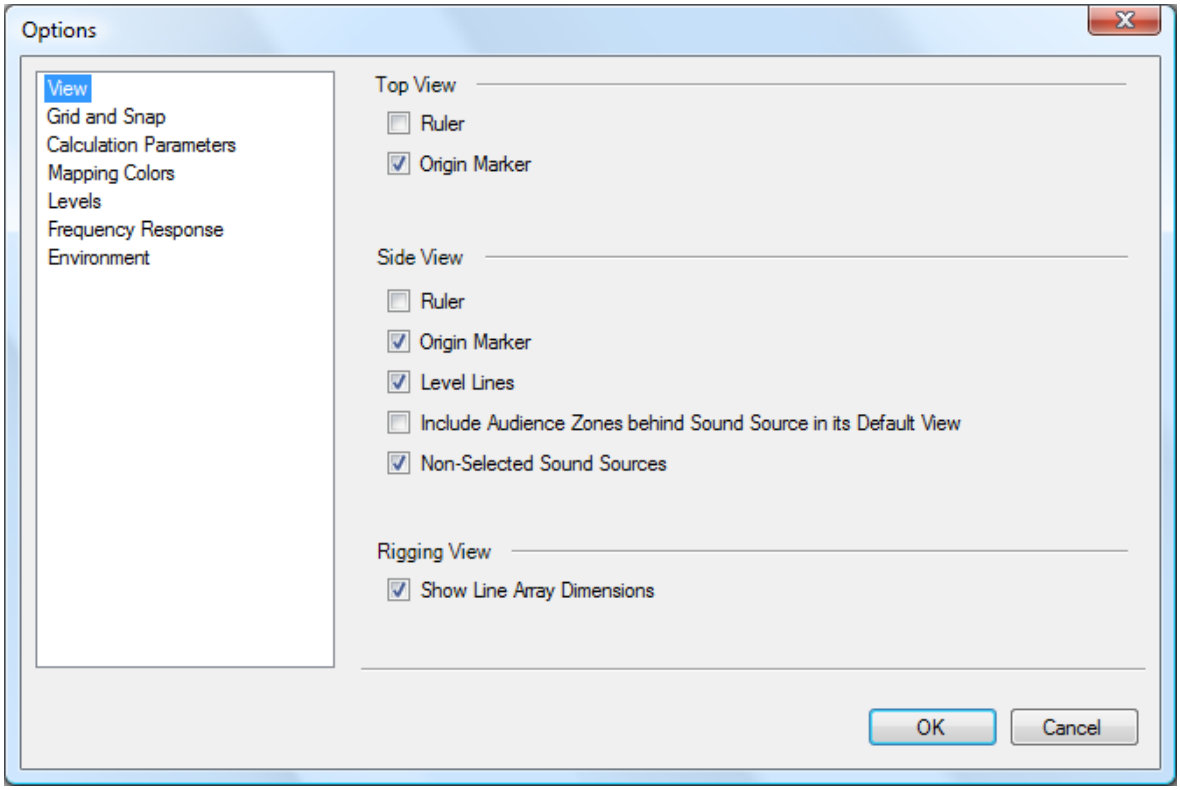
Therefore, here we will only go into the remaining pages: VIEW (§4.1), GRID AND SNAP (§4.2), and ENVIRONMENT (§4.3).

4.1. View

In the VIEW page you can switch on and off some elements that can be displayed in the Top View, Side View and Rigging windows.

Both Top View and Side View can show rulers for both axes and an origin marker at the point {0, 0}. For the Side View you can also toggle level lines on Audience Zones; in addition, you can choose to always display the 3D case of a Sound Source in the background even when another object is selected. Leaving the option INCLUDE AUDIENCE ZONES BEHIND SOUND SOURCE IN ITS DEFAULT VIEW unchecked will display the selected Sound Source always on the left edge of the Side View, along with all elements in front of it; checking it will show objects behind it as well, if some exist.

Finally you can choose to show or hide the total dimensions of line arrays in the Rigging window.

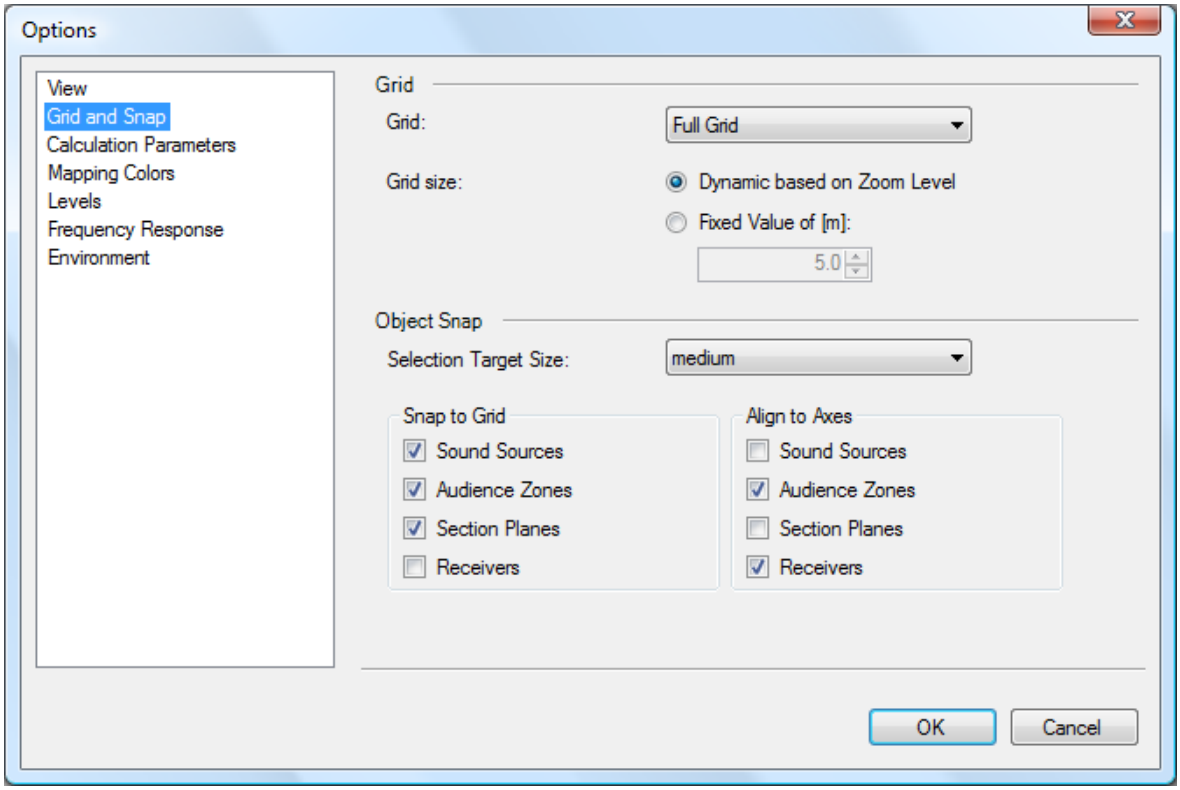


4.2. Grid and Snap

The GRID AND SNAP page displays options related to the grid, shown in both Top View and Side View, and to the behavior of the user interface when moving or editing objects.

There are two types of grids in EASE Focus: FULL GRID shows a normal grid, as is in the default settings, whereas POINTS ONLY displays only crossing points between grid lines, but not the lines themselves. Alternatively, the grid can be completely deactivated by choosing NO GRID. If a grid is visible, its size can be automatic (based on the zoom level) or manual (a fixed value entered by the user).

Snapping happens in two ways when the grid is active: SNAP TO GRID refers to all those actions where an object is being moved or resized, and the object or its edges automatically snap to grid lines when they are close enough; ALIGN TO AXES happens whenever an object is being rotated, and its edges snap to the vertical, horizontal or 45° diagonal axes. Both behaviors can be toggled for all types of objects, and their sensitivity can be set with the SELECTION TARGET SIZE dropdown menu.

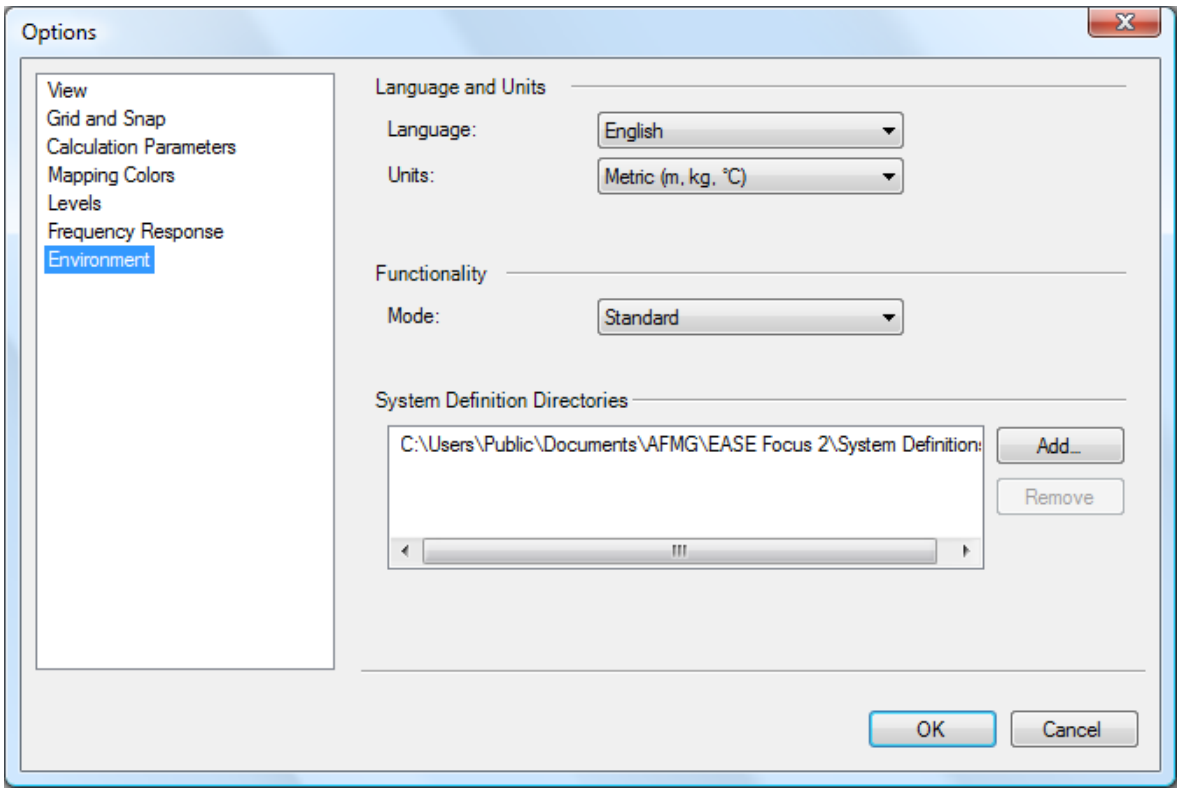


4.3. Environment

The ENVIRONMENT page lets you choose the language of EASE Focus (which also affects reports that you produce, §3.11) and the measurement units (meters or feet).

Here you can also switch between STANDARD and EXTENDED mode. Extended mode enables some features that you may need when working on complex projects, such as Time Response (§5.5), Signal to Noise Mappings (§5.7), Filters and Global Filter (§5.3).

SYSTEM DEFINITIONS DIRECTORIES are directories where system definitions files, that is, GLL and DLL files, are contained, and where Focus searches to display available definitions; normally you won't need to set or change this value.


Options
View
Grid and Snap
Calculation Parameters
Mapping Colors
Levels
Frequency Response
Environment
Language and Units
Language:
English
Units:
Metric (m, kg, °C)
Functionality
Mode:
Standard
System Definition Directories
C:\Users\Public\Documents\AFMG\EASE Focus 2\System Definition
Add...
Remove
OK
Cancel

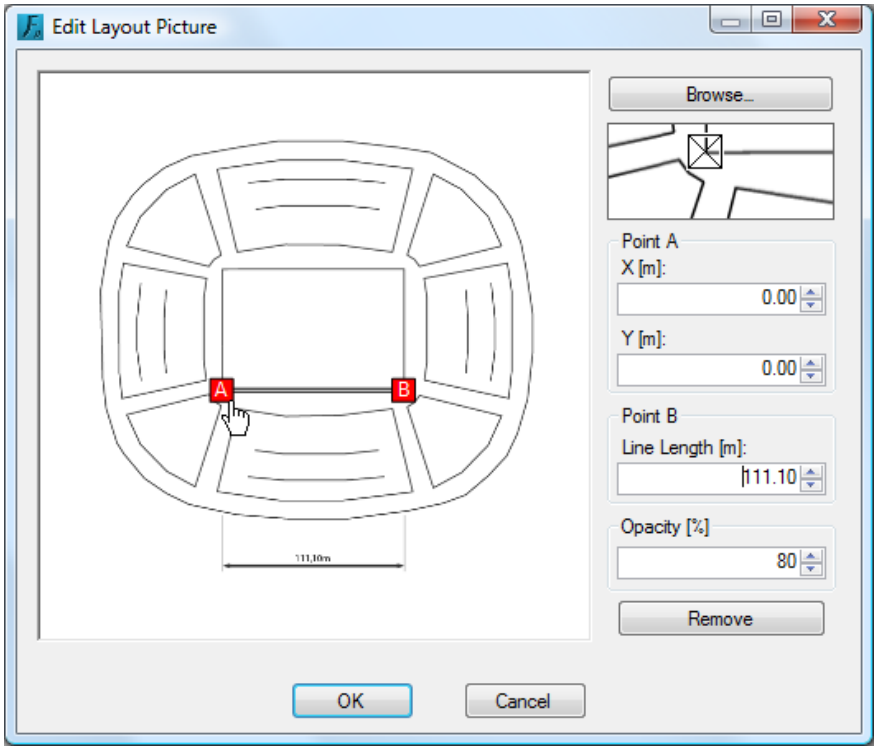
5. Advanced Features

This chapter goes into some features of EASE Focus that can be used to take full advantage of its capabilities.

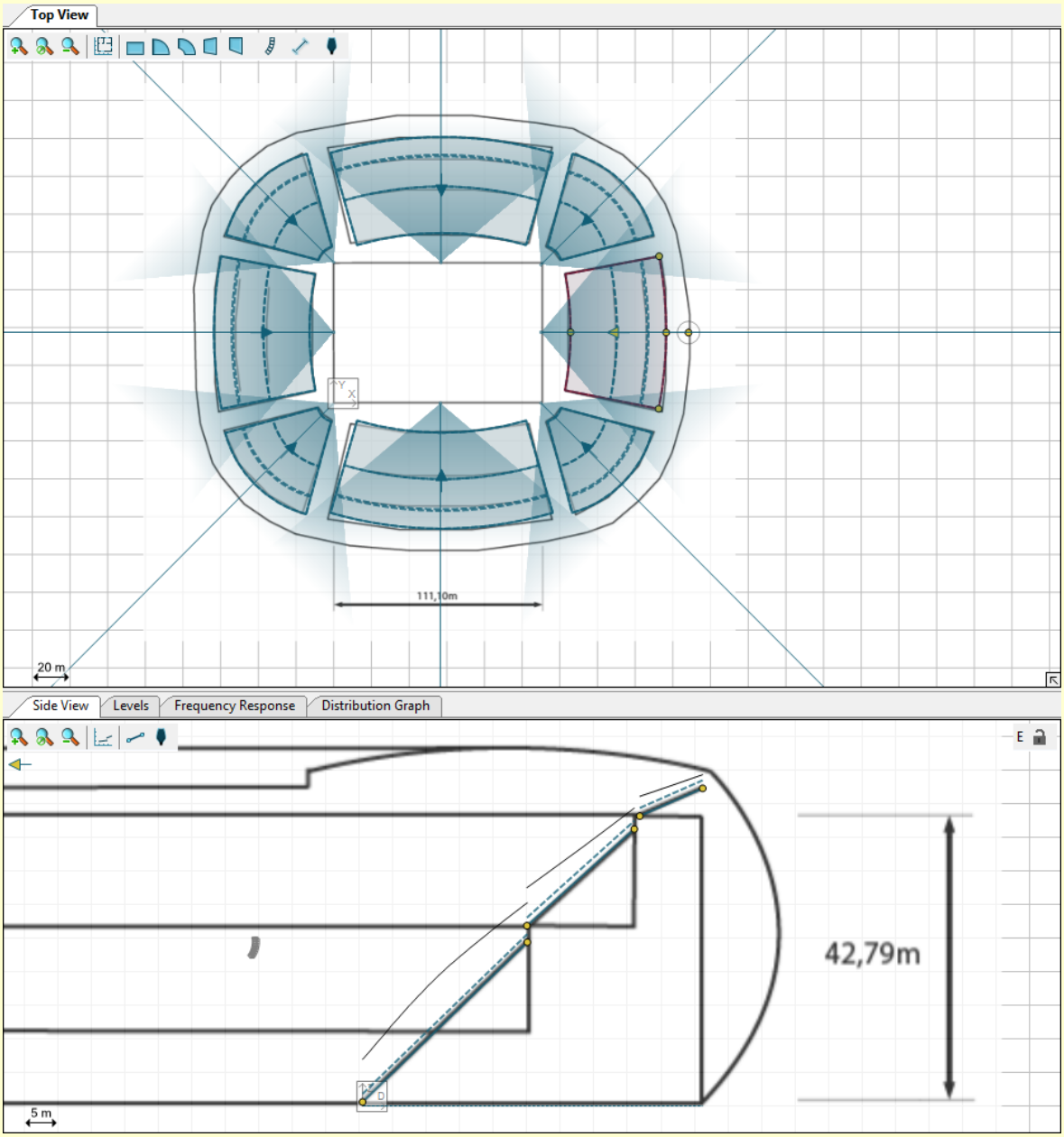
5.1. Setting Layout Pictures

Sometimes you may happen to have a plan drawing or an aerial picture available for your venue. In this case you want to use the picture as a basis to draw your project on.

Click on the Layout Picture icon : a window will appear, and you will be asked for a path to load your picture from. Once you have imported the picture, you will need to drag the points A and B until they match an edge on the drawing whose length is known. Then enter the length; you can also define the shift of the image, by entering the XY-location of point A in your project, or set the opacity of the picture. When you click OK, you will be able to see the picture in Top View, and to draw your venue on top of it.



The same is possible for the Side View: in this case you can load one layout picture for each Audience Zone, by clicking on the icon in Side View when the zone is selected. If you have a cross-section drawing of your venue, you can use it for that. In this case, you will be able to define DZ-coordinates for point A (relative to the front edge of the zone, along its central axis).



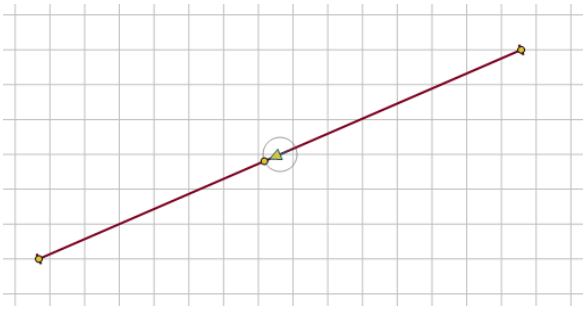
Go to the main program directory of EASE Focus 2: normally this is "C:\Program Files\AFMG\EASE Focus 2" (on 32 bit systems) or "C:\Program Files (x86)\AFMG\EASE Focus 2" (on 64 bit systems), unless you entered a custom path at setup time (§1.3). Use the files that you find in the "Tutorial" subdirectory as layout pictures for a new stadium project: stadium_topview.png for the Top View, stadium_sideview_long.png and stadium_sideview_short.png for the Side View in the two dimensions. Draw Audience Zones and Areas based on it, and place Line Arrays as shown in the picture.

5.2. Adding Section Planes

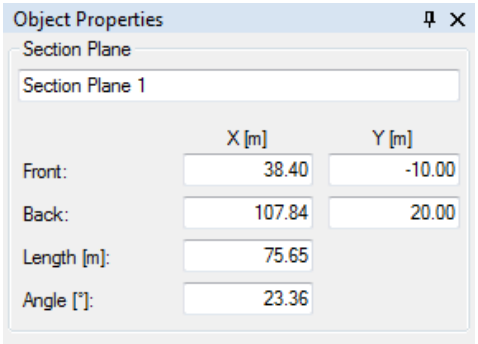
Section Planes, just like other objects, can be added by clicking on the associated toolbar button and then clicking or dragging in the Top View.

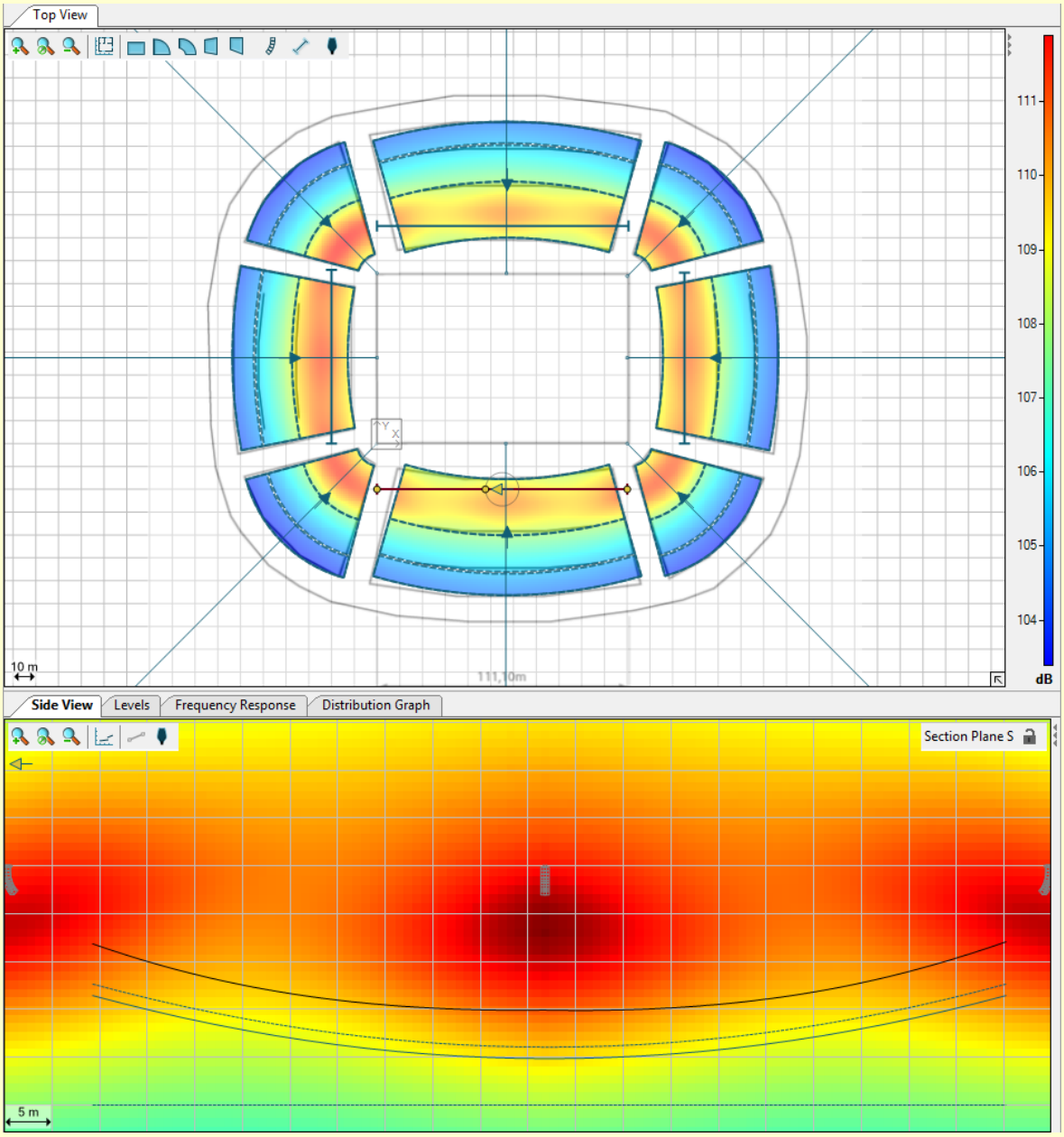
Section Planes are objects that don't have a physical or acoustical meaning: they are only used for viewing purposes. When a Section Plane is selected, the Side View shows the corresponding section: this allows examining, for example, mappings or level lines along axes that do not relate to any other object in the project.

The starting point of the Section Plane is shown on the left in its Side View, and the end point is on the right; the default view (obtained by clicking on the Scale to Fit button in Side View) is exactly comprised between these two points, even if this may cut other elements out of the displayed section. The arrow drawn along the selected plane in Top View, just like for Audience Zones, relates to the identical arrow in Side View pointing to the left: therefore it is pointing from the end point to the starting point in Top View; the viewing perspective can be flipped by rotating the arrow, dragging the mouse handle next to its tip.



Like all other objects, Section Planes have a related Object Properties window (accessible by selecting VIEW | OBJECT PROPERTIES in the main menu, or right clicking on the Plane and selecting PROPERTIES, or hitting F4). Here you can view and edit the edge points, the length and the angle of the Section Plane.

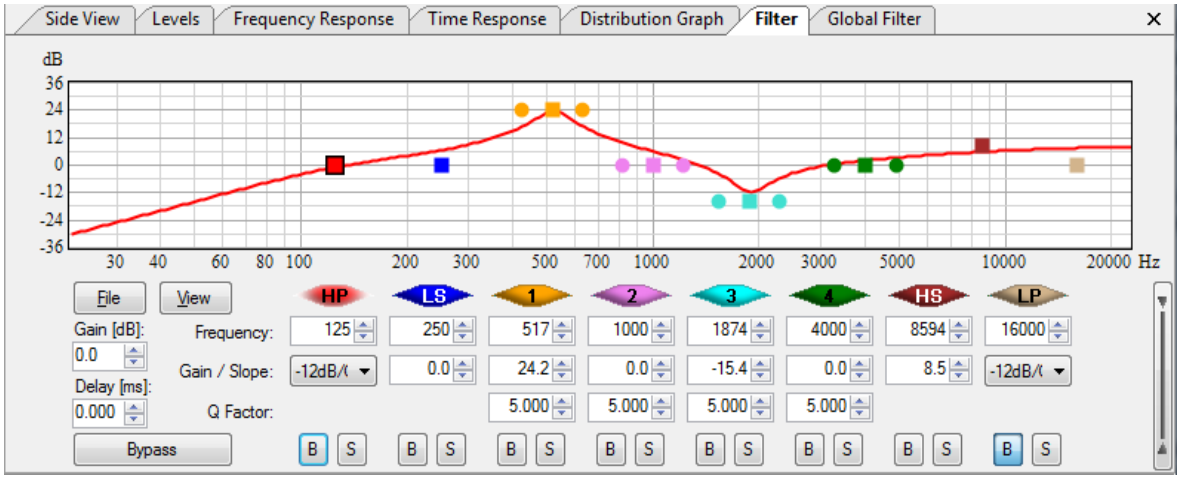




Add transversal Section Planes to your project, as shown in the figure above. How do SPL values vary across the circles?

5.3. Filter and Global Filter

When a Sound Source is selected, a virtual filter can be applied to it: click on the Filter tab to see it (Extended mode only, see §4.3 on how to activate it). Eight individual filters are available, consisting of a high-pass filter, a low shelf, 4 peak/notch filters, a high shelf and a low pass filter.



Analogously to the Filter, the Global Filter is also only available in Extended mode (see §4.3 on how to activate it). The Global Filter looks identical to the Filter, except it is not applied to a single Sound Source, that is, a Line Array or Loudspeaker/Column, but to all Line Arrays and Loudspeakers in the project.

Filters can be modified using the mouse handles in the plot or by editing filter parameters in the lower part of the screen (click on the double vertical arrow on the right to toggle the view of the parameter text boxes). Here you can also set gain and delay values for the Sound Source (or for all Sources, in the case of the Global Filter). You can bypass the entire filter bank (BYPASS button on the left) or individual filters (B button below each filter); clicking on any of the S buttons you can also "solo" a particular filter and exclude all others.

Clicking on the VIEW button you can edit graphical details of the plot. With the FILE button you can import a previously saved compatible filter or export the current filter to an EASE Generic Filter Bank (.xgfb) file. This is the same format used by all AFMG software, such as EASE, EASE SpeakerLab and SysTune. You can also save only the transfer function of the filter, as an impulse response stored in one of many formats including .etm, .efr (EASERA), Wave file and more. These formats are also compatible with all AFMG software.

Note that the color symbols located above the parameter fields are highlighted depending on which filter you are adjusting at the moment. Use a right mouse click on the filter symbol to reset the associated filter setting to its default.

5.4. Filter Settings for Line Arrays

Some line arrays will let you define filter settings for their sources. In most cases you can choose to have a single input for every box or even adjust multiple inputs for each box.

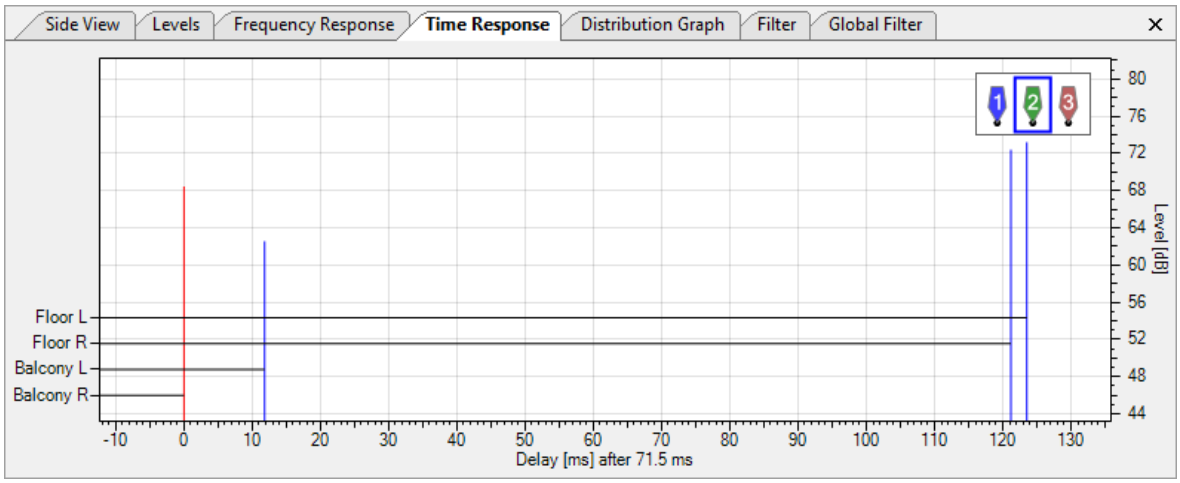
If a system definition lets you define filter settings, you will see it in the Object Properties window: just beneath the POSITION & ORIENTATION frame, two buttons will appear: RIGGING and FILTER SETTINGS. Clicking on them you can switch the view between rigging settings (available for all line arrays) and filter settings, where you can define input types exploiting configurations made available by the manufacturer.

The difference between these filters and the Filter frame is that these are internal filters to the box, which are usually configured through an external controller, a DSP unit or a switch on the box, while the external Filter refers to an external device connected at the line array's input, such as a system DSP or an amplifier. The Global Filter usually represents a device located right after the mixing device in the signal chain, before the signal is sent to the different line arrays.

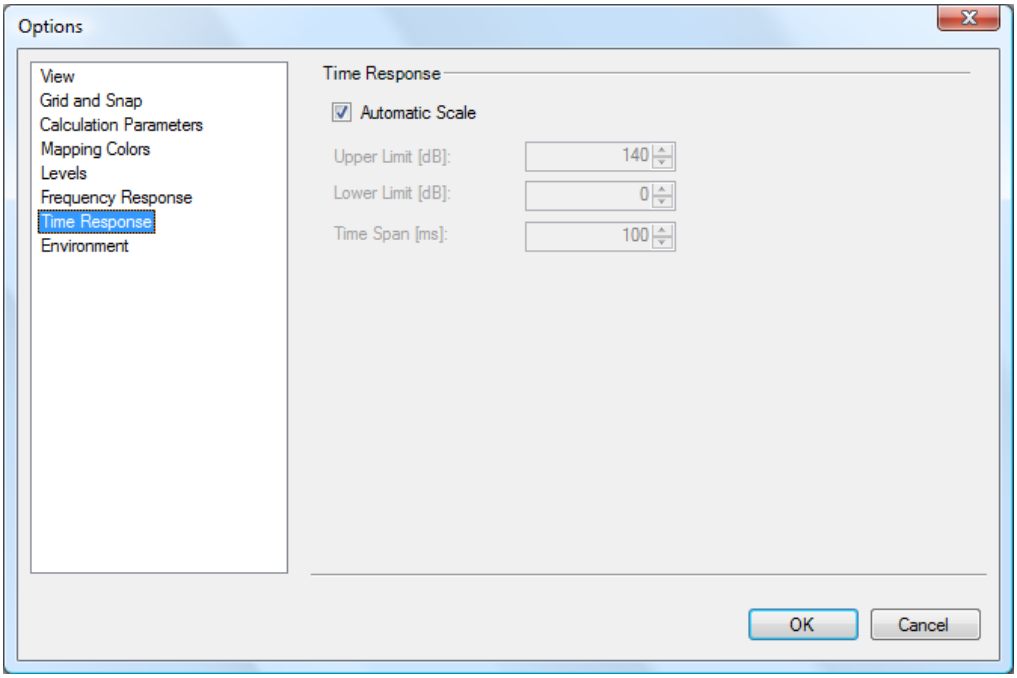
5.5. Time Response

For each receiver, the time of arrival and direct SPL of every sound source can be viewed in the Time Response window (Extended mode only, see §4.3 on how to activate it). Click on a Receiver in the list in the top right of the Time Response window to see the plot for that Receiver. This view may be useful if you want to align delays for different sound sources. To set a delay for a specific sound source, select it and open the Filter window.

Just like in the real world, in the simulation domain the signal delay can also be optimal only for a single spot. When deriving delay values from the time response graph, make sure that you consider several listening locations which are representative of the whole audience area. Also note that the audibility of individual sources will depend on their arrival time and level relative to each other. To investigate typical masking effects in the time and frequency domain please use the advanced acoustic modeling software EASE instead. The Time Response function in EASE Focus can only provide some approximate answers.



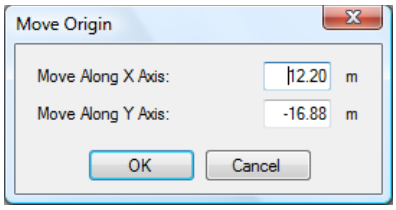
Clicking on the time scale or on the dB scale, you can access the TIME RESPONSE page in the Options window (alternatively, you can reach it by selecting FILE | OPTIONS or hitting F9 and then selecting the item manually). Here you can choose between an automatic scale and a manual one, where you can pick the limits of the dB scale and the time span.



5.6. Moving the Origin

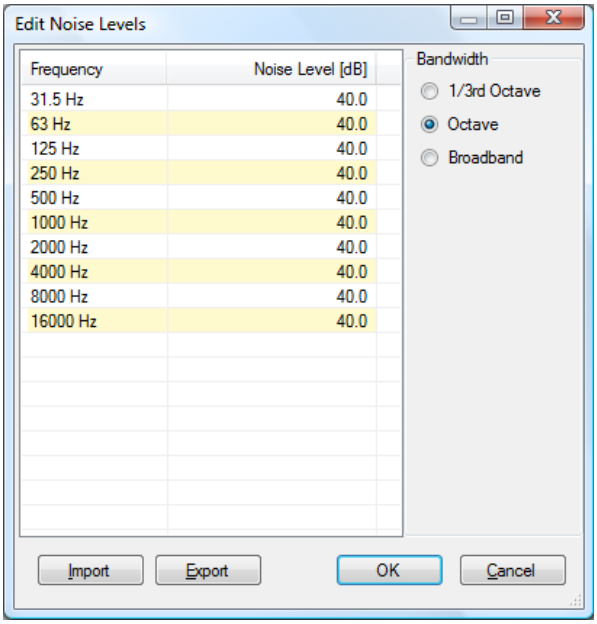
If you have been working on your project for a while, and then would like to change your reference system without having to displace all objects inside it, you can move the origin instead. Just right click on the point where you would like to place it in the Top View, and select MOVE ORIGIN HERE: a window will appear, asking where you want to place the new origin exactly, and the default location will be the point where you clicked. Clicking OK will execute the change.

Alternatively, you can perform the same operation by selecting EDIT | MOVE ORIGIN in the main menu.



5.7. Noise Settings

If you have activated the Extended mode (see §4.3), in the Project Properties window (§2.1) you will see a NOISE SETTINGS button at the bottom, next to the PROJECT SETTINGS button. Clicking it will open the Edit Noise Levels window, where you can define noise levels for broadband, per octave or per one/third octave. You can even import noise level files in the EASE format, or export levels that you have just defined.



Once you have defined the noise levels, it is possible to view S/N Ratio mappings. These can be selected in the Mapping Toolbar, as an alternative to non-weighted SPL mappings and A-weighted mappings (§3.1).

6. References

Find below some articles and textbooks for further reading.

[1] EASE, acoustic modeling software, http://afmg.eu.

[2] S. Feistel, W. Ahnert, *The Significance of Phase Data for the Acoustic Prediction of Combinations of Sound Sources*, 119th AES, October 2005, convention paper 6632.

[3] S. Feistel, W. Ahnert, *Modeling of Loudspeaker Systems Using High-Resolution Data*, J. Audio Eng. Soc., vol. 55, pp. 571-597 (2007 July/August).

[4] S. Feistel, A. Thompson, W. Ahnert, *Methods and Limitations of Line Source Simulation*, J. Audio Eng. Soc., vol. 57, pp. 379-402 (2009 June).

[5] W. Ahnert, F. Steffen, *Sound Reinforcement Engineering*, 1st ed. (E & FN Spon, London, 1999).

[6] L. Kinsler, A. Frey, A. Coppens, and J. Sanders, *Fundamentals of Acoustics*, 4th ed. (Wiley, New York, 2000).

[7] EASERA, acoustic measurement software, http://afmg.eu.