ADAMSON

Adamson Systems Engineering

Blueprint AV™ User Handbook

BLUEPRINT AV

Blueprint AV™ User Handbook

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2D Design

1.1 Getting Started

When opening, Blueprint AV™ defaults to a 2D & 3D mixed mode workspace, using the Metric scale. To change the unit of measurement to Imperial, click on the scale box.

3D mixed mode view

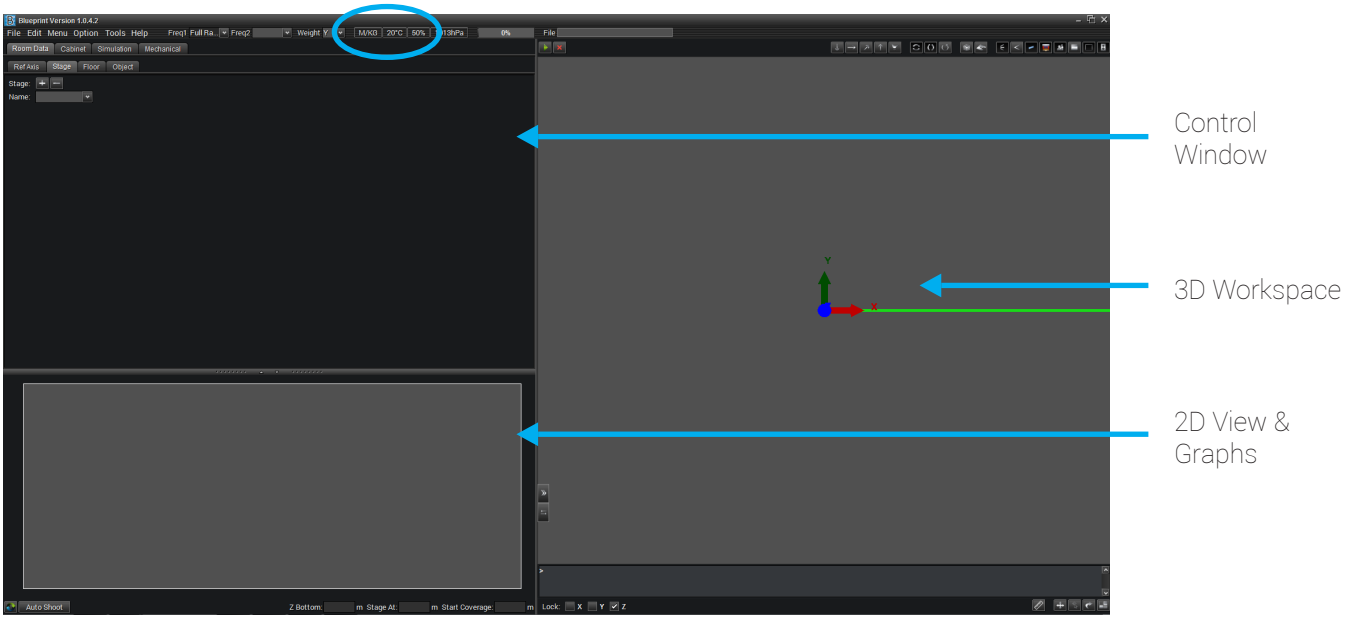


Fig. 1

2D mode view

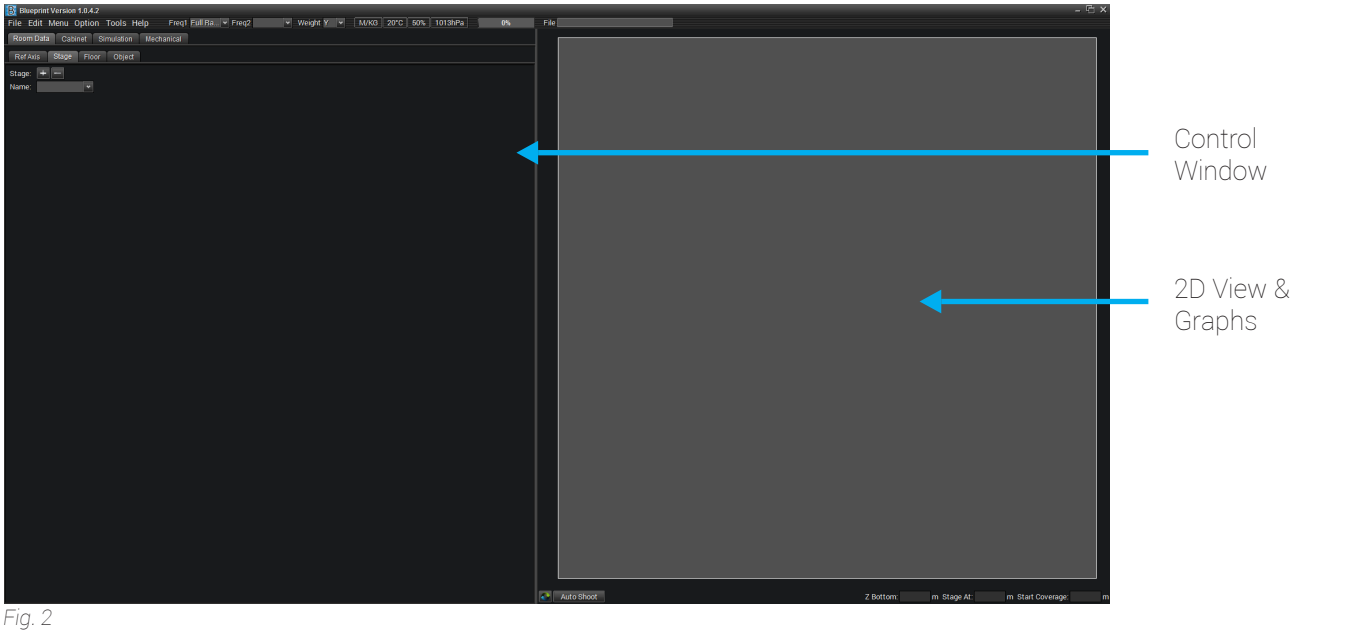


Fig. 2

2D Design

1.1 Getting Started

There are 4 main tabs in the Blueprint AV™ Workspace;

Room Data

Fig. 3

Create 2D or 3D room designs with Floors, Stages and Objects

Cabinet

Fig. 4

Place virtual Adamson line arrays, subs, sub arrays or point source loudspeakers into your design

Simulation

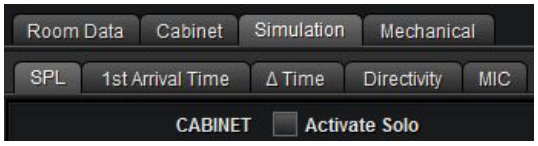


Fig. 5

Run precise simulations to check your design before you deploy a system

Mechanical

Fig. 6

View important rigging information for correct and safe array deployment.

1.2 2D Design

To enter 2D design mode, go to the Tools drop down menu and select 2D mode. The mode can also be entered by CTRL-F.

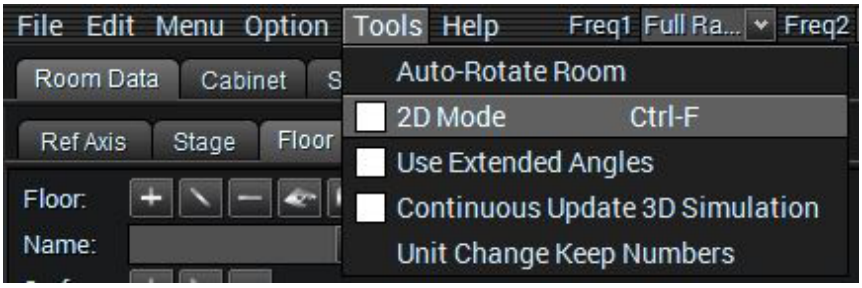


Fig. 1

To begin a 2D design, under the Room Data tab select Stage and add a new Stage by clicking the + symbol.

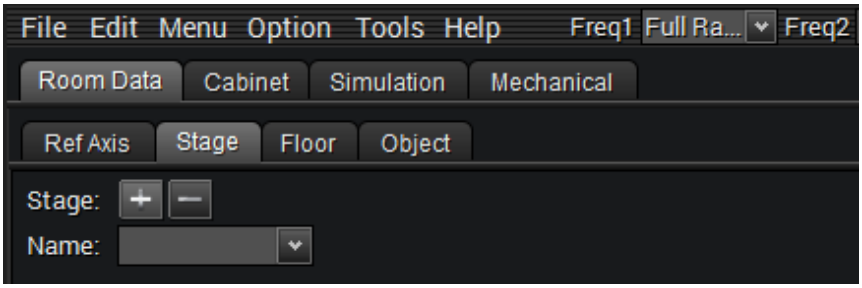


Fig. 2

In the pop up window you can name the Stage, assign the Stage to a Reference Axis, decide whether it will be activated for simulations, and set the following positioning data: mirroring, position on the reference axis, shape and dimensions.

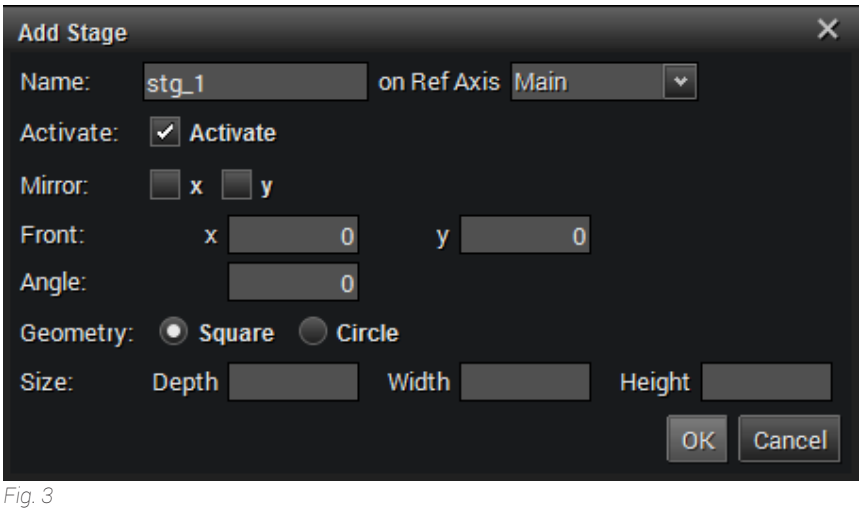


Fig. 3

1.2 2D Design

To add a Floor to the design, under the Room Data tab select the Floor tab and add a new Floor by clicking the + symbol.

Fig. 4

In the pop up window you can name the Floor, select the Reference Axis, adjust the Color, Audience height and whether the Floor will be activated for simulations.

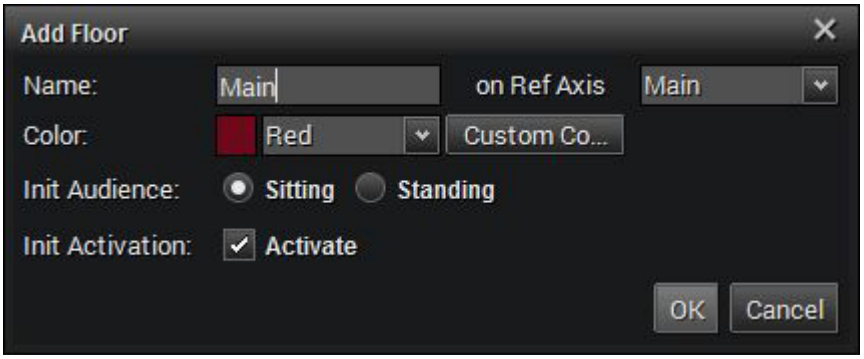


Fig. 5

Once a Floor is created, individual Surfaces can be added using the + button

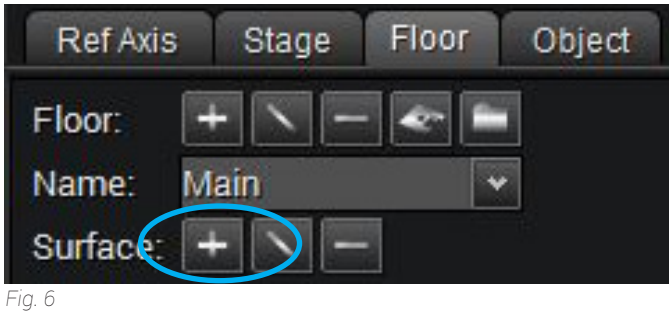


Fig. 6

1.2 2D Design

This will add a new Quad Surface to the Floor. There are 7 geometric Surface types available from the drop down menu, for 2D mode use the Quad Surface.

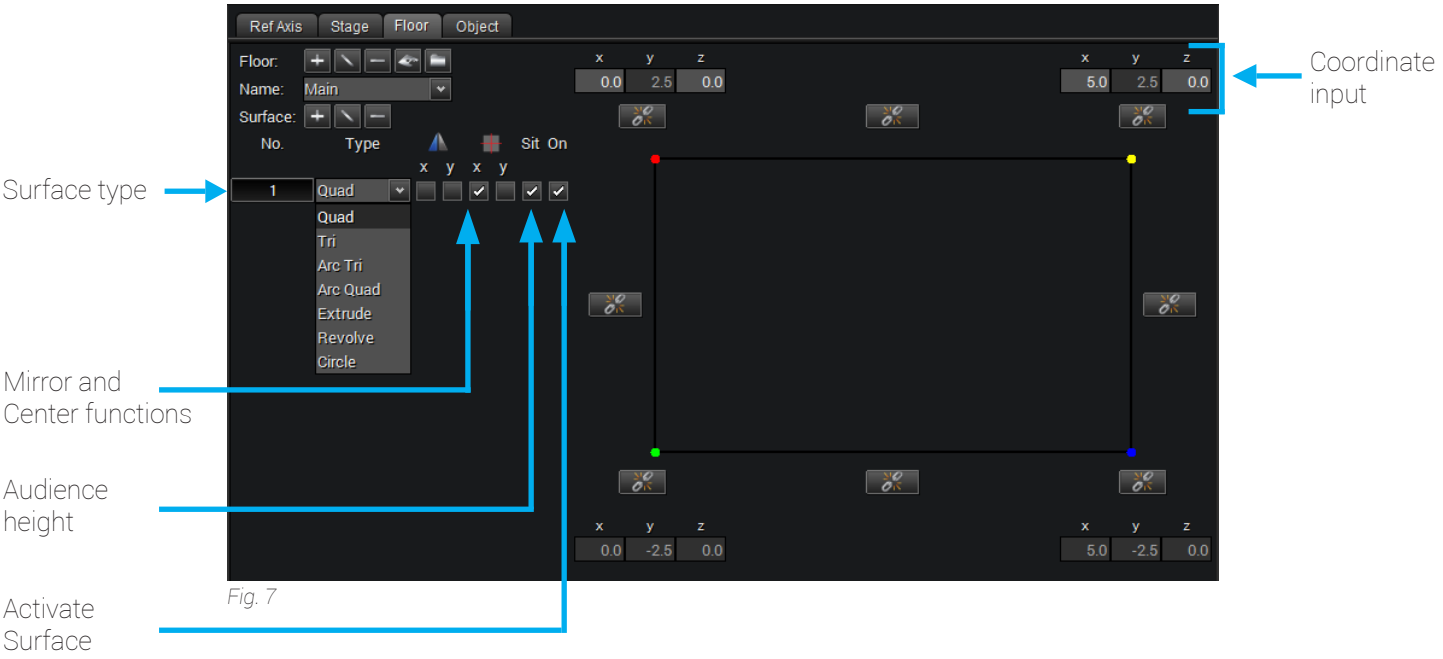


Fig. 7

2D mode allows only 2 vertices to be edited, x being horizontal length of your Surface and z being the height.

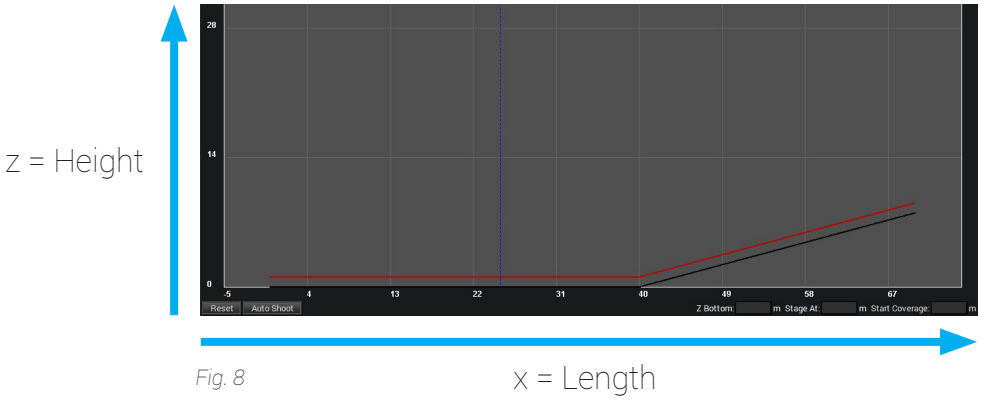


Fig. 8

1.2 2D Design

If Surfaces share a common vertex, data can be copied and pasted between surface by right clicking on the vertex input box to open the copy/paste menu.

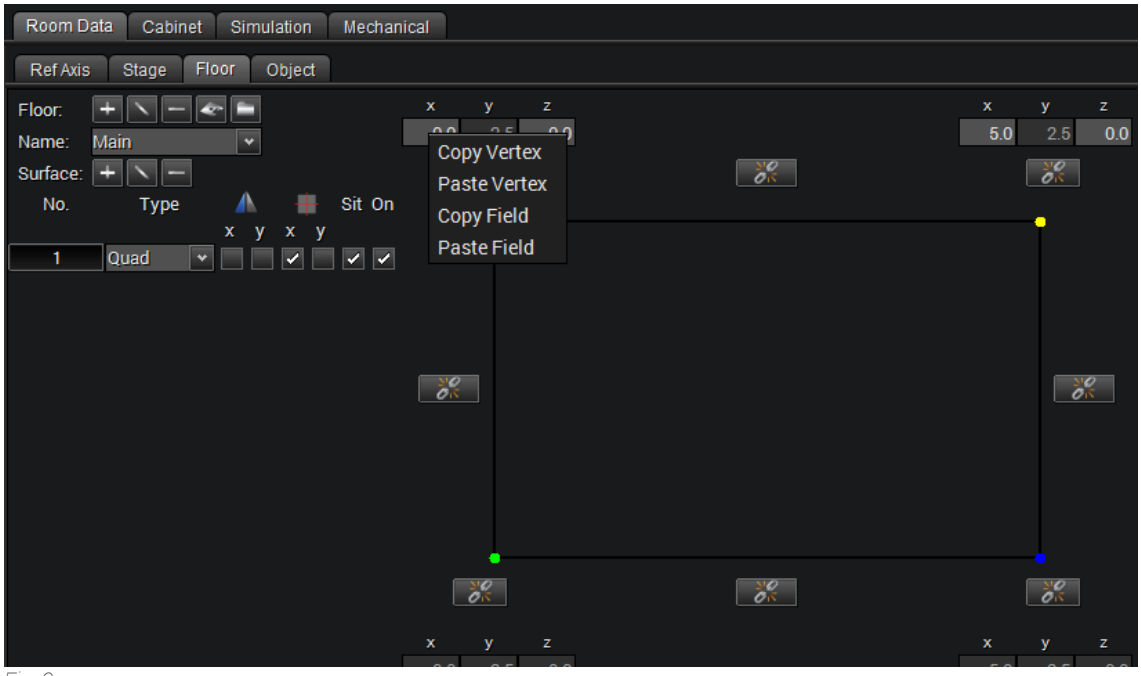


Fig. 9

To learn more about 3D mode and the different surface types, see page 23

1.3 Vertex Input Options

There are 4 modes of data input to set each floor vertex. To switch data input options, navigate to the Options menu and select Vertex Input Option

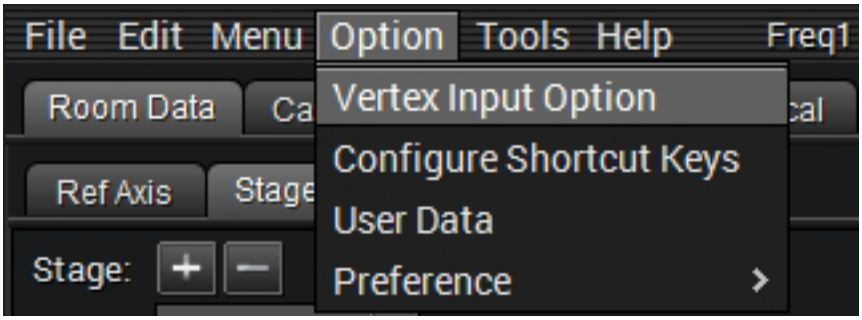


Fig. 1

The pop up window allows you to select between 4 different modes. This chapter will cover the first 2 options:

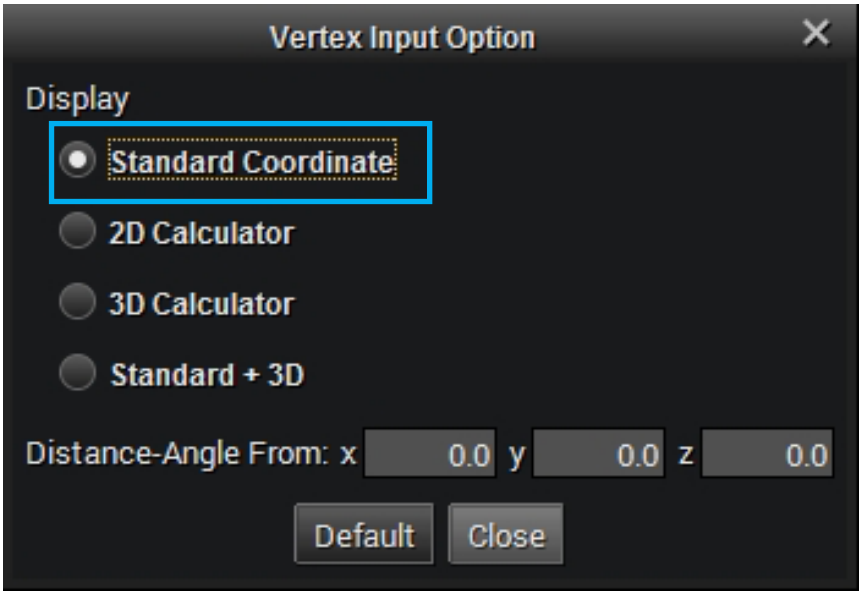


Fig. 2

Standard Coordinate is the default input method. For 2D mode, vertex x and z coordinates are manually entered to design a Floor Surface or Object Surface.

1.3 Vertex Input Options

The second option is a 2D calculator. By defining a measurement point, a room can be measured with a laser distance meter and incline meter to set Vertex point for a Floor Surface.

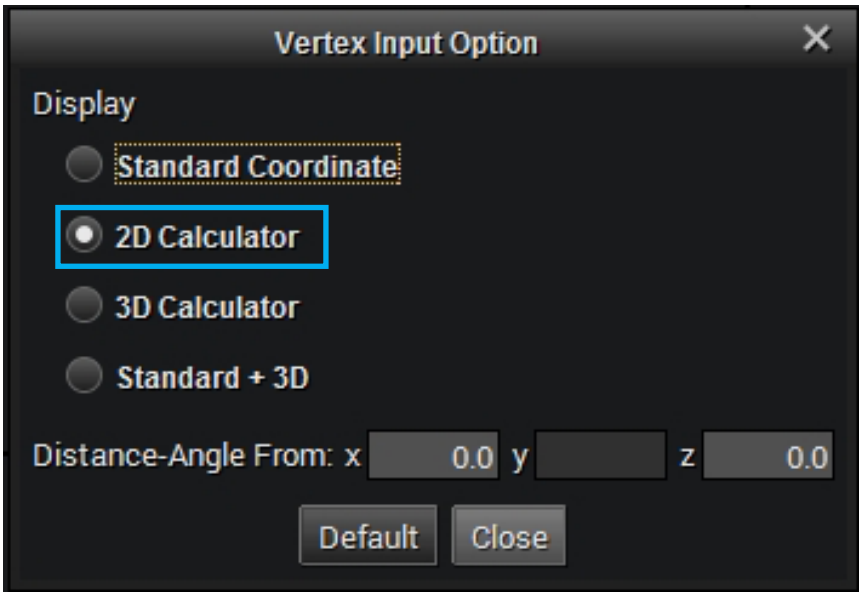


Fig. 3

To define a set point to measure from, enter x & z coordinates into the Distance-Angle From fields eg: If the lip of the stage was the 0,0 and the measurement was taken from 1m downstage at 1.2m high, then coordinates x= 1.0 and z=1.2. It is important to set the Distance-Angle From to ensure accurate room measurements.

Once set, close the pop up. The Floor or Object Surface vertex coordinate input fields will now look like this:

Fig. 3

1.4 Adding Virtual Arrays

Once the room design is complete, virtual loudspeakers can be added in the Cabinet tab. Adding a Cabinet Group will bring up a pop-up window in which the Group can be named, Reference Axis defined, flown or stacked configuration set and Activation in simulation can be changed.

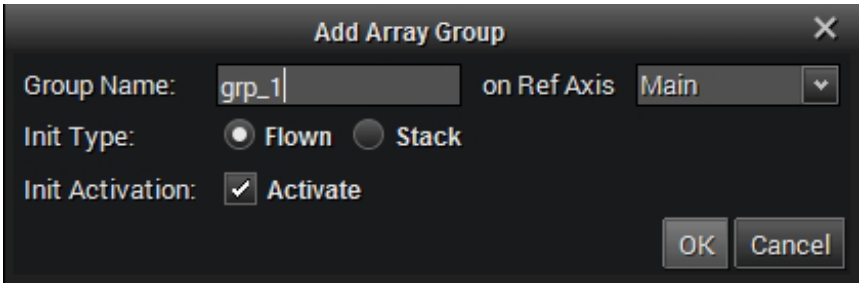


Fig. 1

In the Cabinet Group, adding a Cabinet will add a loudspeaker source to the design. Multiple Cabinets can be added to a Cabinet Group.

Choose a source type; Line Source, Sub, Sub Array or Point, then in Box Type, choose an Adamson Loudspeaker.

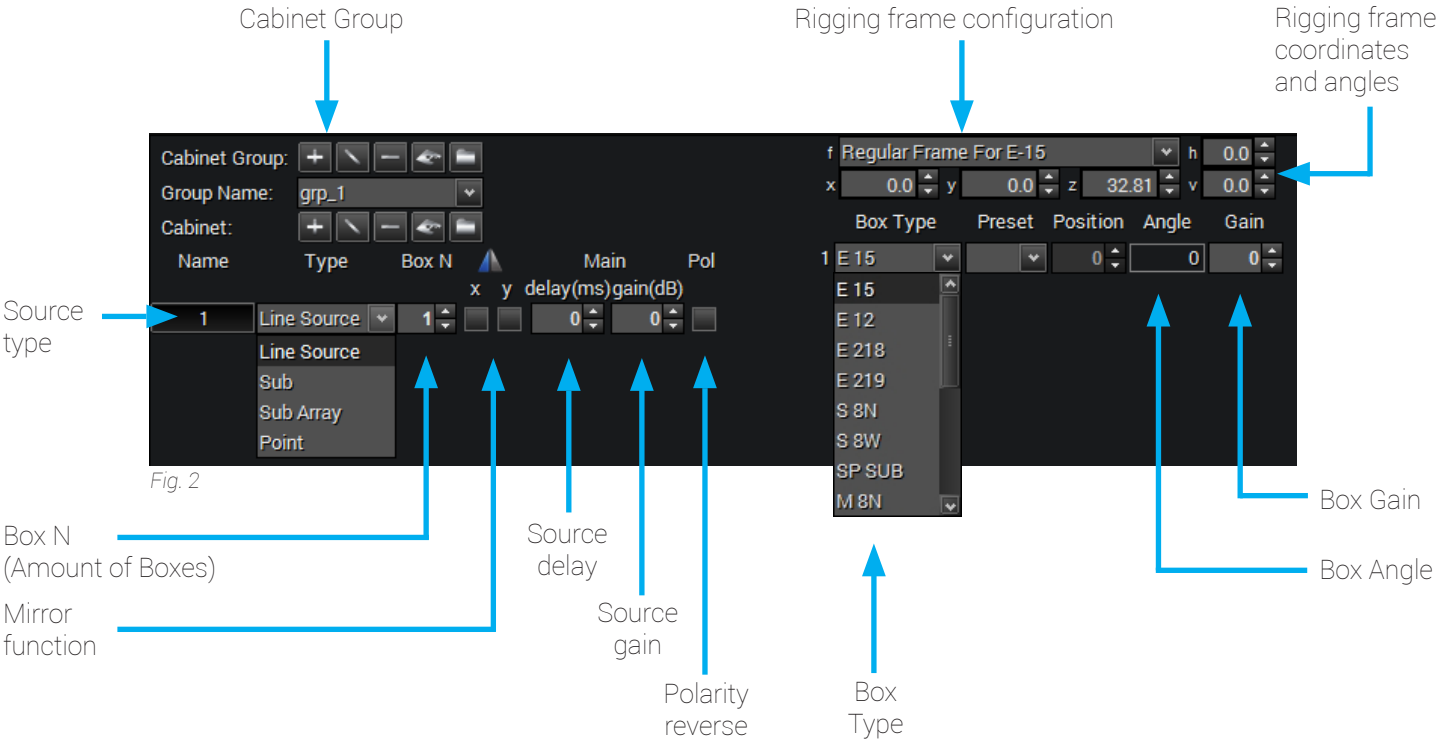


Fig. 2

1.4 Adding Virtual Arrays

Add cabinets to the array by increasing the Box N field, manually entering a number or using the Auto Shoot option (See next page).

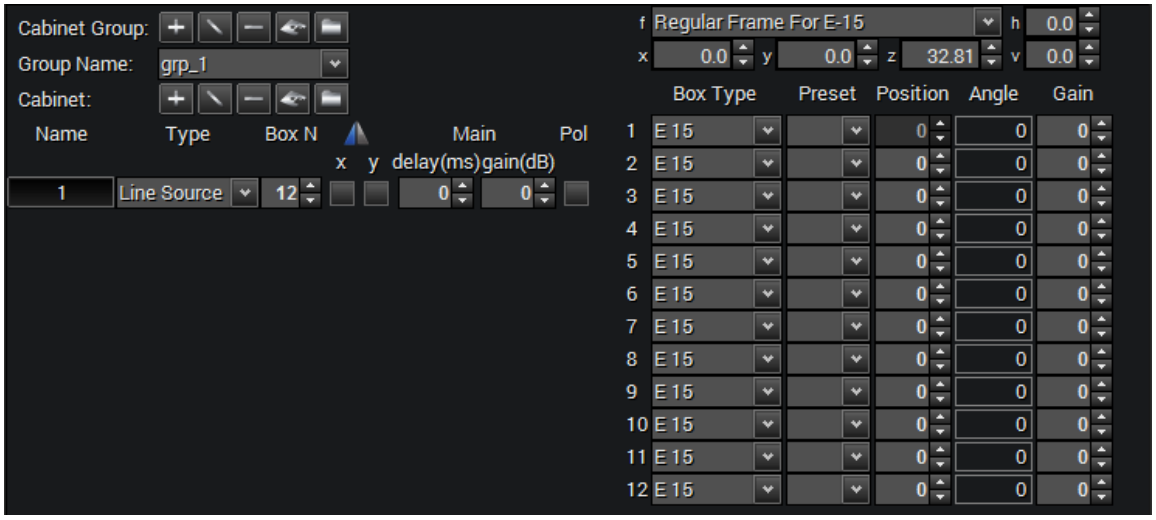


Fig. 3

To create a mixed cabinet array select the Box Type of the loudspeaker that needs to change from the drop down menu. Once selected the Box Type below will change.

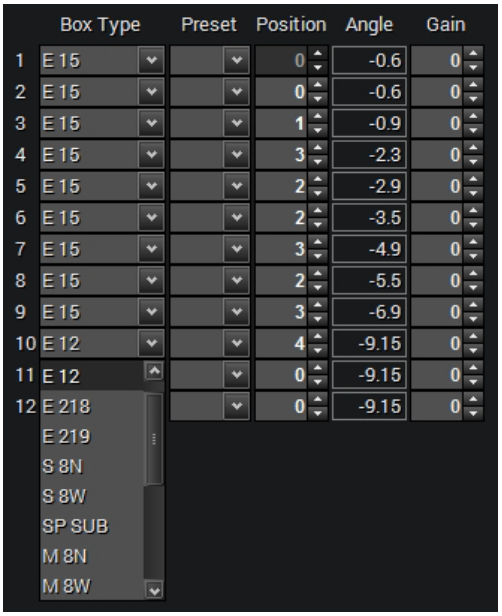


Fig. 4

Box Type legend:

Box Type	Cabinet Type	Box Type	Cabinet Type
E15	E15	M SUB	Metrix Sub
E12	E12	Y 18	Y18
E218	E218	Y 10	Y10 Paper
E219	E219	Y 10 K	Y10 Kevlar
S 8N	SpekTrix	Y10 SUB	Y10 Sub
S8W	SpekTrix Wave	S 10	S10
SP Sub	SpekTrix Sub	S 119	S119
M 8N	Metrix	E 119	E119
M 8W	Metrix Wave		

Fig. 5

1.4 Adding Virtual Arrays

Blueprint AV™ has the ability to Auto Shoot an array for fast and easy predictions. To launch Auto Shoot, select Auto Shoot in the 2D cross section view.

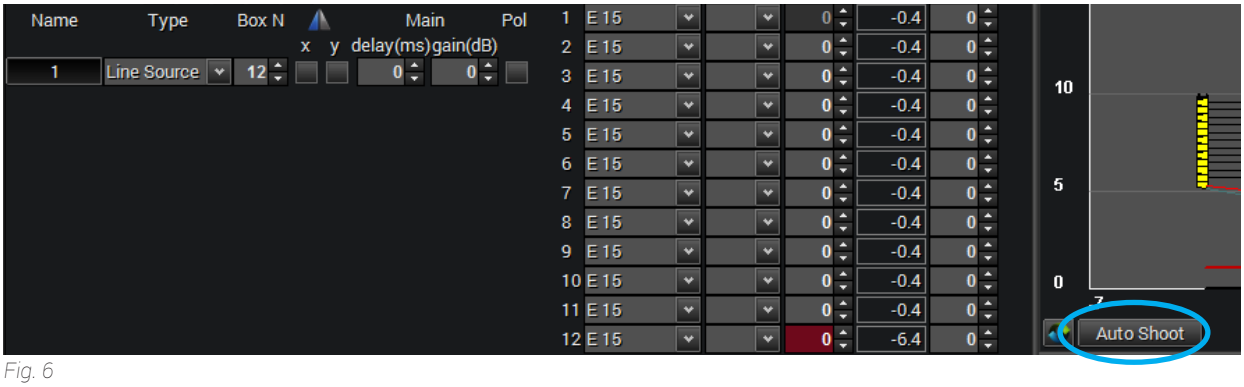


Fig. 6

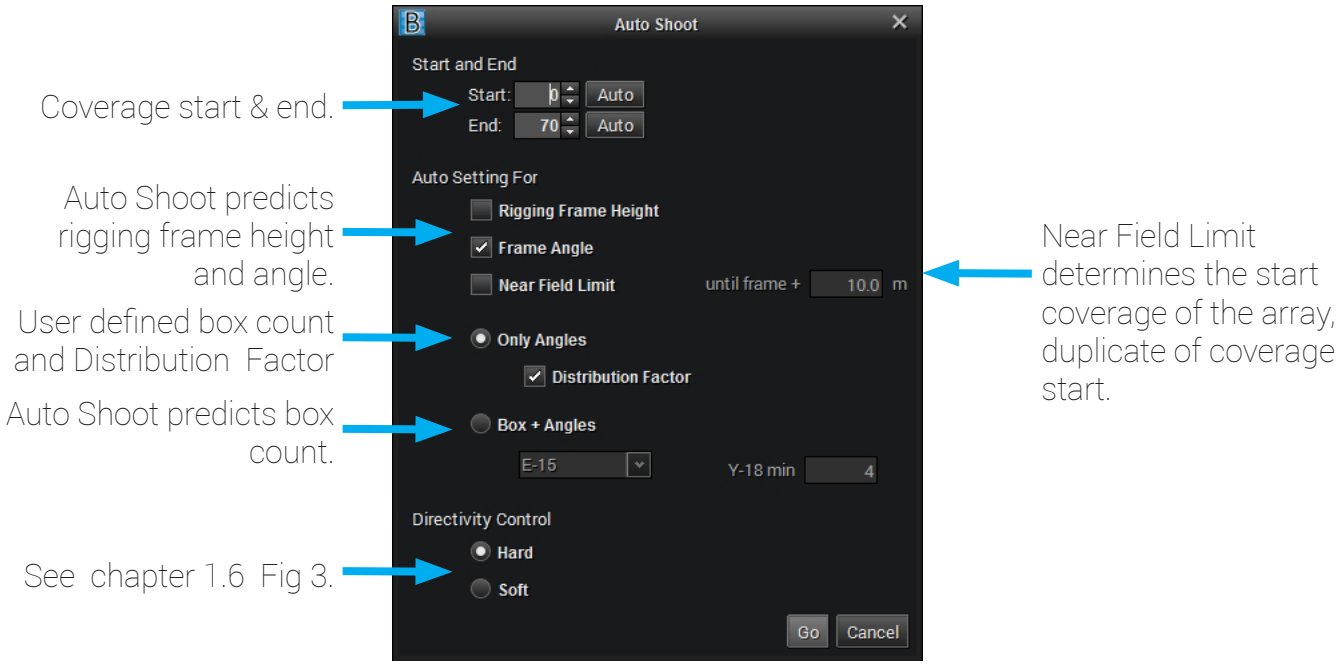


Fig. 7

Auto Shoot is used as a quick start in setting angles in an array. It is recommended that when dealing with multiple surfaces that angles and coverage be adjusted manually to meet exact coverage requirements.

1.5 Cross Section & Graphs

The 2 graphical displays on the right hand side have 5 selectable views to check 2D prediction data.

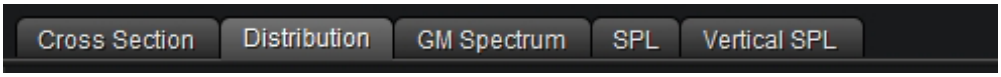


Fig. 1

Cross Section: Access Auto Shoot, View 2D coverage, vertical rays, distance to array bottom and start coverage

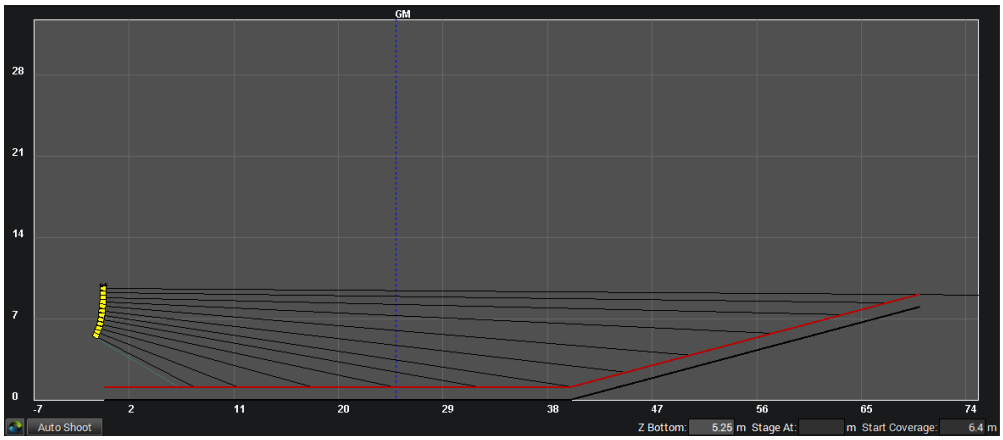


Fig. 2

Distribution: This graph shows the distance in relation to one another of where each cabinet's focal point meets the listening plane. The green line is the Distribution Factor, which will change depending on the settings determined in the Auto Shoot function. The Distribution Factor can be set ahead of time as well, with Auto Shoot attempting to match it. Note that this may result in less initial coverage.

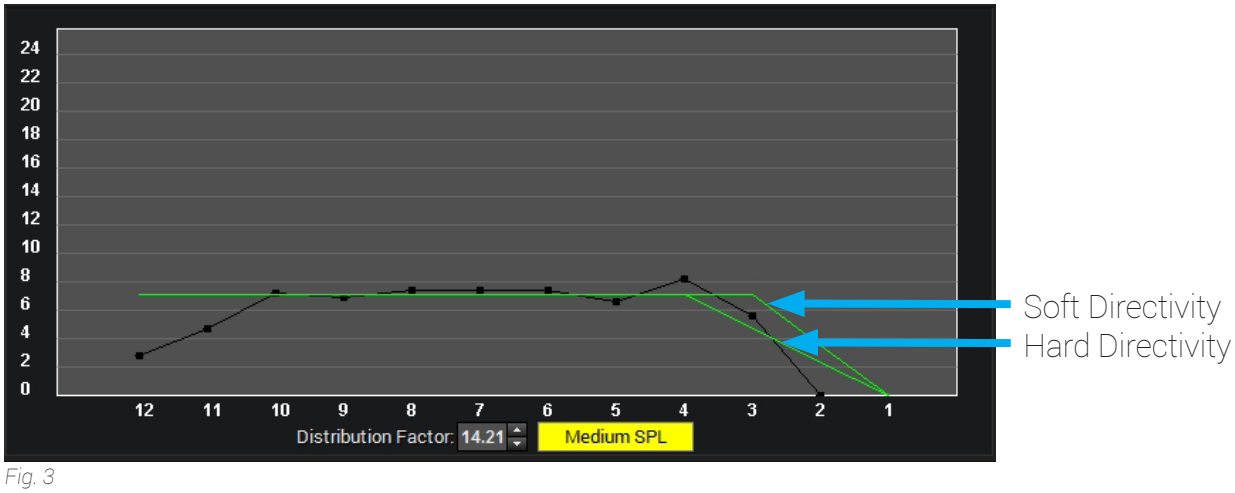


Fig. 3

1.5 Cross Section & Graphs

GM Spectrum: Shows a frequency spectrum response at a specific Guide Mark (GM) on the listening plane depending on the selected weighting.

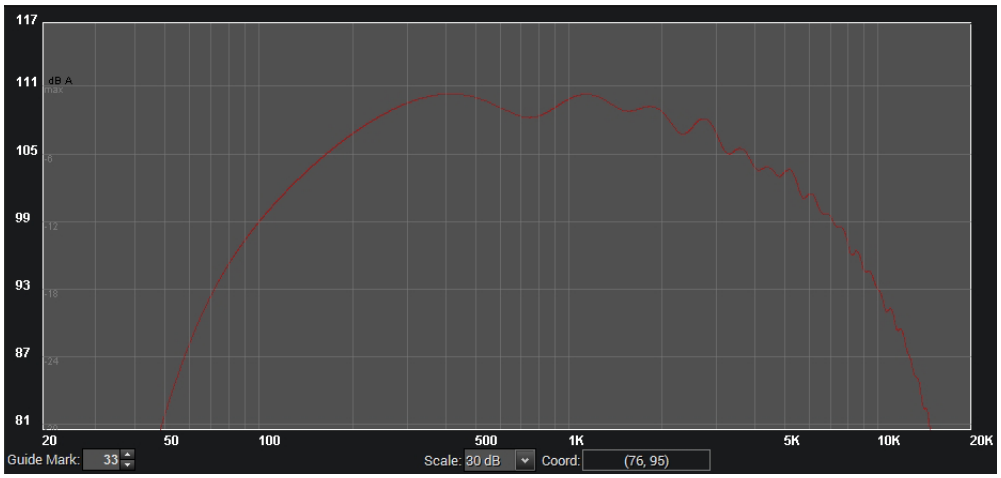


Fig. 4

SPL: SPL coverage over listening area defined by the SPL weighting and frequency selected in the top menu bar (fig. 7)

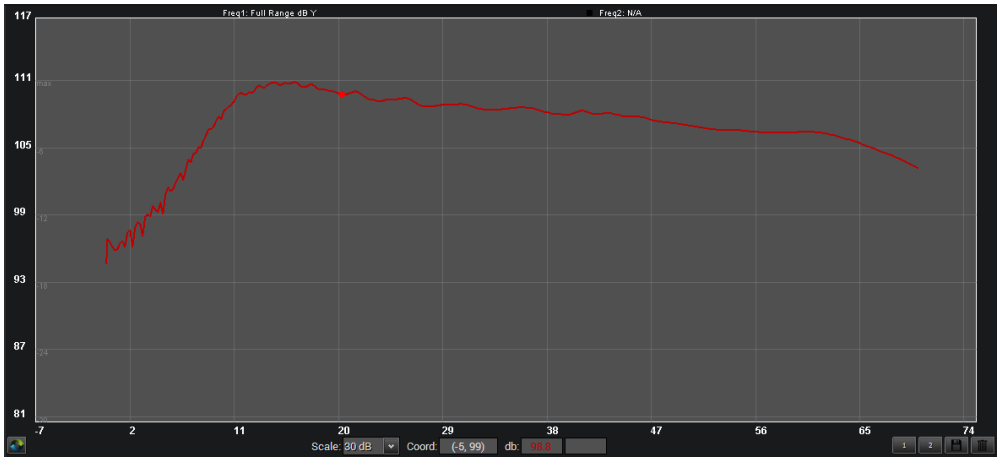


Fig. 5

1.5 Cross Section & Graphs

Vertical SPL: A colored graphical view of the vertical SPL based on selected frequency and SPL weighting (Fig. 7). To activate, select Calc in the lower right corner. To view color scale pop up (Fig. 6.2) select the green button to the right of the display.

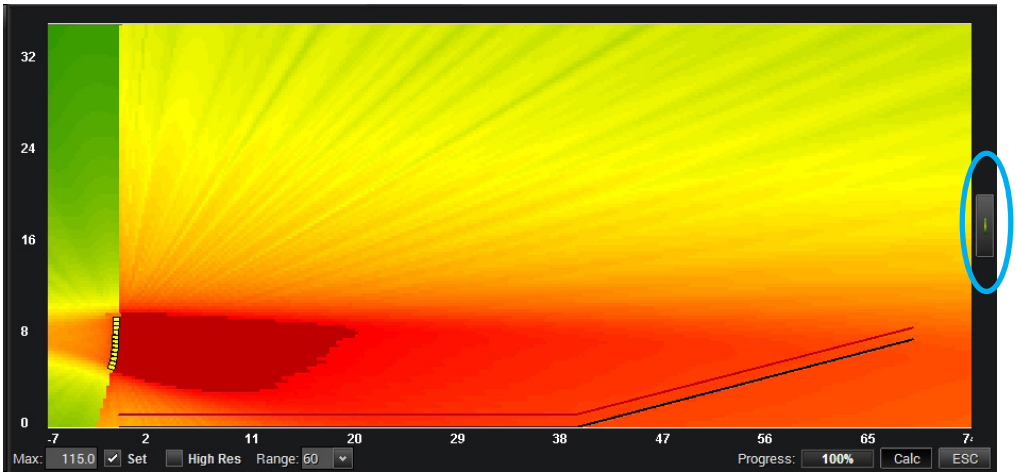


Fig. 6

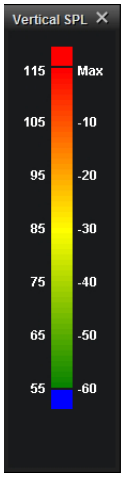


Fig. 6.2

A max SPL can be set to achieve an intended target or if there are multiple sources at varying levels. The range sets the colour resoloution shown incrementally from the maximum SPL value.

Blueprint AV™ simulations can be done in 4 different SPL weightings including Flat frequency response. The default is Y weighted. Frequency response dictated by these different SPL weight can also be shown with the ability to view 2 different frequency responses simultaneously in the SPL tab (Fig.5) as well as 3D simulations.

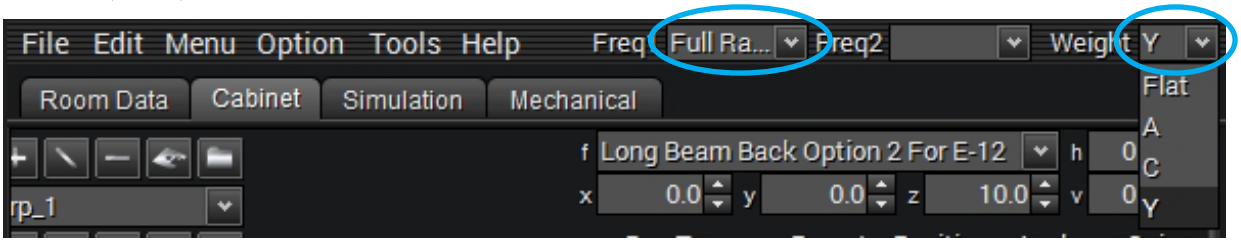


Fig. 7

In our experience, minimal dBA differences across a given space do not necessarily produce an even listening experience due to typical system high frequency distribution approaches. These high frequency variances are small enough not to affect the overall dBA rating but large enough to be experienced by listeners across a given space. While A and C weighted curves are available for use in Blueprint AV™, using the Adamson Systems Y weighted curve, which looks at all audio from 2 kHz to 8 kHz, gives the user a far greater insight into how a targeted area will actually be covered, and how it will actually sound.

1.6 Optimizing Arrays

When designing a loudspeaker system in Blueprint AV™, Adamson recommends the following optimization techniques.

Cross check A and Y-weighting SPL graphs. An ideal design will have a 6dB corridor in both A and Y-weighted SPL. This ensures tonal balance throughout the intended listening area as demonstrated below.

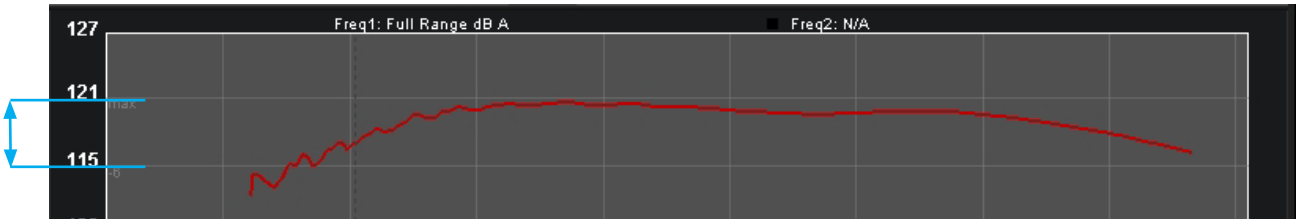


Fig. 1

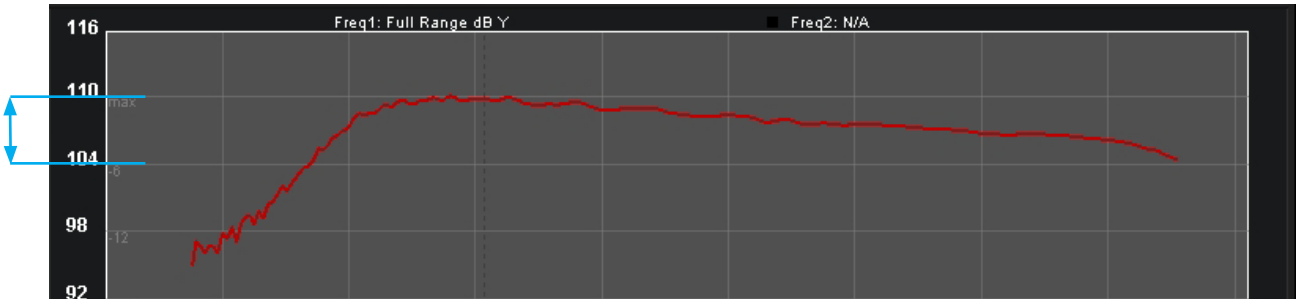


Fig. 2

Check individual frequency responses, as 2 individual frequencies can be displayed simultaneously. ie: 8Khz to optimise inter-cabinet splay angles.

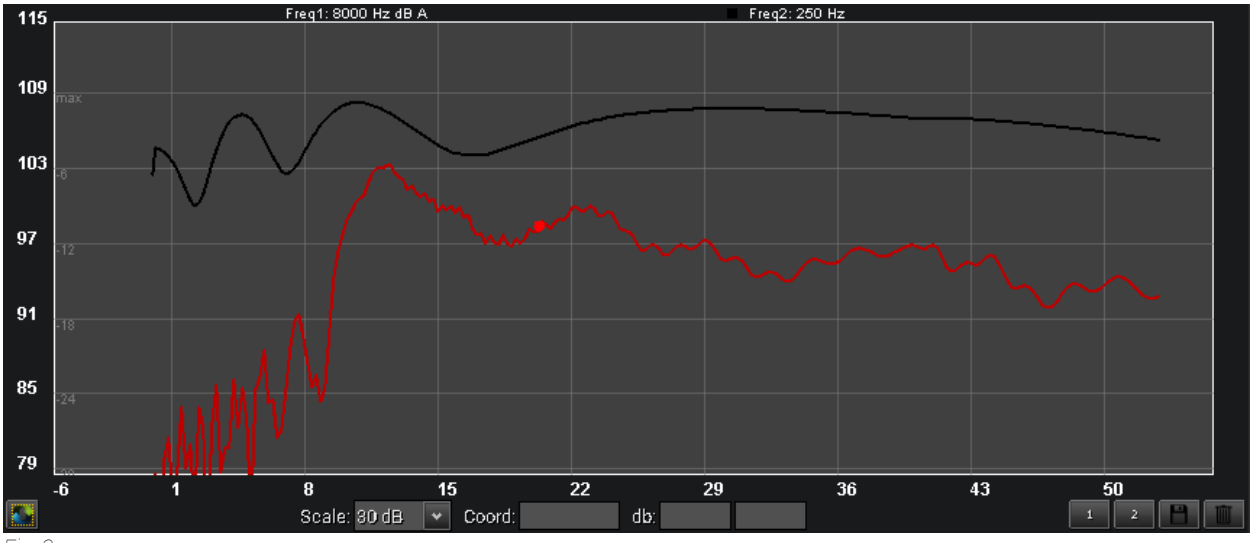


Fig. 3

1.7 Mechanical Tab

The Mechanical Section contains two sub-tabs; the Mechanical Tab, and the Rigging Plot Tab (Rigging Plot not available in 2D mode)

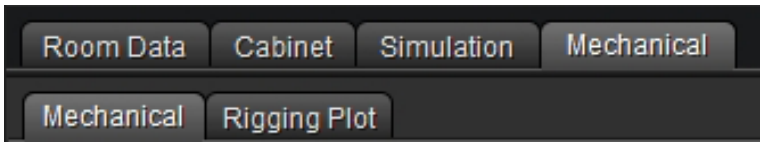


Fig. 1

The Mechanical Tab is comprised of three graphical displays; Cabinet, Frame Side and Frame Top.

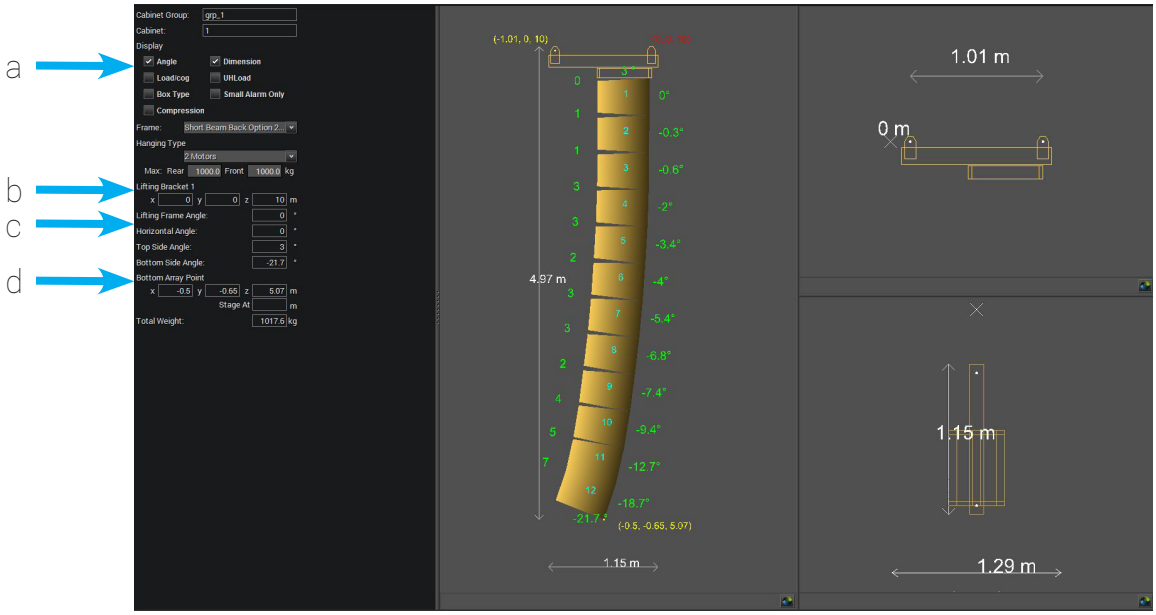


Fig. 2

Dimension data as well as control parameters are shown on the left side of the screen.
Fig 2:
a) Display check boxes allow you to hide or show pertinent details on the display screens (Fig. 3)
b) Frame allows switching of rigging frame configuration to meet safety standards
c) Hanging type allows setting of amount and load limit of hanging motors
d) All pertinent coordinate and dimension data is located under Hanging Type.

1.7 Mechanical Tab

Display checkbox legend:

Dimensions	Frame location, array bottom height, angles, rigging positions
Gravity	Center of gravity, load weight of each motor point
Name	Cabinet name
Compression	Weight taken by each rigging link, compression between cabinet rigging
Overall	Array length, width, lifting point distance
UH Load	Under hang load for Y18/Y10
Small Alarm Only	Changes hoist alarm from main page to small alarm next to checkboxes

Fig. 3

Rigging Alarm legend:

Alarm Type:	Cause:	Solution:
Hoist Overload	Array exceeds lifting capacity,	Increase motor capacity or remove cabinets
No Tension on Hoist	One motor not taking any weight, unbalanced load.	Change frame configuration or decrease frame angle until both motors take weight
Not Safe	Configuration unsafe	Decrease cabinets, change lifting or cabinet angles or increase lifting capacity

Fig. 4

Once the design has been completed a User Sheet can be printed to take to the rigging and audio team to deploy on site.
The User Sheet is located at the bottom of the File menu. To edit the show/event, date and venue notes for the User Sheet select User Data from the option menu to launch the User Data pop up box (*fig. 5*).
The User Sheet will generate a PDF as shown on the next page.

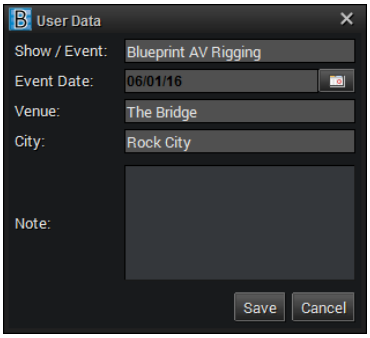


Fig. 5

ADAMSON BLUEPRINT USER SHEET

Show/Event: Blueprint AV Rigging

Event Date: 06/01/16

Venue: The Bridge
City: Rock City

Line Source: **1 (Main Hang)**

Array Information

Installation Type: **Flown**
Hanging Type: 2 Motors
Frame: **Short Beam Center For E-15**

Lifting Frame Angle: -0.5°
Horizontal Angle: 0°
Top Side Angle = 2.5°
Bottom Side Angle = -18.7°

Total Array Height (incl. Frame) = 5 m
Total Array Depth = 1.2 m

Z Bottom Array Point = 5 m
Stage at

Rigging Frame Position

Lifting Bracket 1: X = 0 m
Lifting Bracket 1: Y = 0 m
Lifting Bracket 1: Z = 10 m

Rigging Information

Hanging Type: 2 Motors

Total Weight: **1017.6 kg**
Front Load = 414.3 kg
Rear Load = 603.3 kg

Distance Front/Rear = 1 m

Array Configuration

Frame: Short Beam Center For E-15 **Lifting Frame Angle: -0.5°**
Top Side Angle = 2.5° **Lifting Bracket 1: (0, 0, 10)**

#1	E 15	0	-0.5°
#2	E 15	0	-0.5°
#3	E 15	0	-0.5°
#4	E 15	0	-0.5°
#5	E 15	3	-1.9°
#6	E 15	2	-2.5°
#7	E 15	2	-3.1°
#8	E 15	4	-5.1°
#9	E 15	2	-5.7°
#10	E 15	4	-7.7°
#11	E 15	4	-9.7°
#12	E 15	7	-15.7°

Bottom Array Point = (-0.6, -0.6, 5) Bottom Side Angle = -18.7°

3D Design

2.1 3D Design Overview

Blueprint AV™ will always open in the last viewed configuration, so if you're continuing from Module 1, change from 2D to 3D Mode by unselecting 2D Mode from the tools menu.

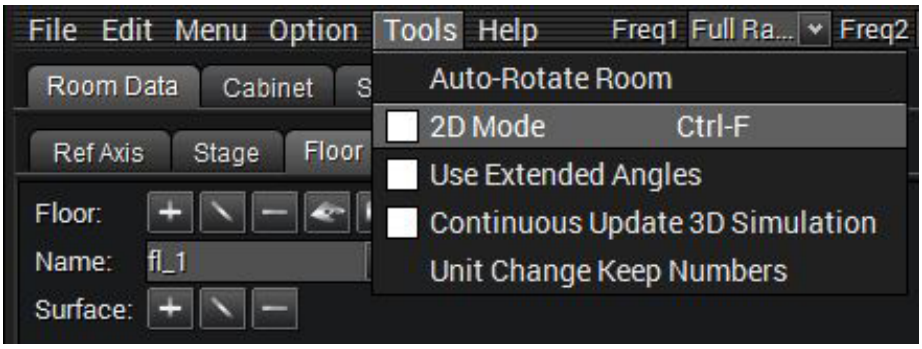


Fig. 1

In 3D mode the right hand window will default to the 3D workspace, a 2D window is added to the bottom of the left hand editing window.

Above the 3D workspace some useful new buttons appear:

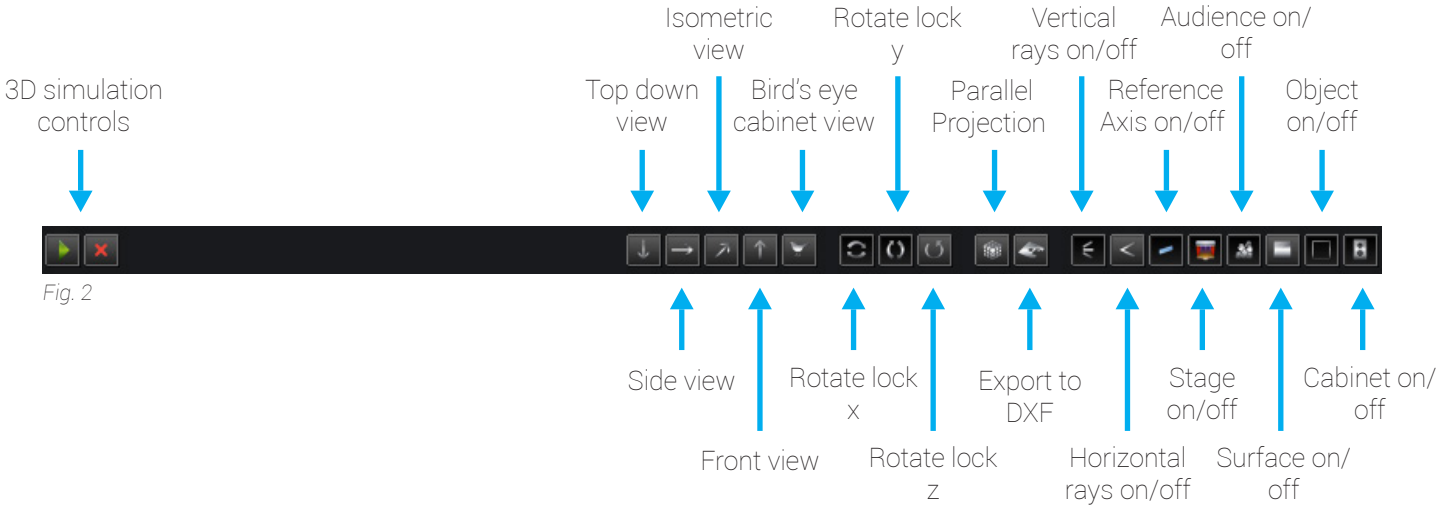


Fig. 2

2.2 3D Surfaces

Stage

To add a Stage, select the Stage tab under the Room Data tab. Use the + symbol to add a stage.

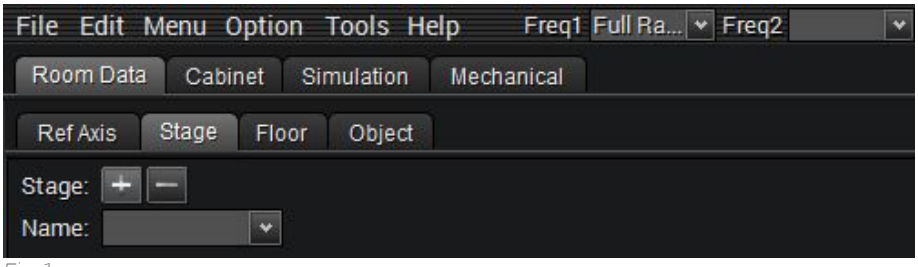


Fig. 1

In the pop up window choose a Name, Reference Axis, Stage Geometry and input dimensions

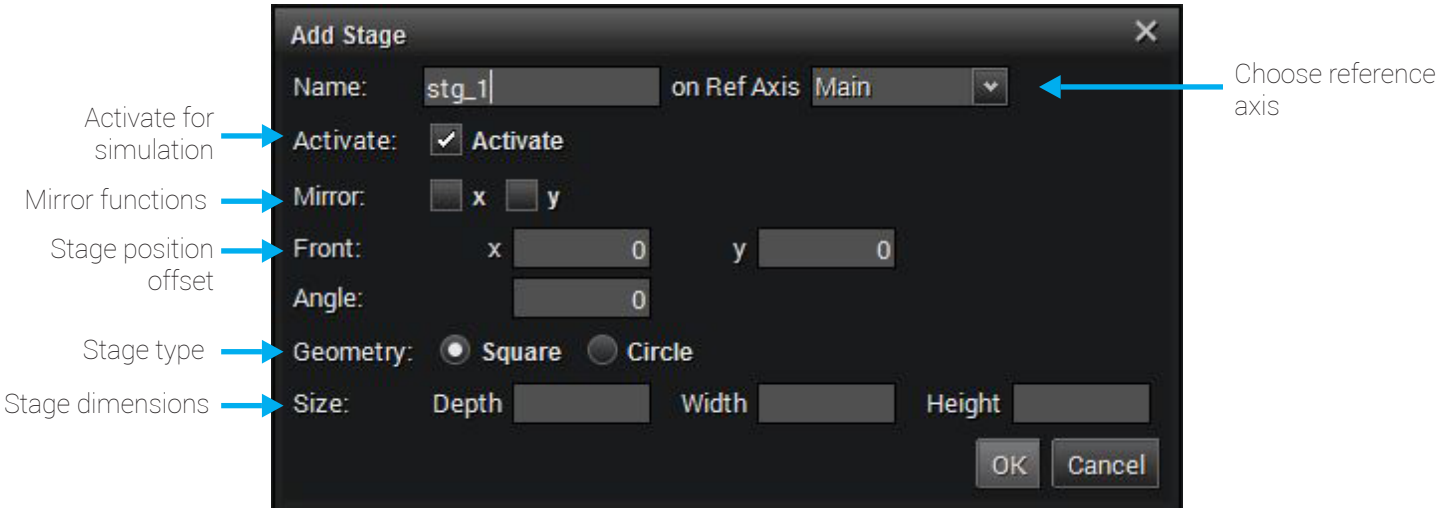


Fig. 2

2.2 3D Surfaces

Quad

In the Room Data tab create a new Floor and add a new Surface, name the Floor and choose audience listening height. The default Surface type is Quad, however in 3D mode access to all 4 vertex are available. Surfaces and Vertices can be linked and the Surface can be centred or mirrored.

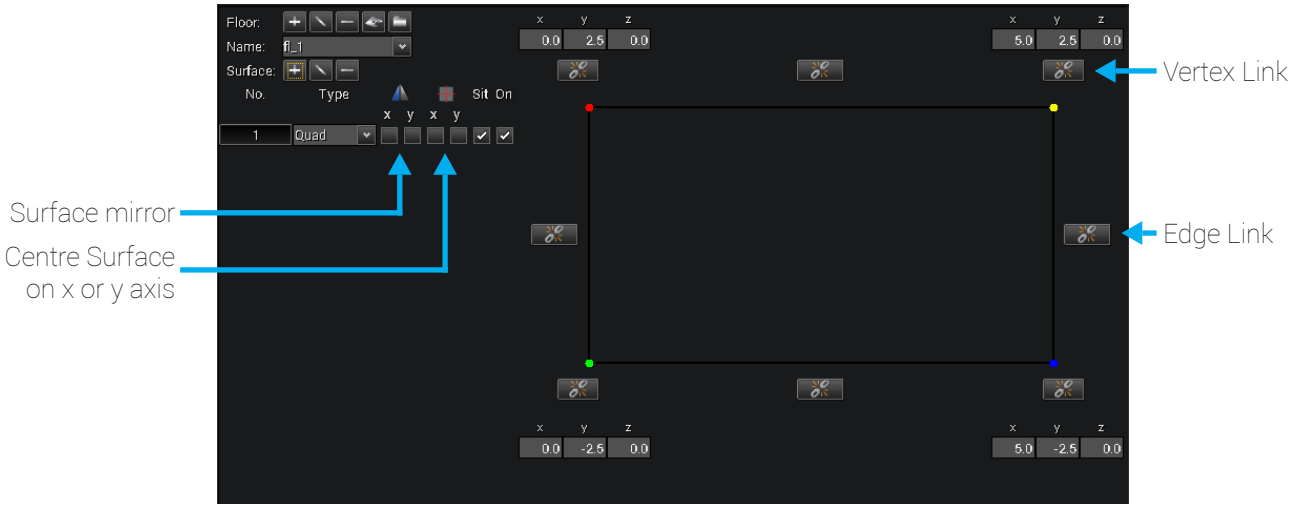


Fig. 3

Arc Quad

The Arc Quad Surface has 4 vertices like the standard Quad but allows for 2 opposite edges to be arc'd by inputting a radius value in the r field and the height of the radius in the z field.

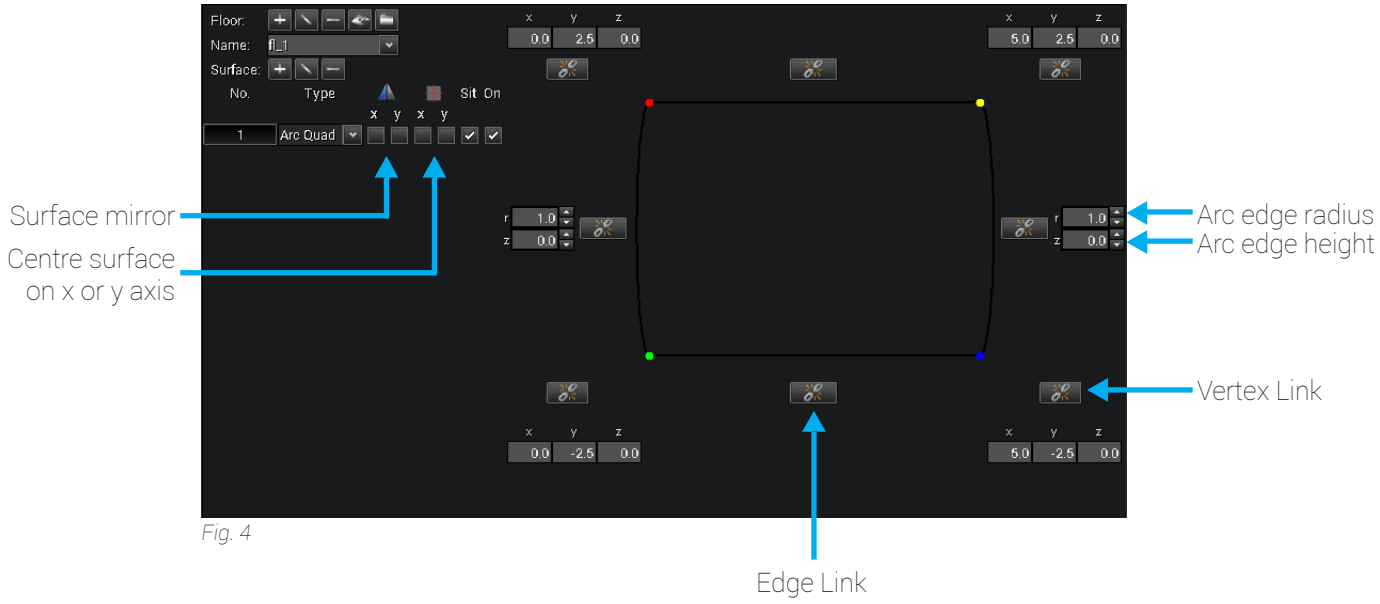


Fig. 4

2.2 3D Surfaces

Triangle

A 3 Vertex, 3 edge Surface.

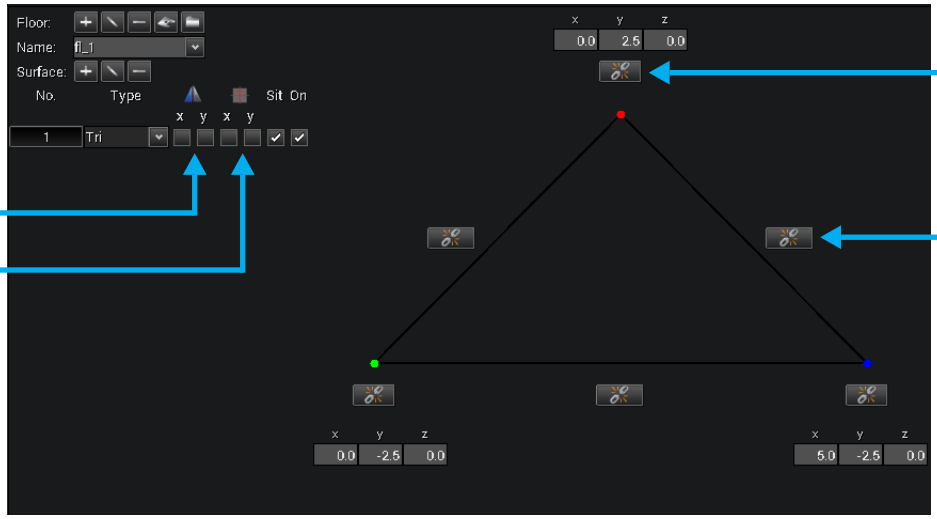


Fig. 5

Arc Triangle

A 3 Vertex, 3 edge Surface with the ability to add a radius to one edge as well as radius height.

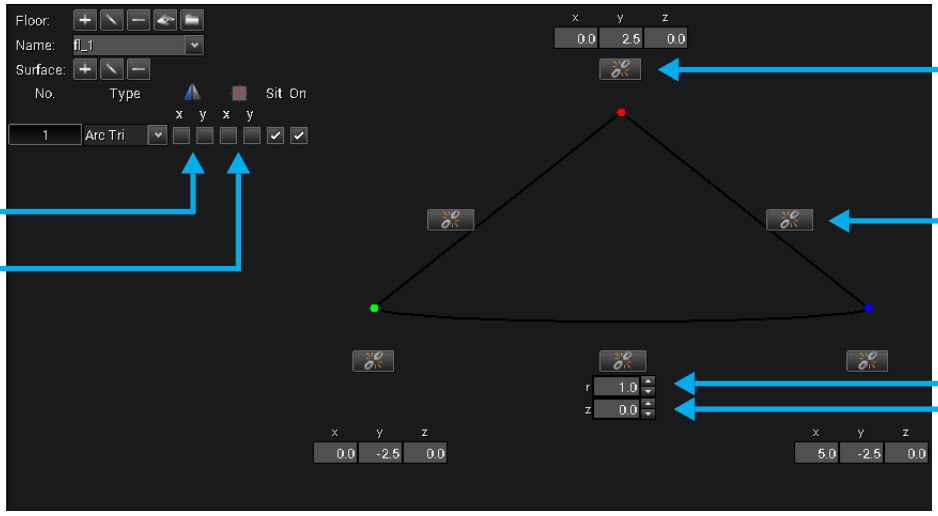


Fig. 6

2.2 3D Surfaces

Circle

A circular Surface with adjustable points for radius and how many sectors the radius will be broken into. The centre of the Circle can be placed in the design by entering in x, y or z co-ordinates.

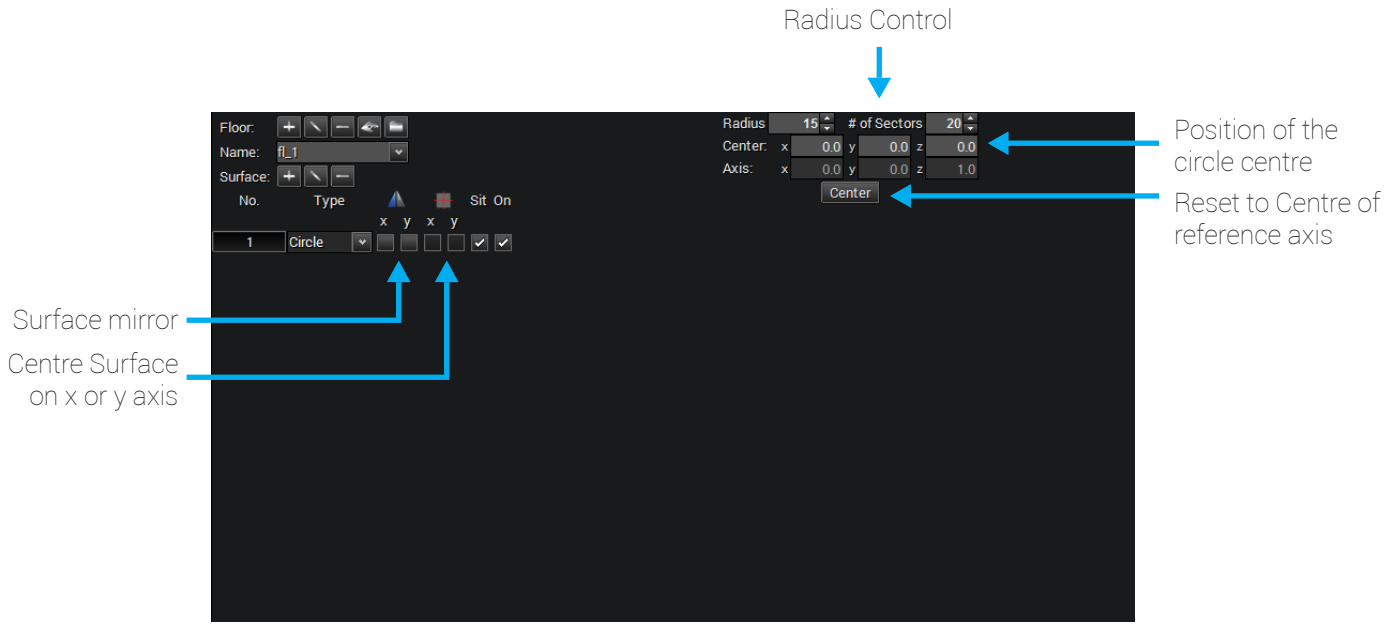


Fig. 7

2.2 3D Surfaces

Extrude

Extrude can be used to quickly create multi-level Surfaces. Up to 6 points can be made for a total of 5 Surfaces. The direction drop down defines the direction of the extrude to be either left or right from the extrude vertices or centred. The Dim Top and Bottom define the width from the centre of the Extrude.

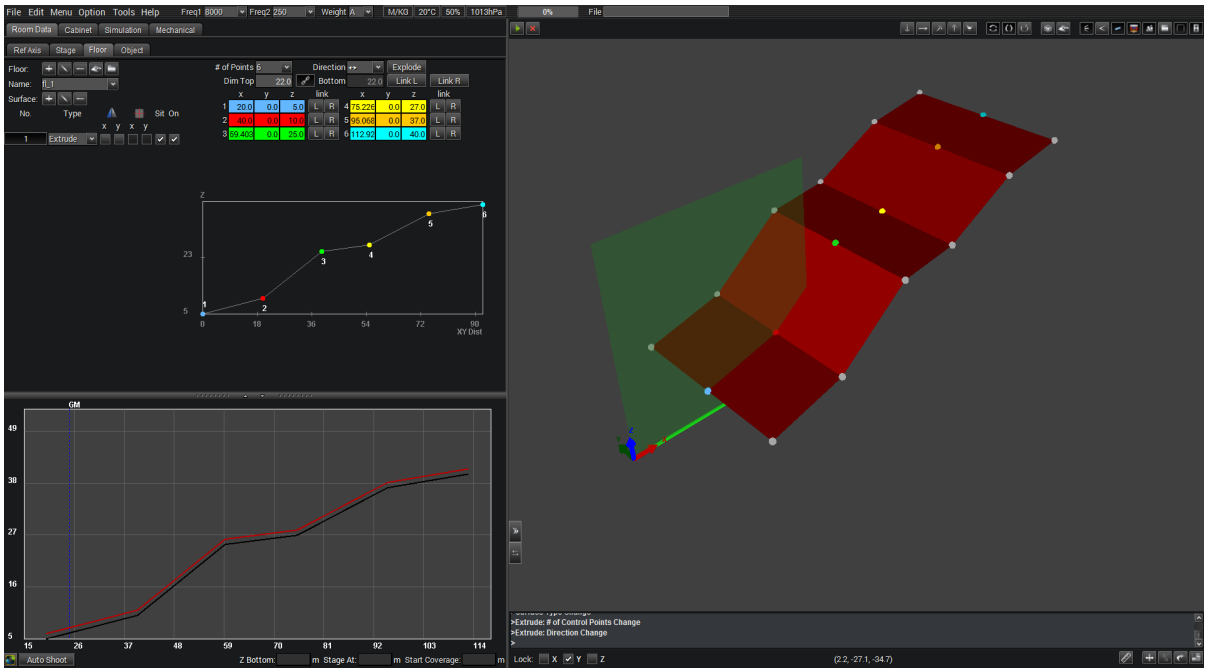


Fig. 8

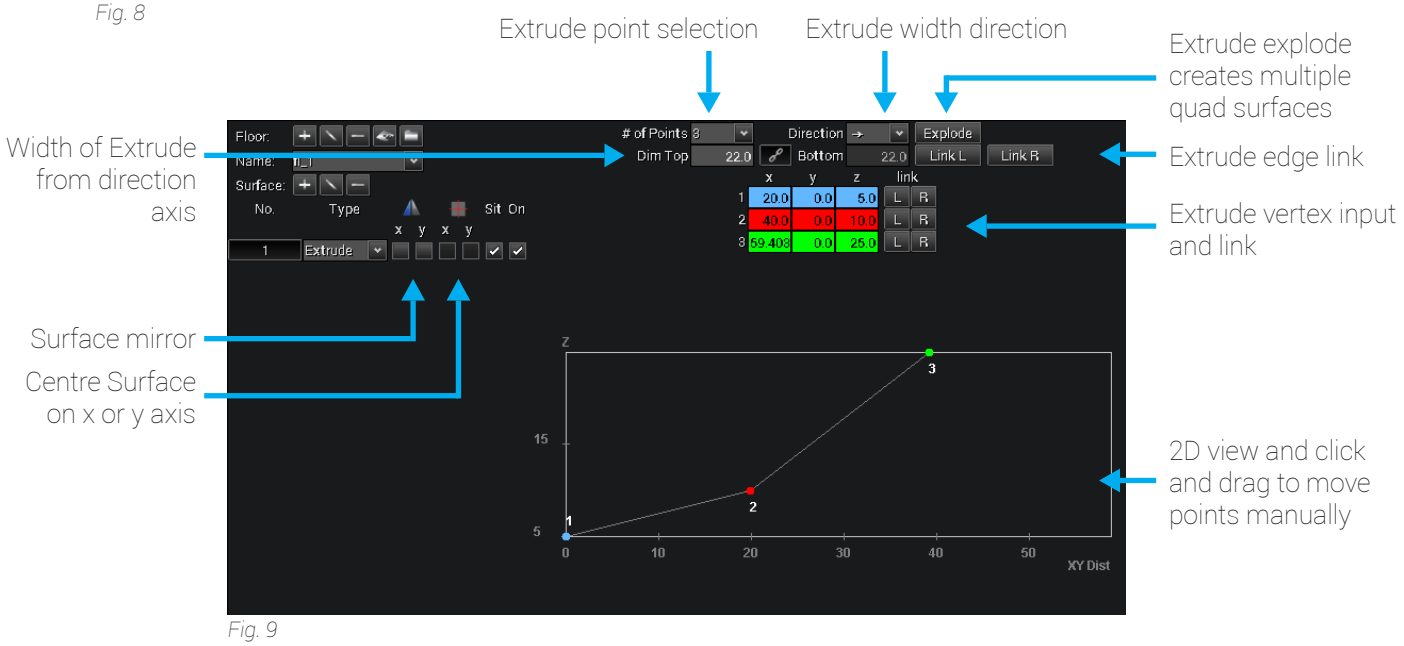


Fig. 9

2.2 3D Surfaces

Revolve

The Revolve Surface is used for creating multiple layered curved Surfaces. Revolve edges can be linked drectly to Extrudes and left and right vertices can be linked to other Surface types.

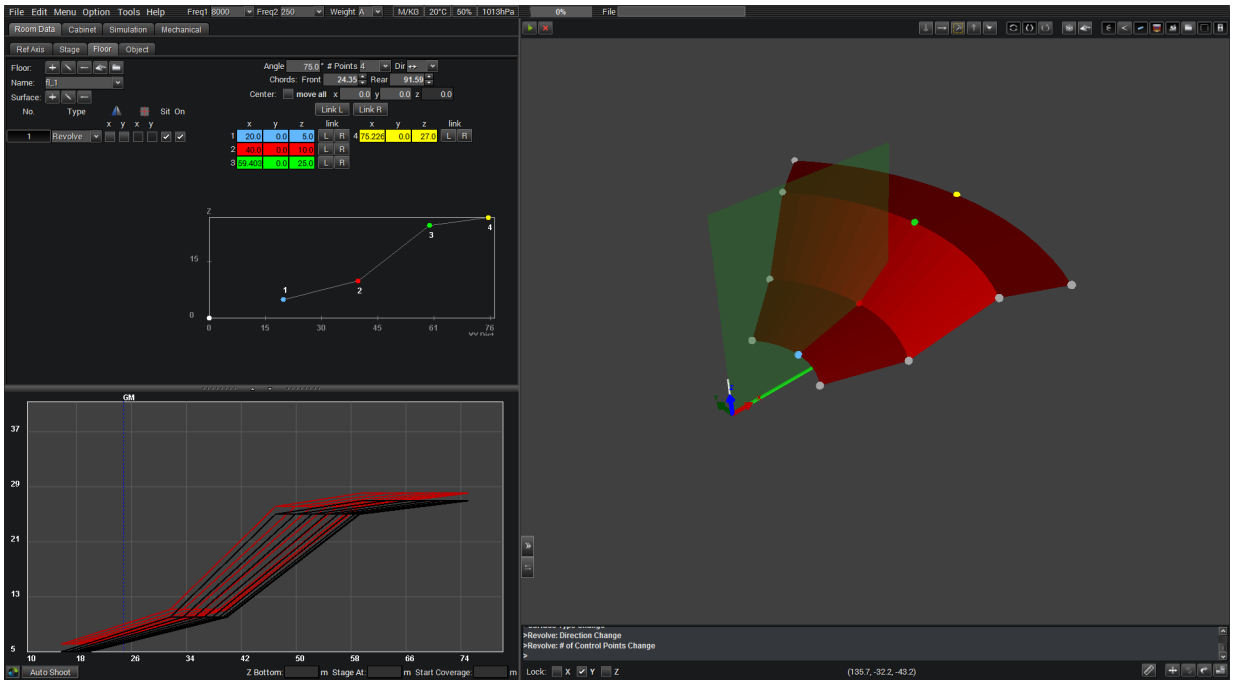


Fig. 10

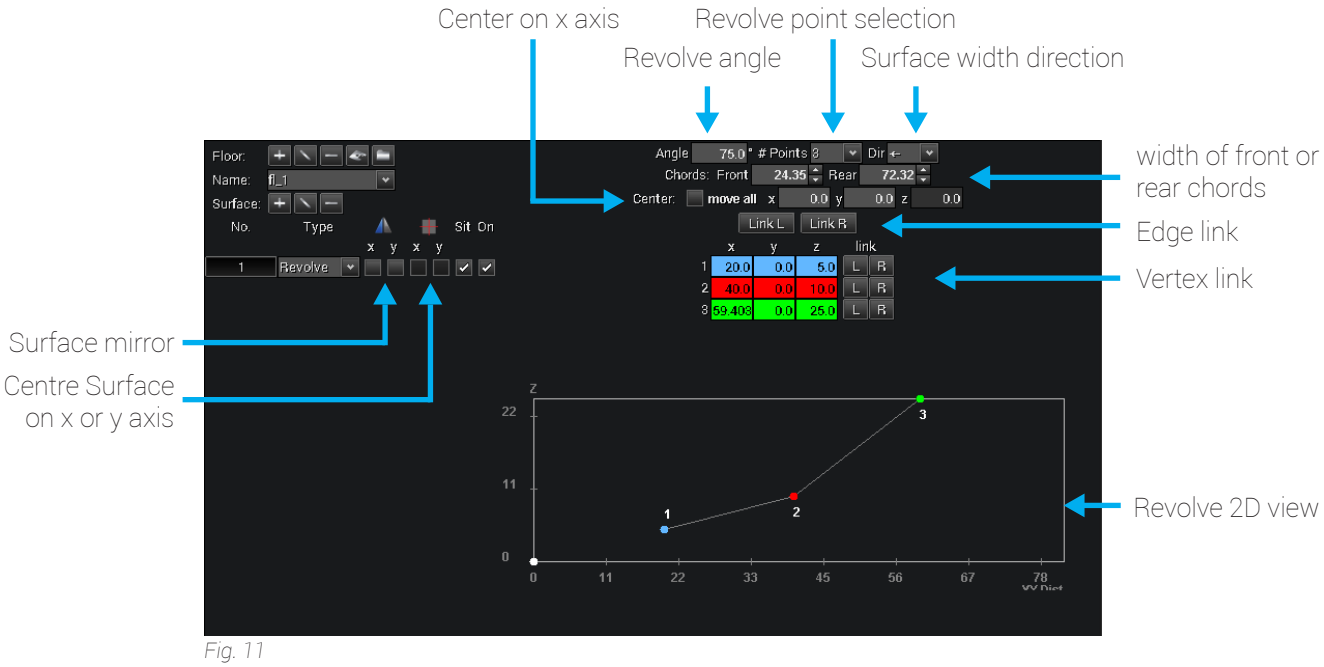


Fig. 11

2.2 3D Surfaces

Linking surfaces

In 3D mode, most Surface edges can be linked together using the button or link buttons. When an edge is set to link, hover the mouse over the surface you wish to link to. The edges of the surface will display a white dashed line, move the mouse to the desired edge until it's line becomes a solid white line and click to link. Note that linking a Surface to another means the first Surface will take on the characteristics of the second Surface.

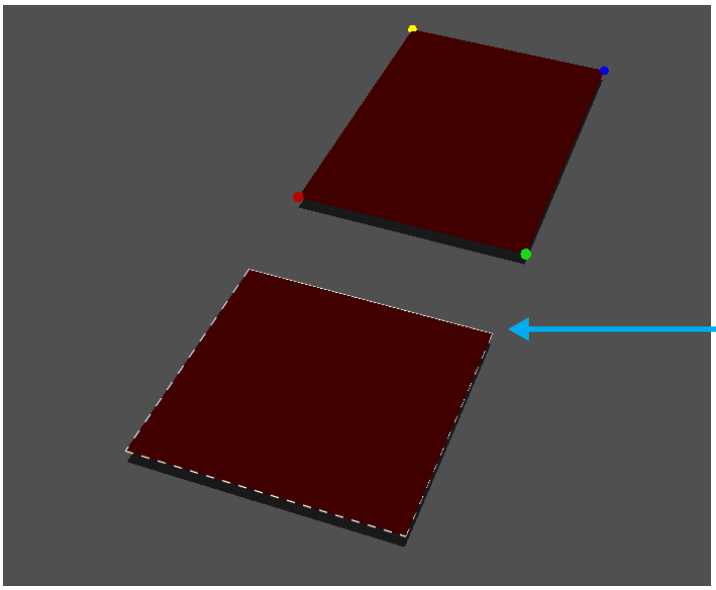


Fig. 12

Linking vertices

In 3D mode vertices can be linked easily by selecting the Vertex link button then using the mouse to select the Vertex in the workspace.

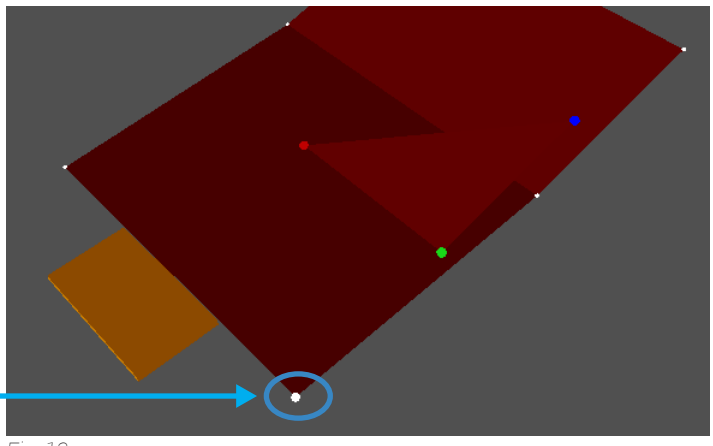


Fig. 13

2.3 Objects

Objects are useful for creating Surfaces that do not need to be included in a simulation, ie: proscenium arches, underbalcony ceilings or FOH/spot towers.

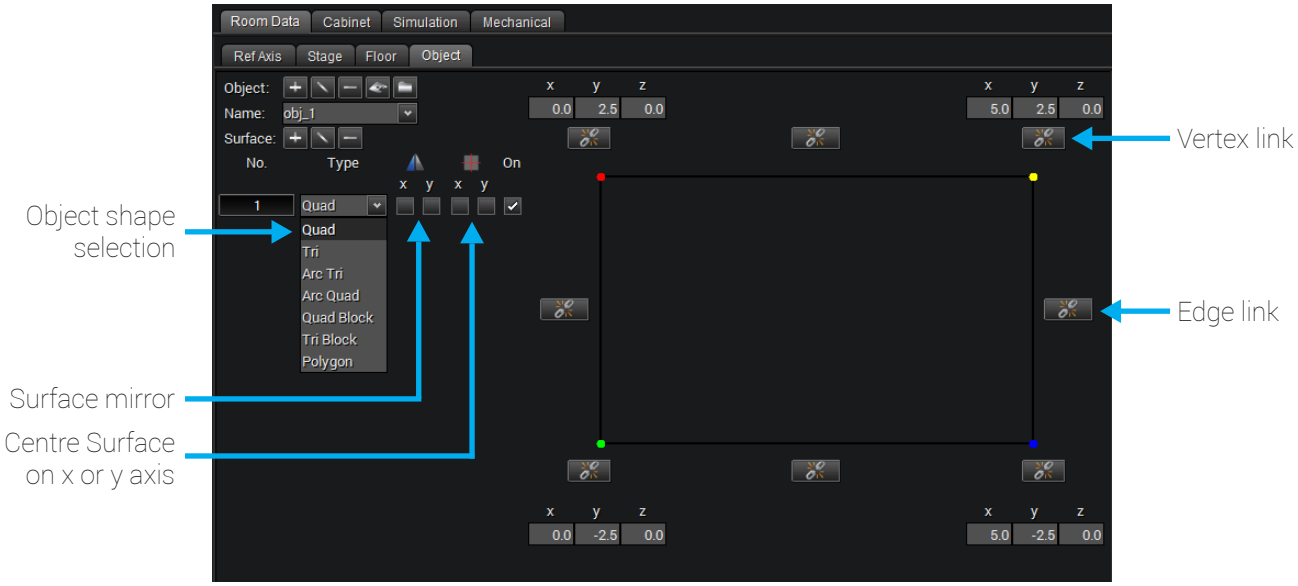


Fig. 1

Objects are created in the same way as Floor Surfaces with the addition of 3 extra Surfaces in place of the Extrude and Revolve; Quad Block, Triangle Block and Polygon.
The Quad and Triangle block objects are solid 3D objects, the distance field defines the height from the 4 vertices on the z-axis.

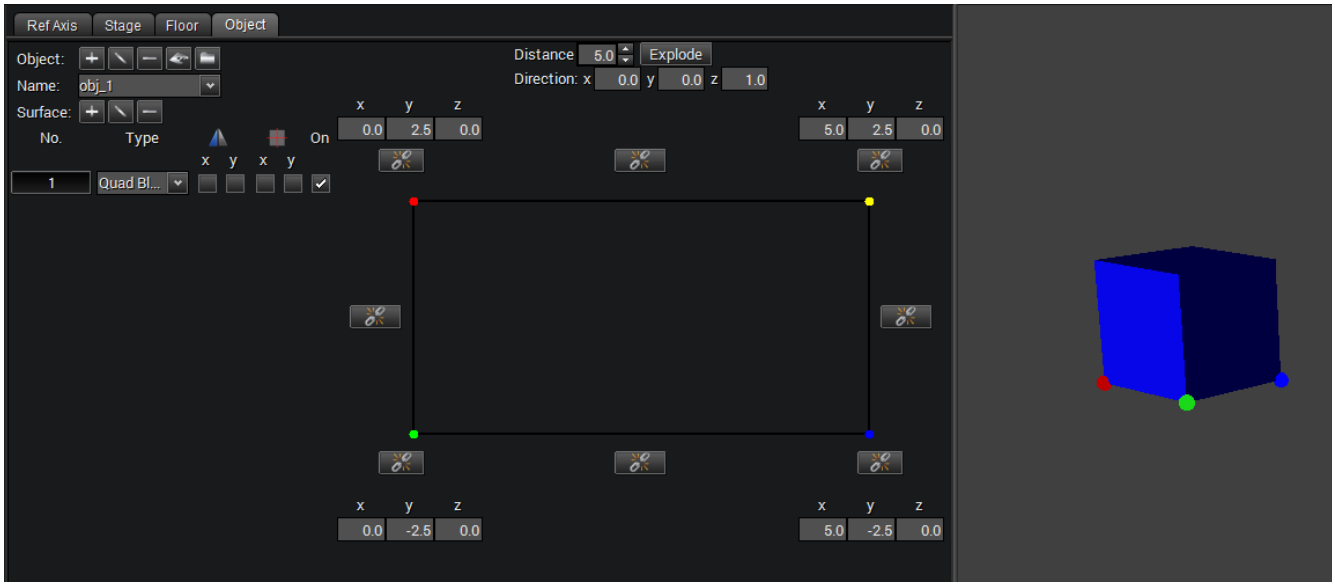


Fig. 2

2.4 3D Array Design

Line Source

Virtual arrays can be added to a 3D design in the Cabinet Tab as in Chapter 1.5. Every new array added is always placed at 0.0 on the y axis.

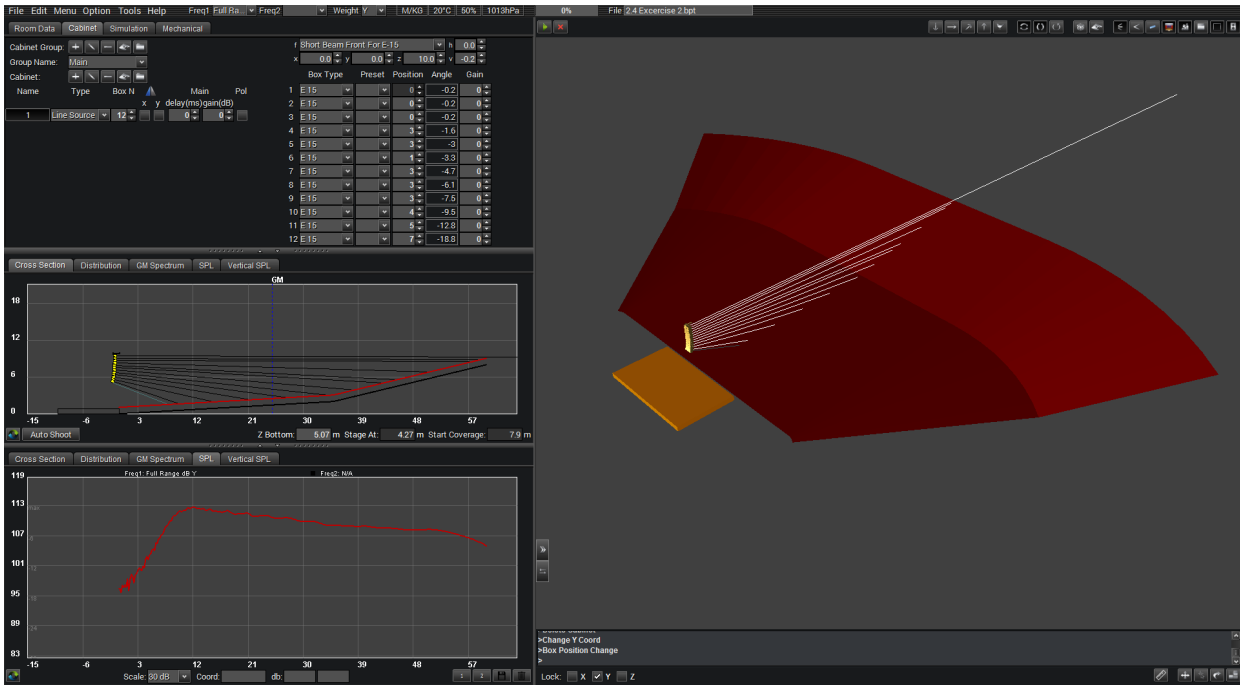


Fig. 1

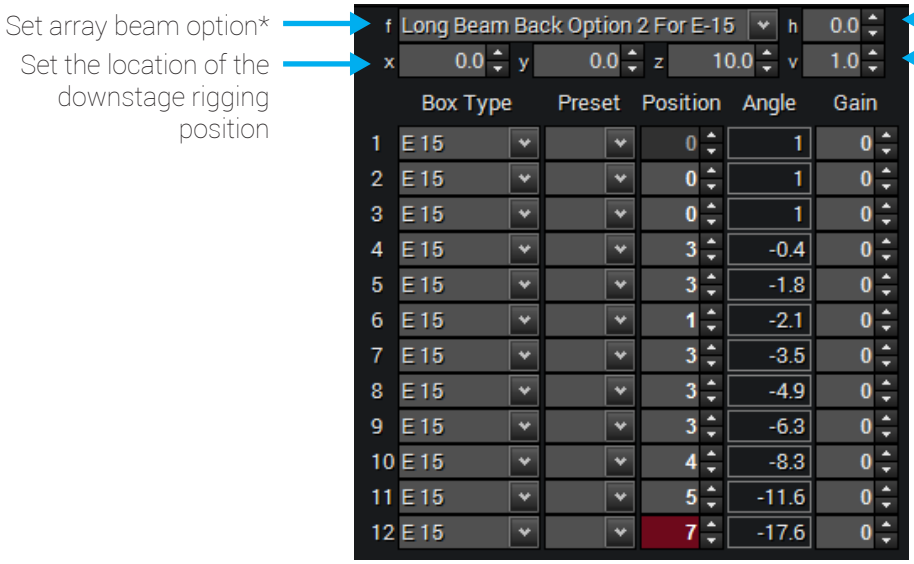
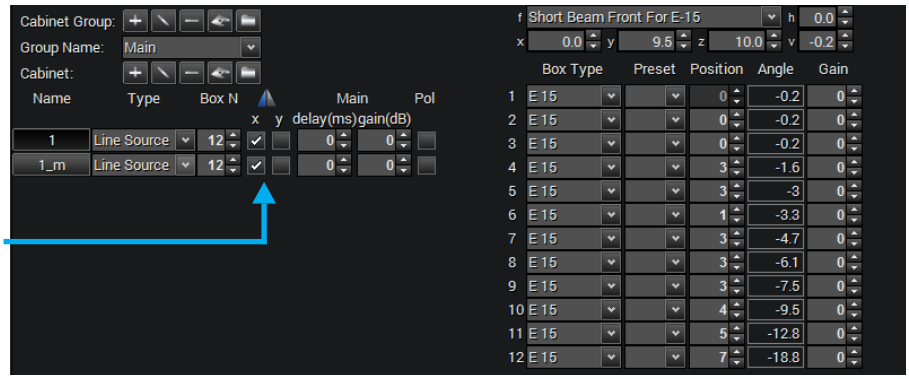


Fig. 2

*The beam option affects the array position

2.4 3D Array Design

To create a L+R array, set the y position of the array and if the design is symmetrical, mirror the array on the x axis. Changes made to either array will affect both providing they are kept mirrored.



Cabinet mirror

Fig. 3

The process can be duplicated to add outfills, 270 or delays.

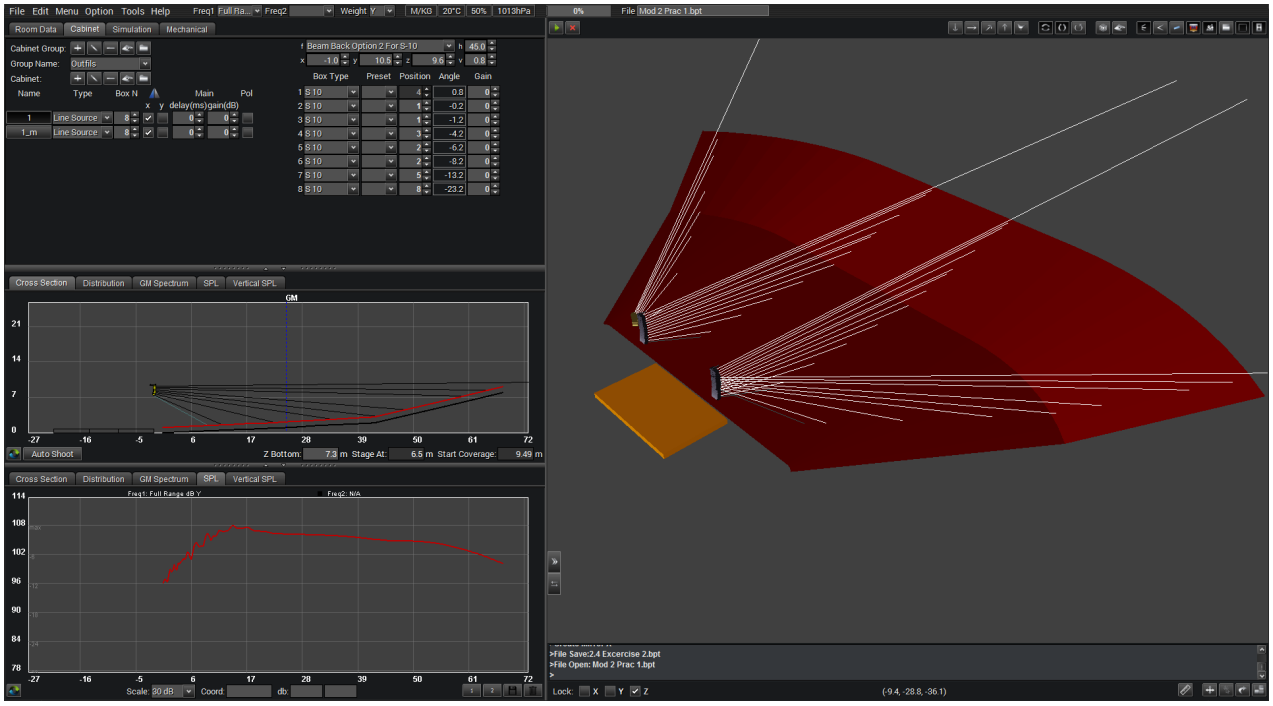


Fig. 4

2.4 3D Array Design

Sub

Selecting Sub from the Cabinet drop down will place a single sub or a stack of subwoofers in the workspace. Choose subwoofer type and increase the stack by increasing the Box N. The Preset drop down allows for cardioid presets to be added. Choose from End Fire, Front-Back or Front-Back-Front. Engaging these presets automatically adds the necessary cabinets needed for 1 unit of this preset. Changing the Box N when a preset is engaged will double or triple the subwoofers needed.

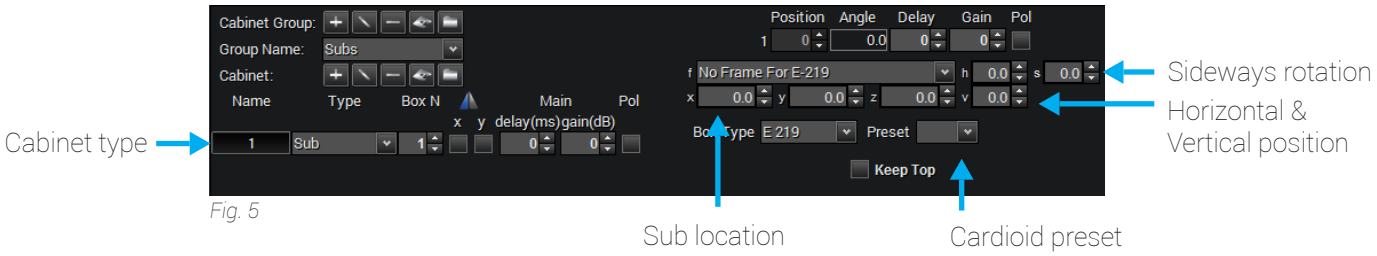


Fig. 5

Sub Array

For complex sub arrangement, using Sub Array allows for multiple columns with the ability to space, center and place as well as individually adjusting column delay, polarity and gain for simulation.

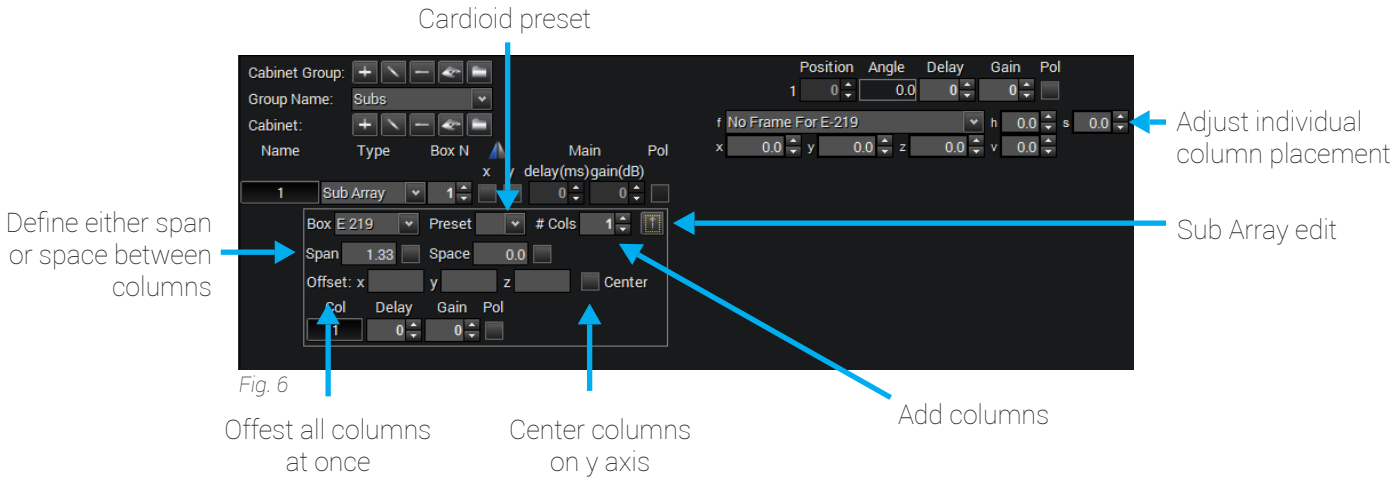


Fig. 6

2.4 3D Array Design

Point

Selecting Point from the array drop down will add a single point source speaker to the workspace. Each Point Series cabinet can be either flown or ground-stacked, as well as mirrored, delayed and have its gain adjusted individually.

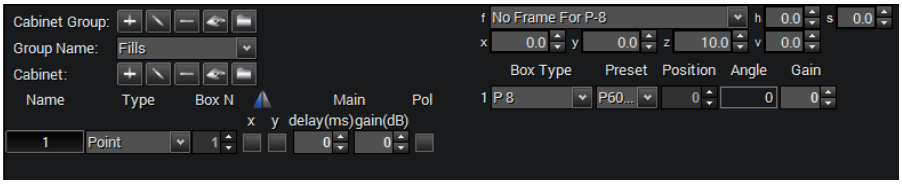


Fig. 7

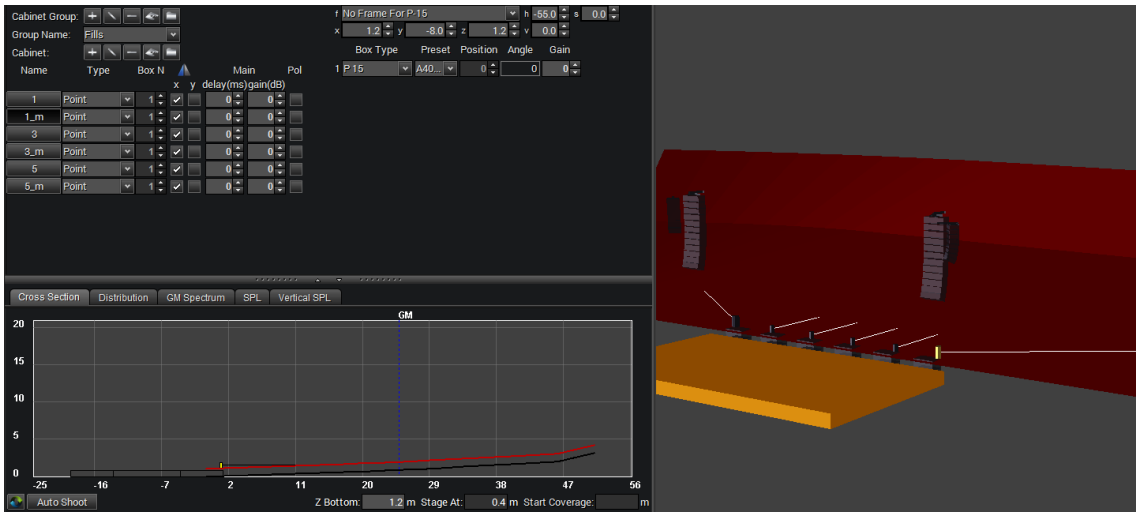


Fig. 8

2.4 3D Array Design

Rigging alarms

When adding virtual arrays to Blueprint AV™, if an unsafe or impossible rigging option is selected an alarm will show in the 3D workspace. If a red box surrounds the 3D work space, check rigging frame options, inter-cabinet angles or rigging hoist load restrictions in the mechanical tab.
For a list of rigging alarm types refer to the Mechanical Tab in chapter 1.8 fig 4.

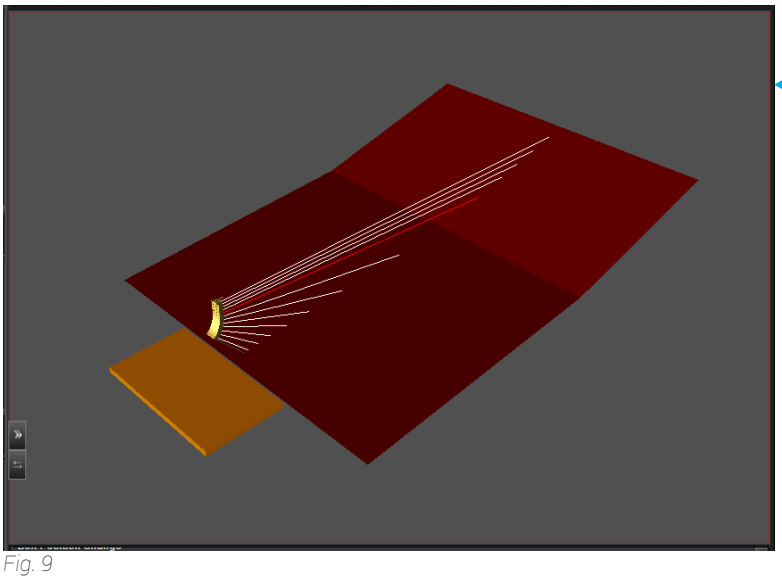


Fig. 9

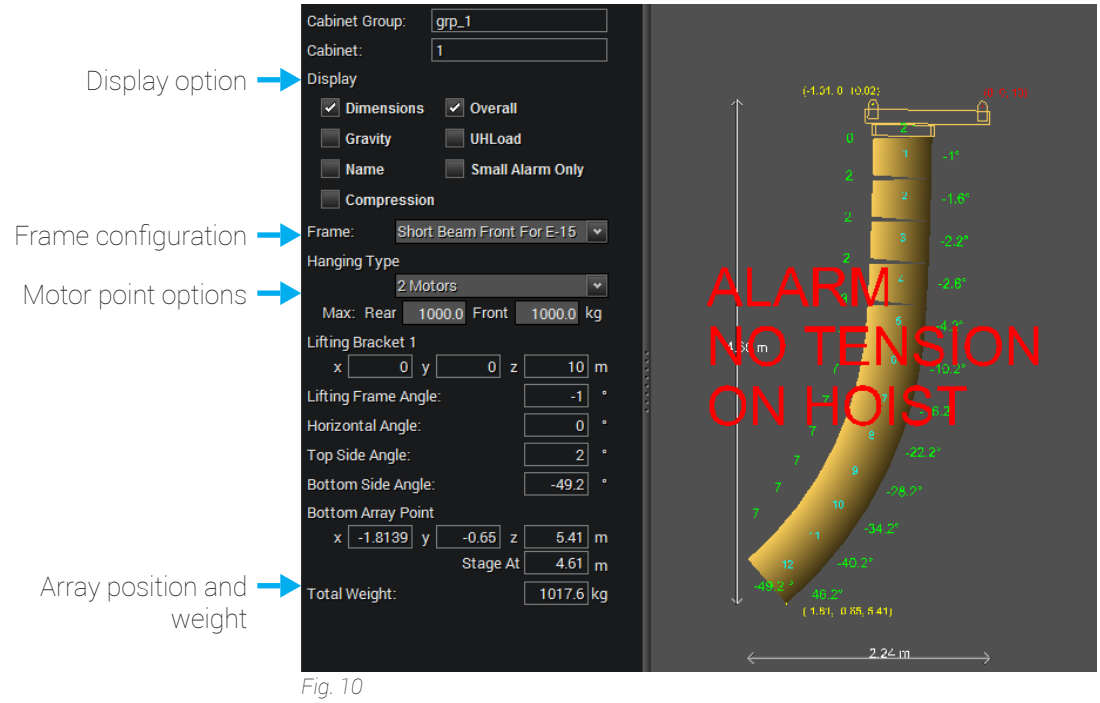
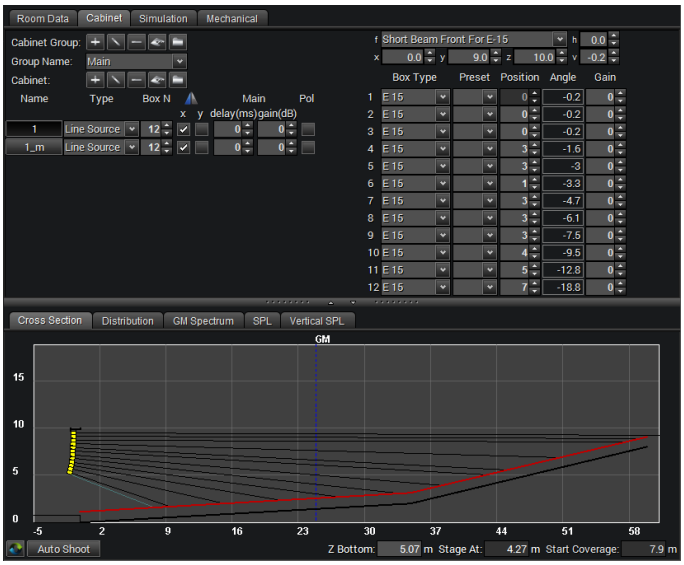


Fig. 10

2.5 Simulation

It's important to check array coverage before deployment. In 3D mode, the 2D SPL graph is still viewable below the array editor. This is important to check when adjusting inter-cabinet angle as shown in module 1. SPL simulations are covered here, refer to section 3.4 for Advanced SImulation options.



2D cross section and SPL simulation data available in 3D mode

Fig. 1

3D simulation for all listening surfaces can be calculated by clicking the draw button at the top of the workspace.

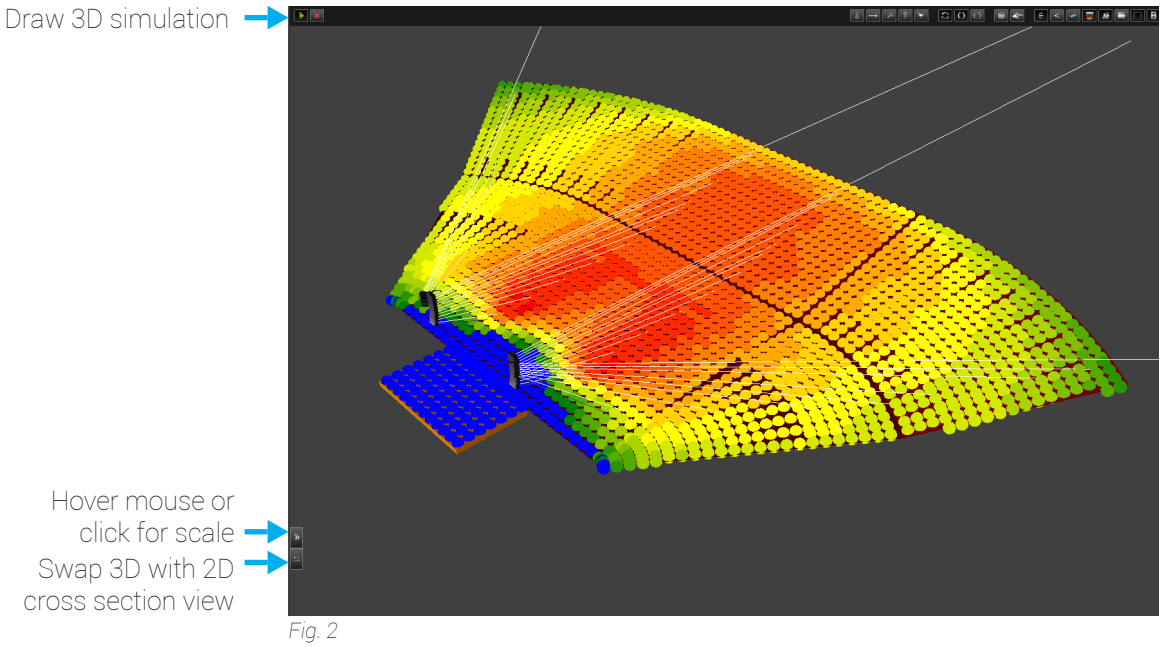


Fig. 2

2.5 Simulation

The simulation tab offers more advanced simulation options. Under the SPL tab cabinets can be individually deactivated to be excluded in simulation data. Cabinets, Floors, Stages and Objects can also be deactivated. Select group and uncheck the Cabinet, Floor, Stage or Object to be excluded from simulation.

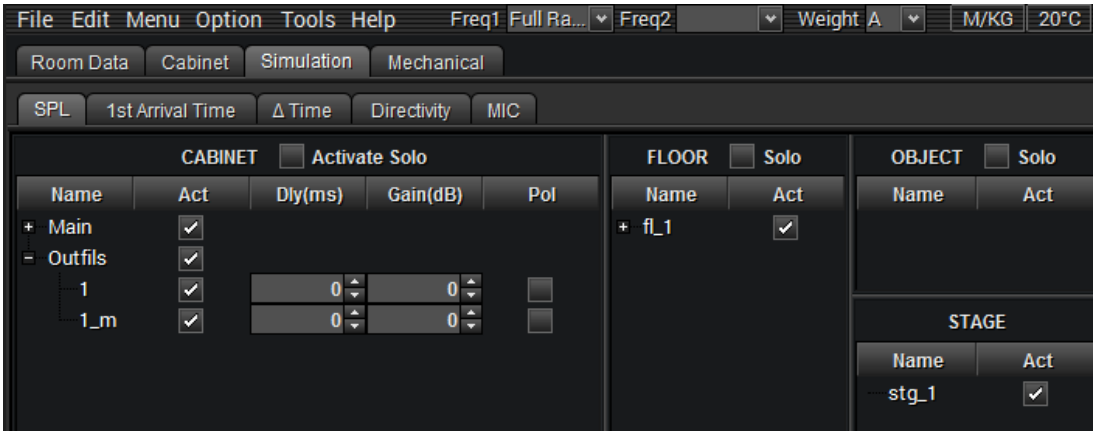


Fig. 3

Hover on the scale button to view the 3D SPL scale. The scale window allows saving of 8 snapshots, the SPL bubble grid size (default is1.5m), high resolution, setting a max SPL, adjusting the scale range and to calculate interference between arrays. Changing the SPL weight in the top drop down menu will require the simulation to be re-drawn to take affect.

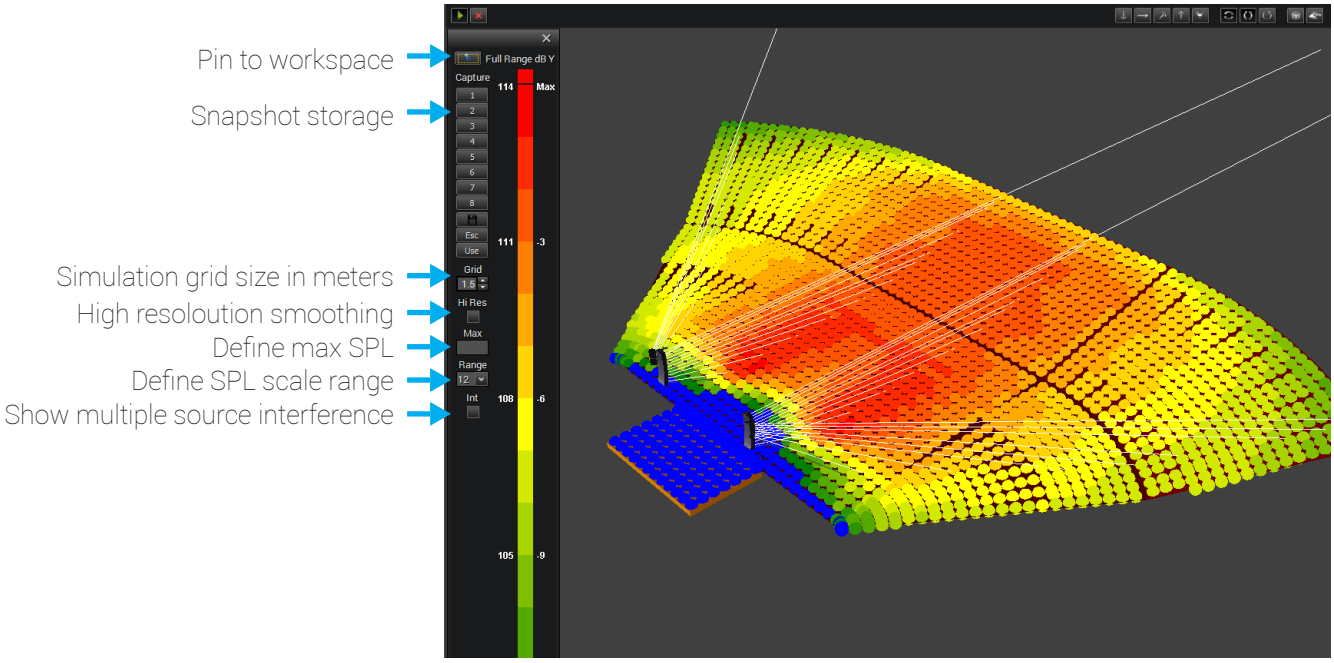


Fig. 4

Advanced Design Tools

3.1 Reference Axis

Reference Axis sets the zero point for the x, y & z of a design, giving a defined point to start designing from. Blueprint AV™ allows for multiple reference axes to be set in a single design project, useful for adding multiple Stages, Cabinets and listening areas to create large festival grounds or even multiple configurations of popular venue.

In the Room Data tab, select Ref Axis, a default "main" reference axis is set for each new design.

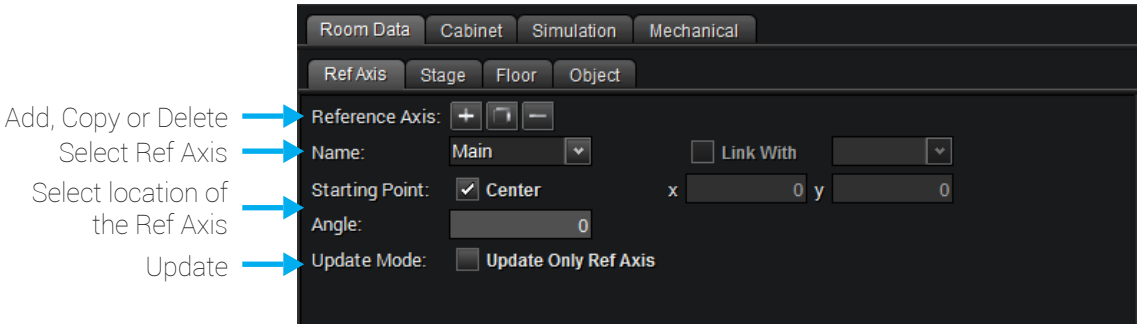


Fig. 1

To create another Reference Axis, click the + button, name and set the starting location of the new Ref Axis based on the main Ref Axis by defining the x or y, center and or set horizontal angle.

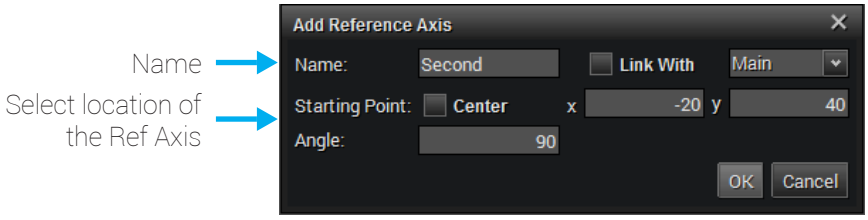


Fig. 2

Reference Axes can be linked so when one is moved the linked axis will move in unison to the new x, y position.
Centering a Reference Axis will center the new axis with the main Reference Axis.
X, y and angle define the orientation of the new Reference Axis.

3.2 Vertex Input Option

In Blueprint AV™ V1.0.4 and up, Vertex Input Options were added as a powerful tool for entering venue data quickly on a site survey. There are 4 options for data entry, switching between input options will retain all dimensions and angles.

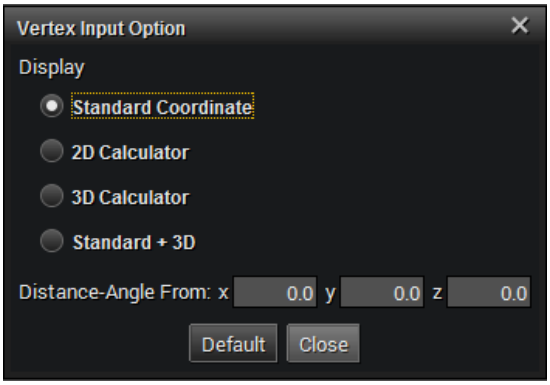


Fig. 1

Standard coordinate entry is the default input option and allows for x, y & z dimension input.

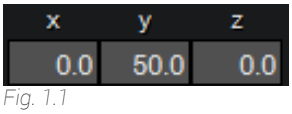


Fig. 1.1

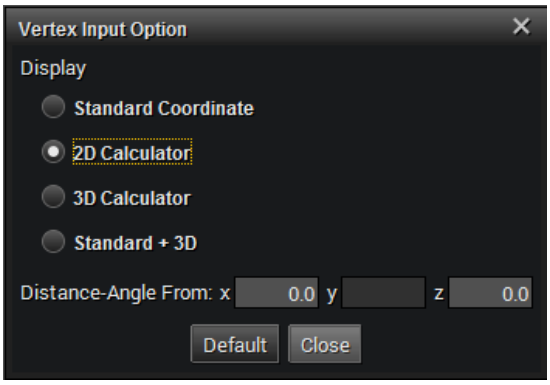


Fig. 2

2D Calculator is for use with distance and incline measurement tools. Coordinate input fields are; distance, y and vertical angle.

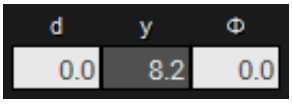


Fig. 2.1

Enter the position of measurement tool

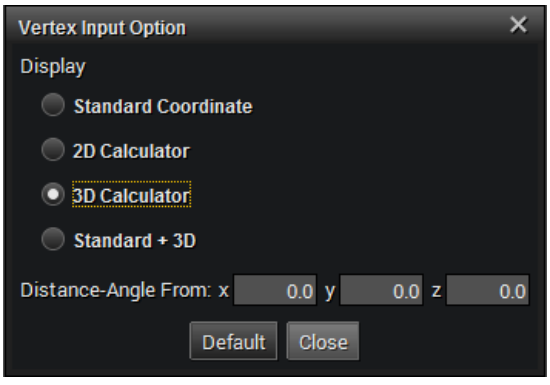


Fig. 3

3D Calculator is for use with distance and incline measurement tools where the horizontal angle can be protracted in degrees. Coordinate input fields are; distance, horizontal angle & vertical angle.

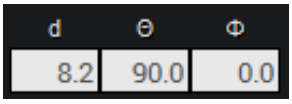


Fig. 3.1

Enter the position of measurement tool.

3.2 Vertex Input Option

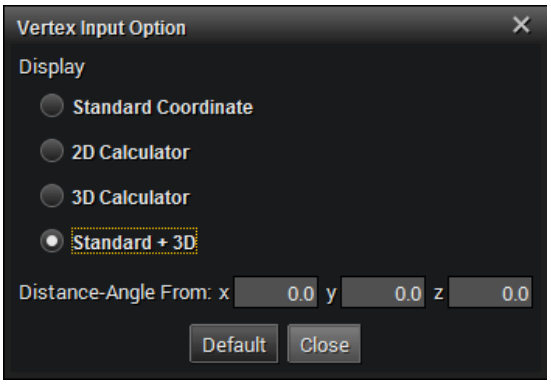


Fig. 4

Standard + 3D is a hybrid entry method combining the 1st and 4th options.

x	y	z	d	Θ	Φ
0.0	8.2	0.0	8.2	90.0	0.0

Enter the position of measurement tool.

3.3 Command Line

There are a few useful function of Blueprint AV™ that are accessible from the lower workspace window or the Command Line below. Typing the name of the button will achieve the same result.

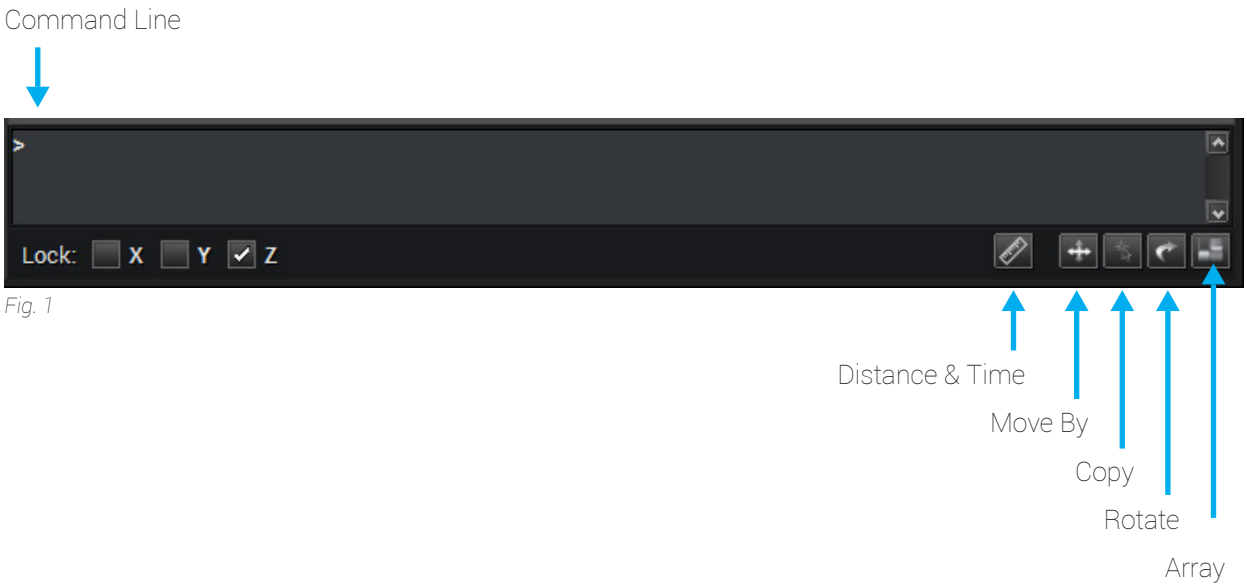


Fig. 1

The Command Line section can be used for manually moving, rotating or copying Floors, Objects or Cabinets. Type a command followed by enter/return. To cancel any command press esc to re-initialise the terminal. Ctrl-z or ctrl-y also undo or redo.

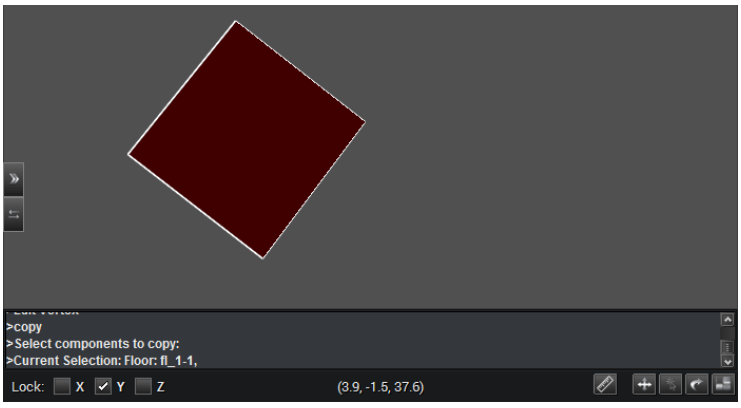


Fig. 2

Example:
> Type "copy"
> Select a floor surface and enter
> Select first point or enter x,y,z coordinates, press enter
> Select second point or enter x,y,z to move , press enter
> Select yes, copy done

3.3 Command Line

Distance/Time is used to measure the distance between 2 points and displays length and time in your specified scale as well as milliseconds. This is useful for finding delay times between Cabinets and is used to input delay time for Virtual Mics.

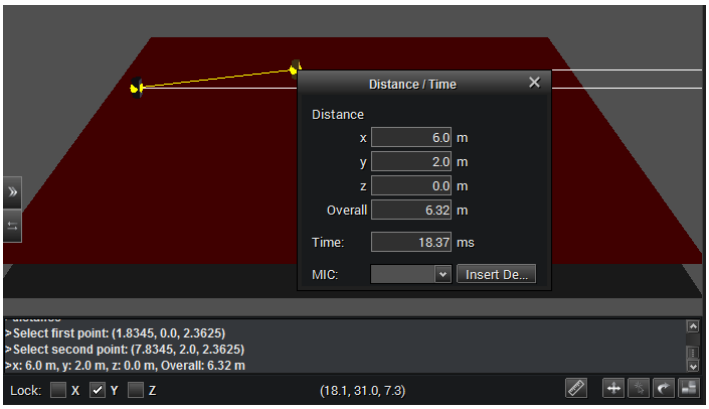


Fig. 3

Example:
> Select , follow prompts in the Command Line:
> Select first point, enter
> Select second point, enter
> Pop up window with data

Move by allows the user to move a floor, object or cabinet between points.

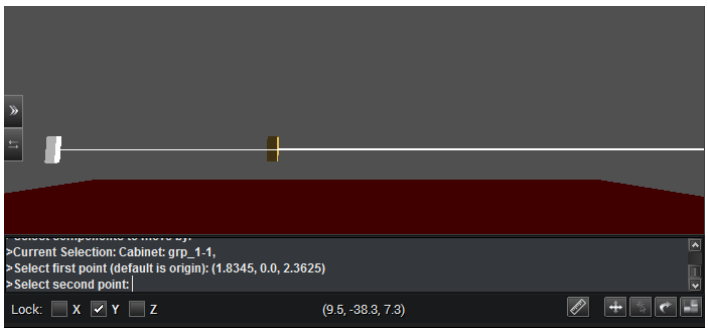


Fig. 4

Example:
> Select , follow prompts in the Command Line:
> Select first point, enter
> Select second point, enter

Copy Floor, Object or Cabinets

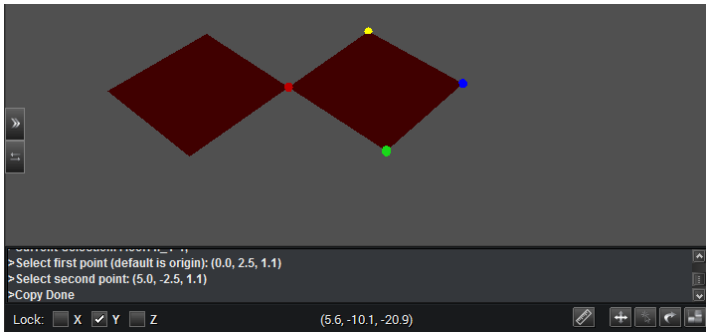


Fig. 5

Example:
> Select , follow prompts in the Command Line:
> Select first point, enter
> Select second point, enter

3.3 Command Line

Rotate Floors and Objects

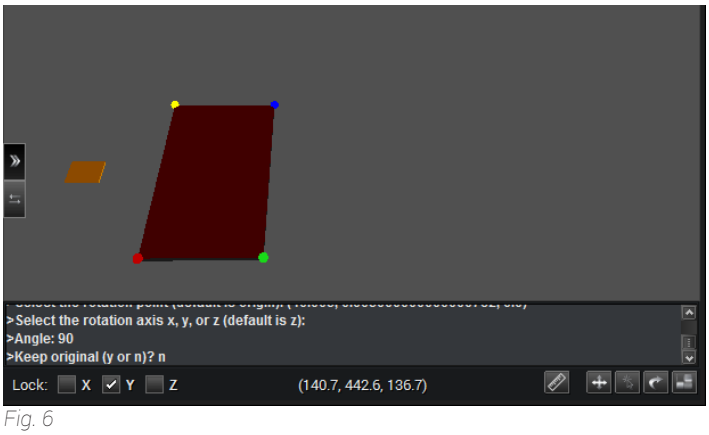


Fig. 6

Example:
> Select , follow prompts in the Command Line:
> Select Surface(s), enter
> Select rotation point, enter
> Select rotation axis (default is z), enter
> Define angle
> Keep or discard original surface (Y/N), enter

6. Array, like the AutoCAD function, allows for a Floor, Object or Cabinet to be arrayed on either axis.

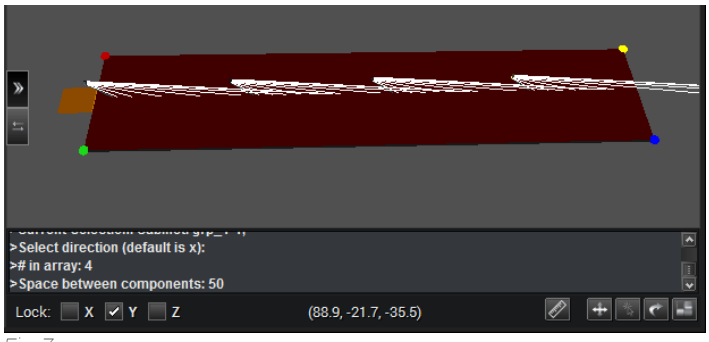


Fig. 7

Example:
> Select , follow prompts in the Command Line:
> Select component, enter
> Select direction (default is z), enter
> Define end result number
> Define distance between each component

Many of the functions listed in section C are also accessible by right clicking in the workspace, activating a drop down menu. The menu varies between the Room Data, Stage, Floor and Object tabs as well as the Cabinet tab as shown here:

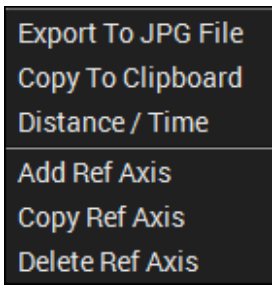


Fig. 8

Stage & Ref Axis; right clicking in the workspace will bring up the following menu.

← Ref. Axis

Stage →

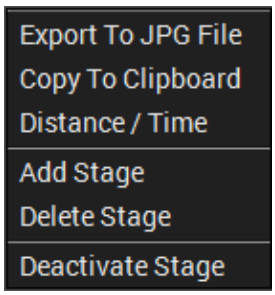


Fig. 9

3.3 Command Line

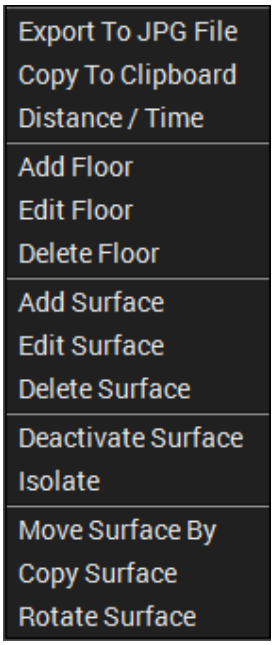


Fig. 10

Select a floor or object and right click in the workspace to bring up the following menu.

← Floor

Object →

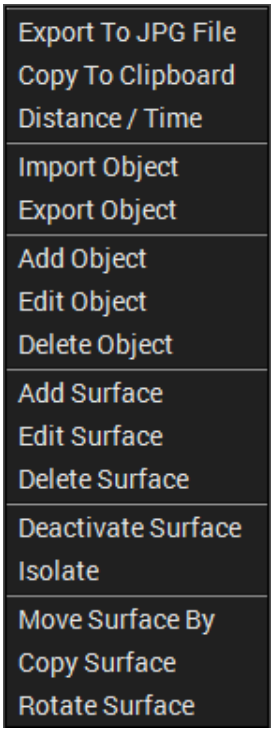


Fig. 11

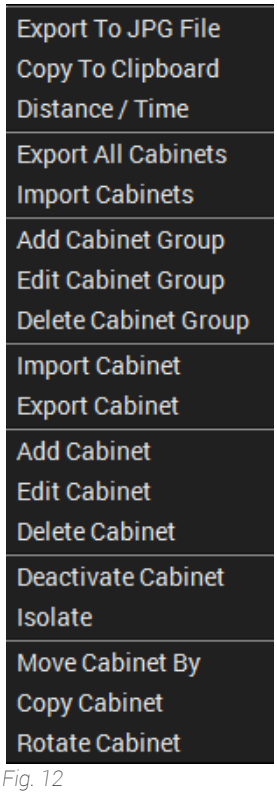


Fig. 12

Select a cabinet and right click in the workspace to bring up the following menu.

A full list of Command Line shortcuts and shortcut keys can be found in the Help menu.

3.4 Advanced Simulation

The Simulation Tab offers 5 different types of simulation data. Each tool is useful for predicting the outcome of a design before deployment, cutting down valuable and often costly onsite work. Simulation Data in this tab are only available in 3D mode and can be drawn from the 3D work-space.

SPL is the default simulation. SPL calculates data using the global weighting and frequency 1 in the top menu ribbon.

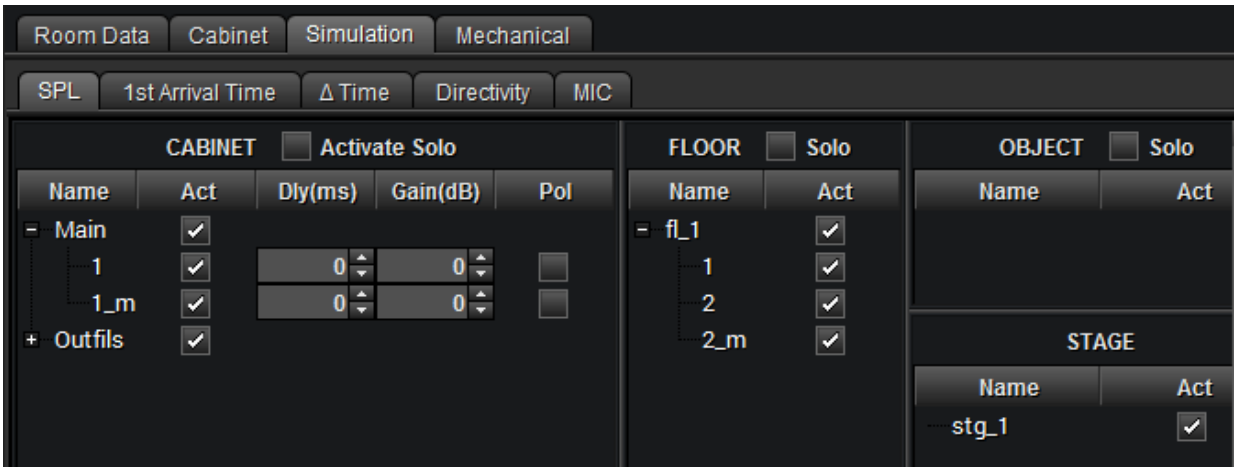


Fig. 1

First Arrival Time calculates multiple time arrival differences within a 6 or 10dB threshold.

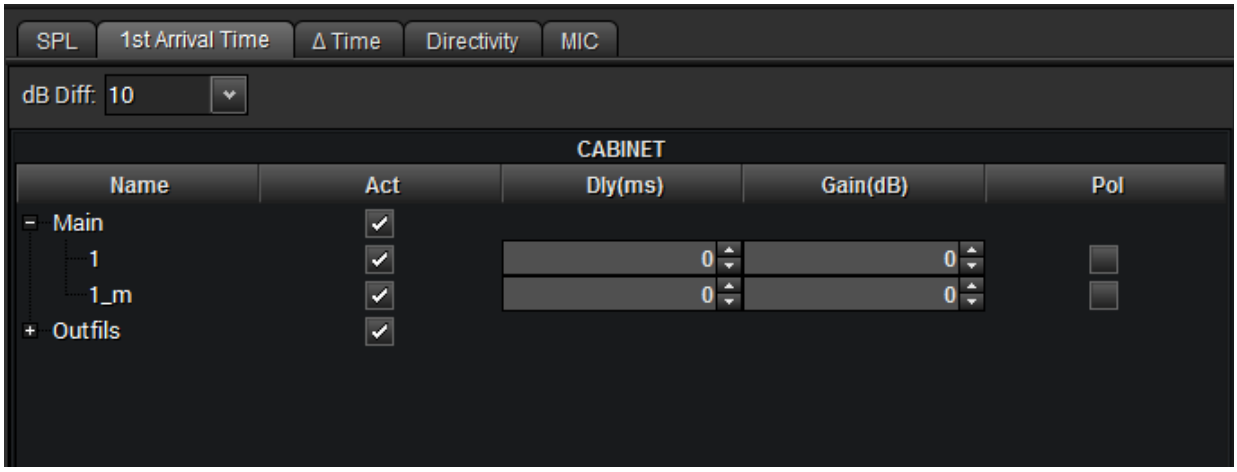


Fig. 2

3.4 Advanced Simulation

Δ (Delta) Time allows users to see off-axis time alignment between two arrays as it falls within Haas Effect parameters within a 6 or 10dB threshold

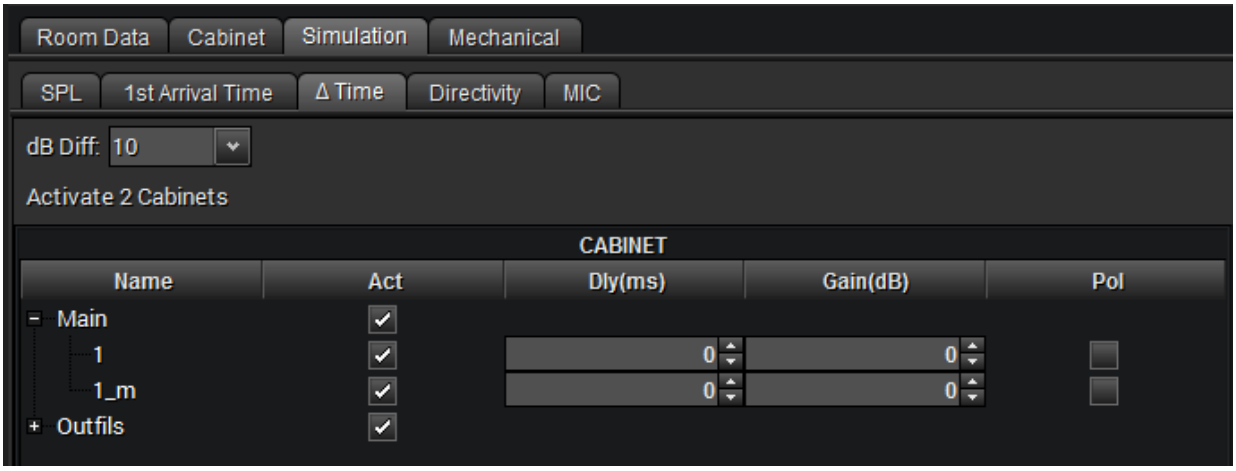


Fig. 3

Directivity calculates 0-6dB of summation between sources, providing an idea of stereo imaging.

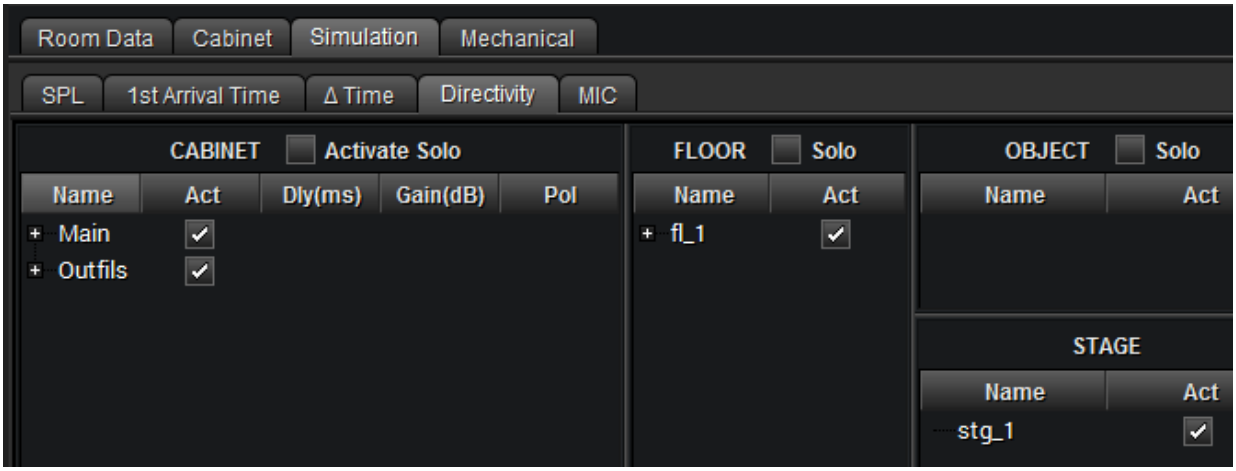


Fig. 3

3.4 Advanced Simulation

Virtual microphones provide a representation of how a measurement will appear based on IEC peak values with global weighting applied.

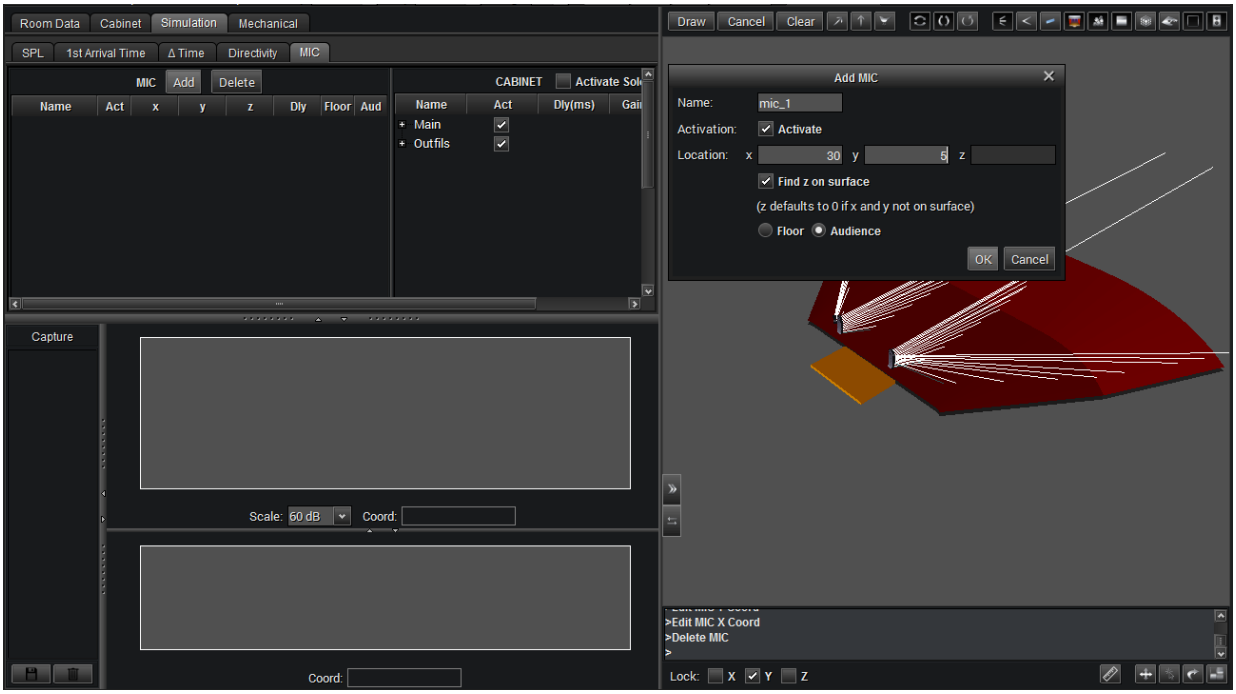


Fig. 4

Note: Measurement is based on a flat cabinet response (no preset data), to be used as a reference, showing the difference between two or more positions on the listening plane.

3.4 Advanced Simulation

Introduced in Blueprint AV™ V1.0.4.2 objects can now be set to block sound along with what frequency bandwidth the blocking will effect.

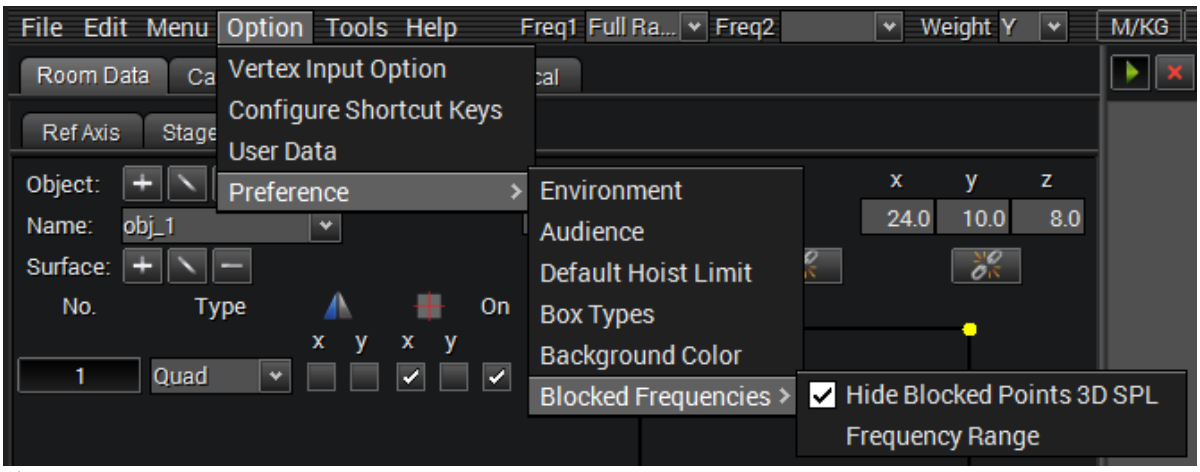


Fig. 5

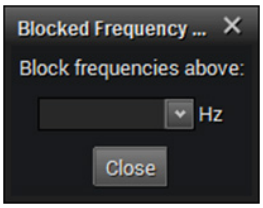


Fig. 6

Below is an example showing a Quad Block in the listening field showing the potential dead spot in SPL from a FOH tower. Object blocking simulations will take longer than regular 3D simulations due to the increased calculations performed by Blueprint AV™

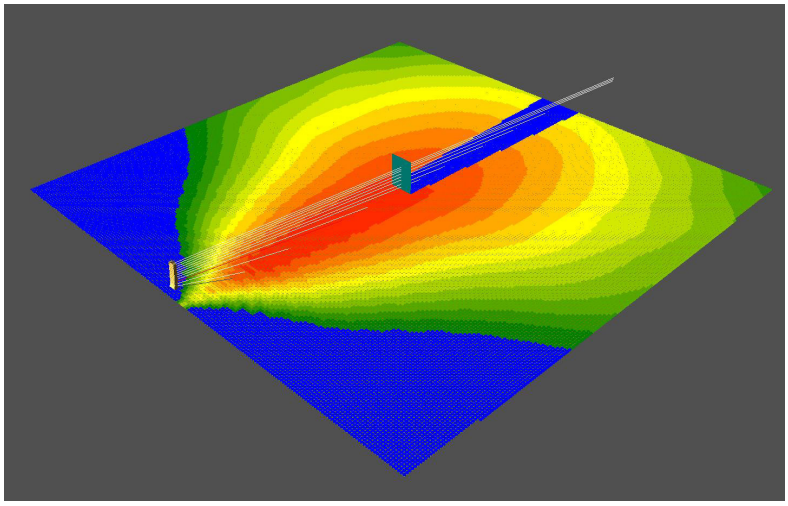
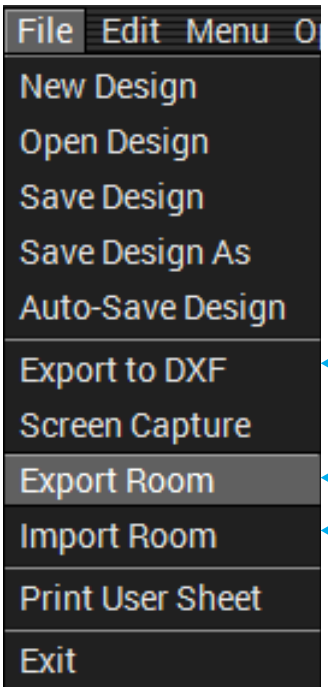


Fig. 7

Advanced Design Tools

3.5 Design Export

Blueprint AV™ has several export options, room, object and cabinets can be exported to be imported into new projects, and an entire project can be exported to DXF for using popular CAD programs.



Export to DXF will take all floors, objects, stage and cabinets and create a scale drawing for autoCAD, Sketchup or any other popuar 3D drawing software.

Room designs can be imported or exported from the file menu. Exporting a room will save all floor, object, stage and reference axis in a single .rm file.

Fig.1

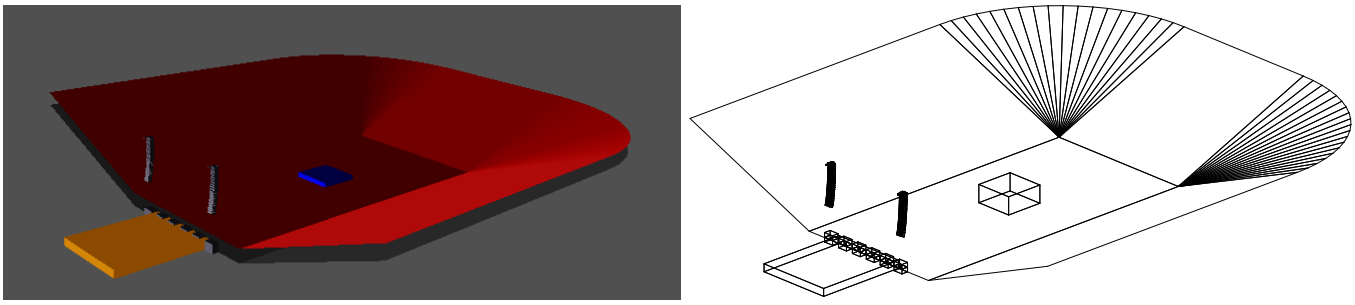
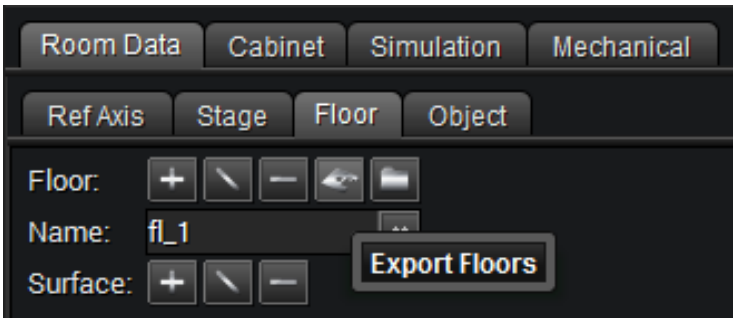


Fig.2

Fig. 2 shows the a blueprint design on the left and the DXF in AutoCAD on the right.
The DXF export layers for CAD programs are by default:
Layer 1: Cabinet
Layer 2: Stage
Layer 3: Floor
Layer 4: Object

3.5 Design Export

Individual Floors, Objects and Cabinets can also be imported or exported in their edit windows.



Floors can be exported

Fig. 3

Objects

Fig. 4

Cabinets

Fig. 5