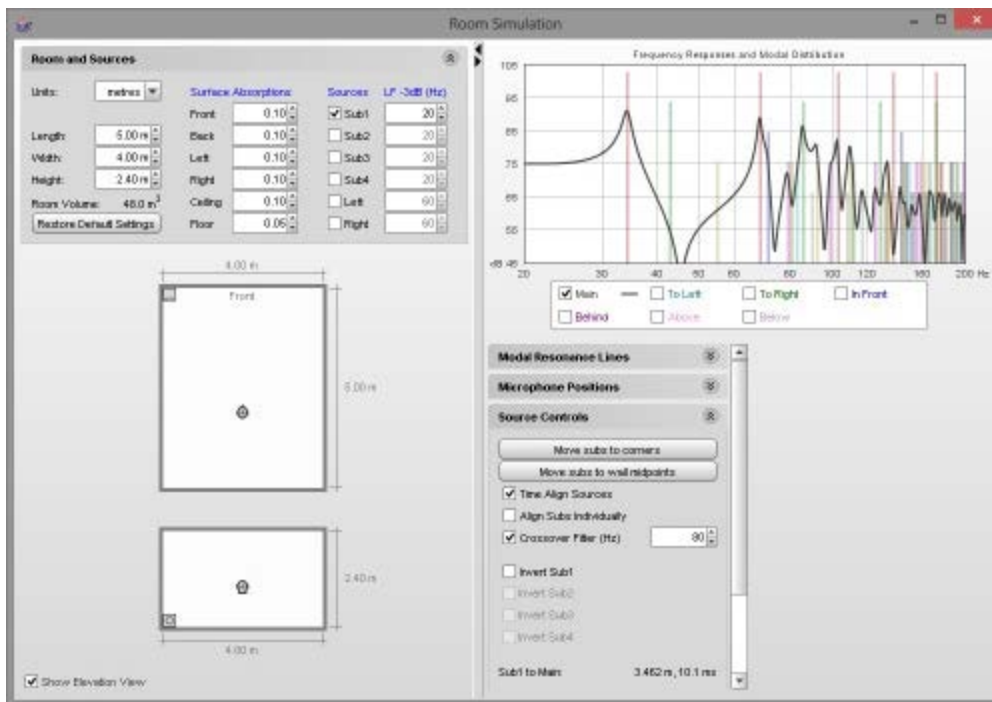


Room Simulator

The Room Simulator generates frequency responses for multiple sources at multiple locations in a rectangular room. It uses a frequency domain method based on the rigid boundary solution to the wave equation, modified for lossy boundaries. Results are directly equivalent to those obtained by the image source method in the time domain (Allen and Berkley 1978). Sources and listening positions can be altered by dragging on plan and elevation views of the room.

The Room Simulator window looks like this when first opened:



The left hand panel shows a view of the room with controls for room dimensions, the acoustic absorptions of the room's surfaces and the sources to be modelled. The right hand side shows the frequency response at the main listening position and additional positions around it and has controls for which modal resonances are shown, the positions at which responses are to be calculated and how the sources are managed. The entire window can be resized and the divider between the left and right panels can be dragged to adjust the proportion allocated to each. The small triangles at the top of the divider allow either panel to be collapsed completely.

Room Panel

The dimensions and properties of the room are configured in the controls at the top of the room panel. The controls may be collapsed by clicking on the chevrons at the top right of the panel.

Room and Sources

Units: metres

Length: 5.00 m

Width: 4.00 m

Height: 2.40 m

Room Volume: 48.0 m³

Restore Default Settings

Surface Absorptions

Front	0.10
Back	0.10
Left	0.10
Right	0.10
Ceiling	0.10
Floor	0.05

Sources

<input checked="" type="checkbox"/> Sub1	20
<input type="checkbox"/> Sub2	20
<input type="checkbox"/> Sub3	20
<input type="checkbox"/> Sub4	20
<input type="checkbox"/> Left	60
<input type="checkbox"/> Right	60

LF -3dB (Hz)

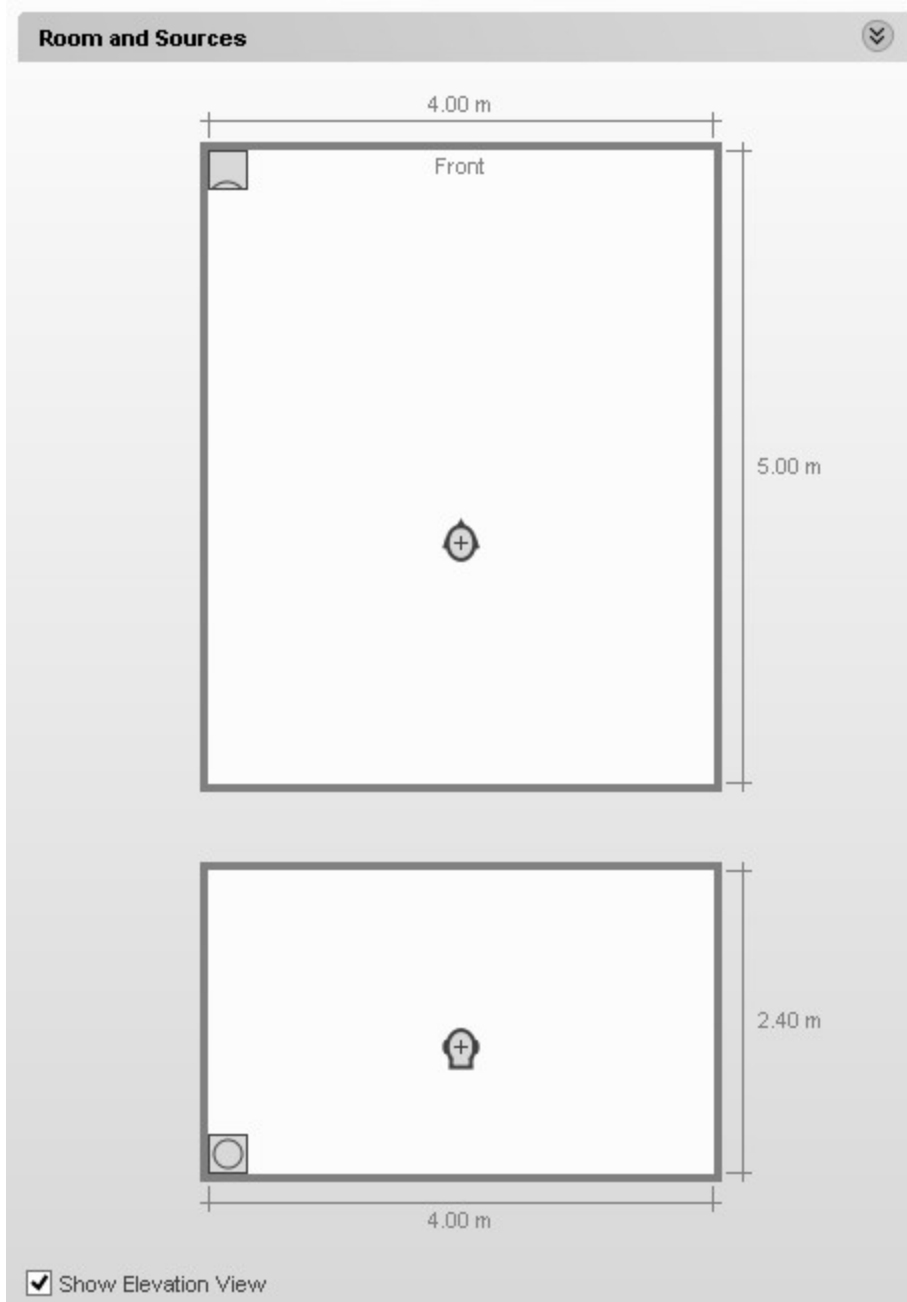
Dimensions may be displayed in metric or imperial units according to the selected **Units**.

Regardless of the units selected, the dimension controls accept input in metric or imperial units, for example 2.5m, 250cm, 2500mm, 8.2ft, 8ft 2in, 8' 2", 8f2i, 8f2 and 98in are all valid entries. If an entry is a number without any units it is assumed to be in the selected measurement units.

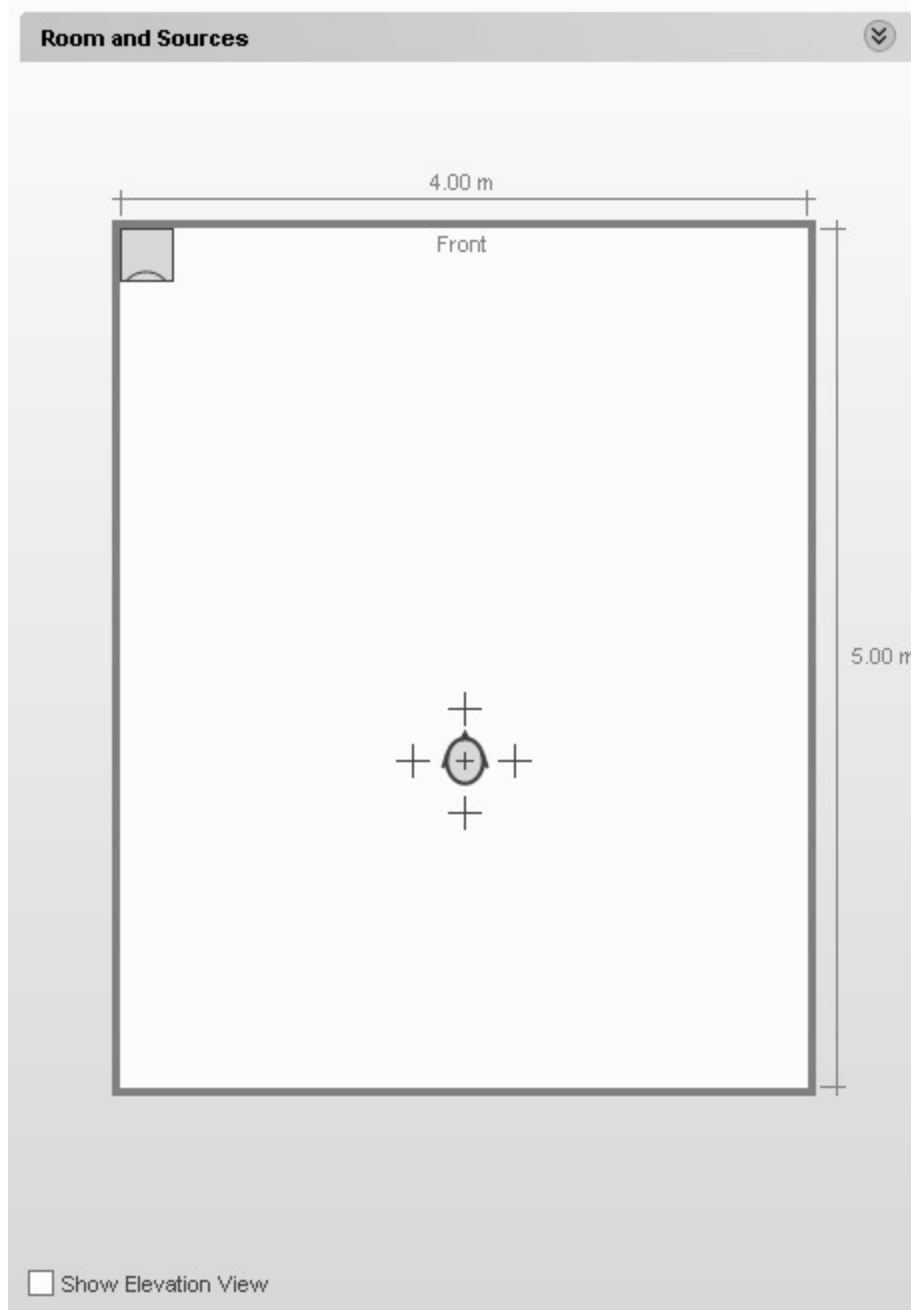
The surface absorptions define how sound is absorbed when it meets the surface. The absorptions are independent of angle or frequency. The higher the absorption figures, the more sound is absorbed at that surface and the more damped the room's modal resonances become.

A number of sources may be selected, including up to 4 subwoofers. The low frequency extension of each source can be configured independently - this is the frequency at which the source begins to roll off, it is not the bass management frequency (that can be configured in the **Source Controls** panel). The room responses shown are the sums of the contributions of all the selected sources.

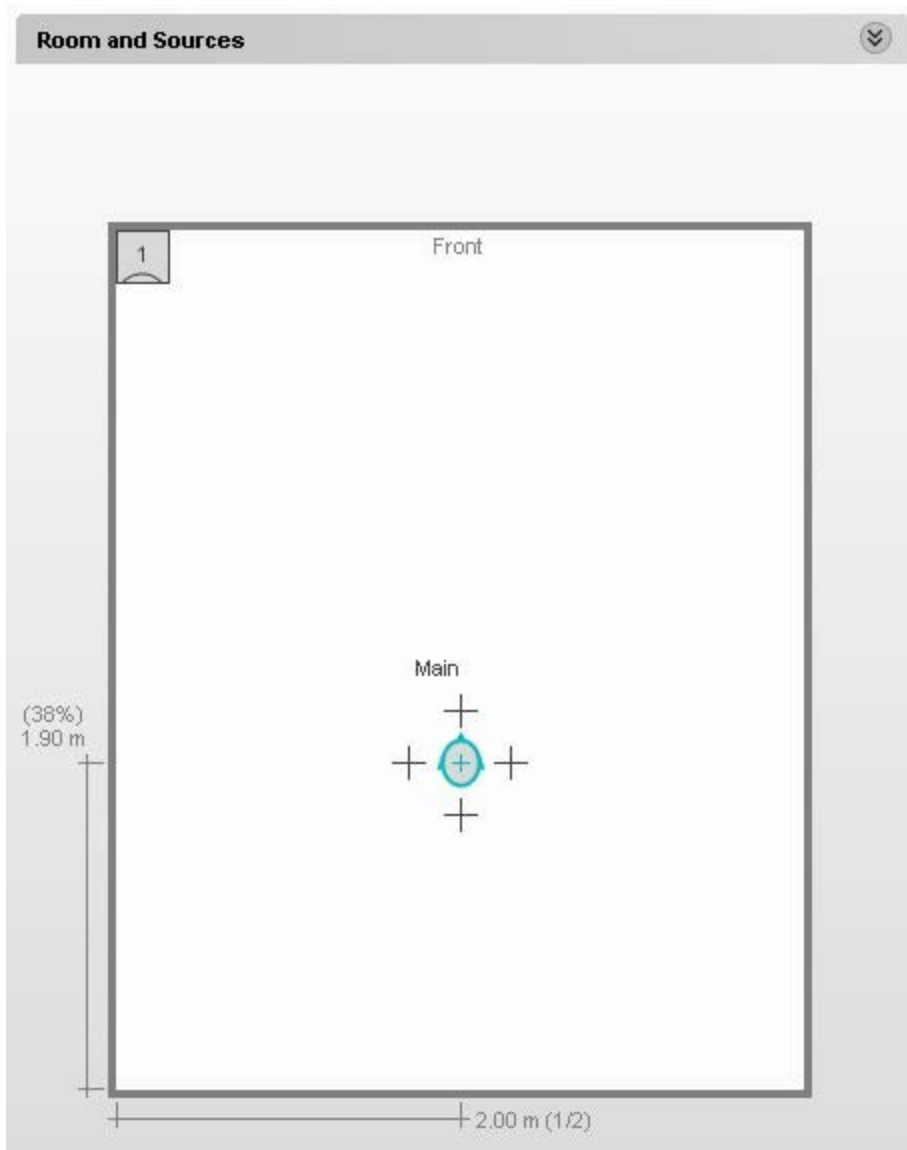
Below the room panel controls are the views of the room, in plan and elevation.



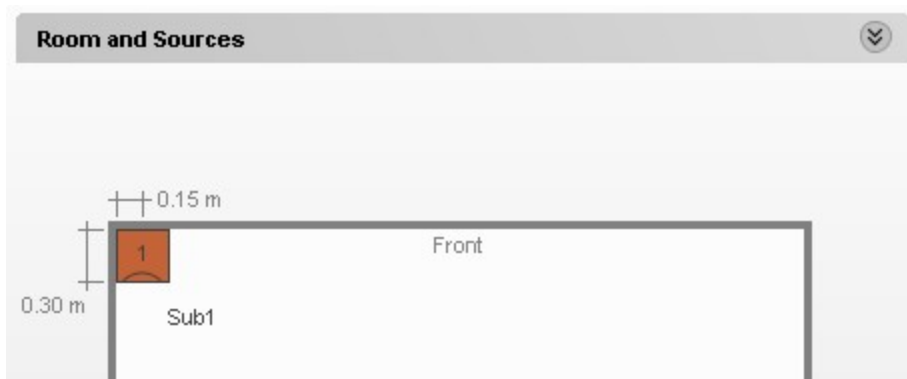
The elevation view can be hidden by unticking the **Show Elevation View** box at the bottom of the panel. The main listening position is indicated by the head. Crosses around the head show the locations of any additional points selected for responses to be generated, in the image below the positions to left, right, in front and behind the main listening position have been selected.



A source can be selected by moving the mouse cursor over it. The source will be highlighted and can be moved by left-clicking and dragging or by using the arrow keys, the arrow keys allow finer adjustment of position. The source can be rotated by right-clicking or by pressing the R key (clockwise rotation) or L key (anticlockwise rotation). Note that rotating the source does not alter its response, all sources are treated as omnidirectional. The main listening position can similarly be moved using the mouse or, after highlighting it, the arrow keys, as can any of the additional listening positions. When a source or listening position is highlighted its location is shown:

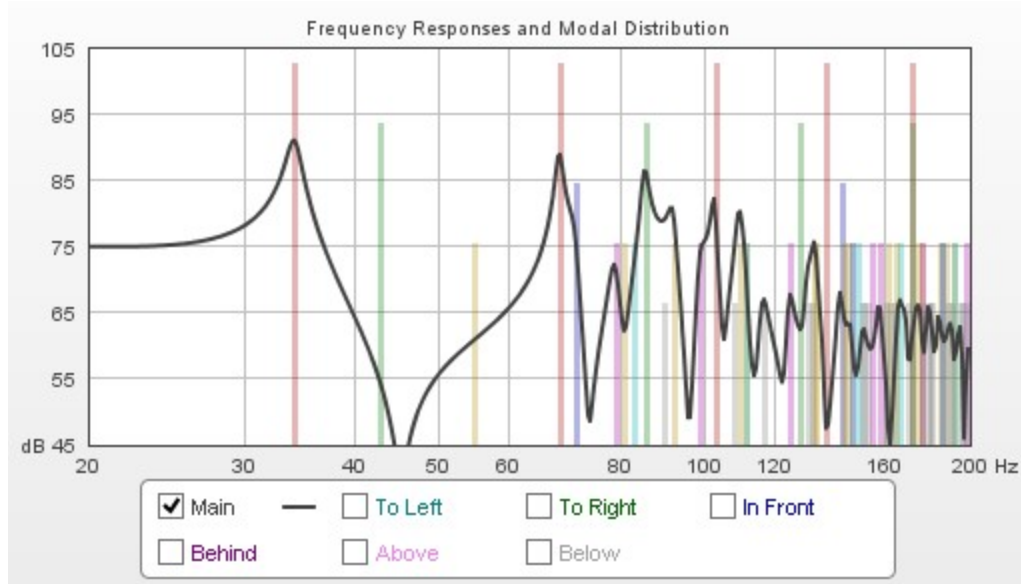


When a source is highlighted the dimensions shown are to the acoustic centre, which is located at the centre of the front face. When a source is highlighted its individual contribution to the combined response at the main listening position is shown on the response graph.



Response Panel

The modal distribution for the room is shown on the response panel using lines that are colour-coded according to the axes they include:



The **Modal Resonance Lines** controls identify the colours of the individual lines and allow their transparency to be adjusted. Any lines which are not selected will not appear on the graph.

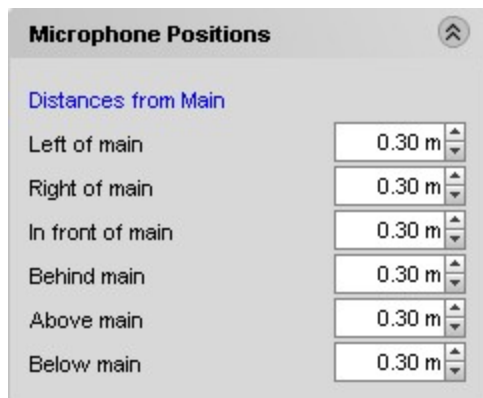
Modal Resonance Lines

Line Transparency (%):

- ☒ Axial Length (red line)
- ☒ Axial Width (green line)
- ☒ Axial Height (blue line)
- ☒ Tangential Length/Width (orange line)
- ☒ Tangential Length/Height (magenta line)
- ☒ Tangential Width/Height (cyan line)
- ☒ Oblique (grey line)

Colour	Mode
Red	Axial Length
Green	Axial Width
Blue	Axial Height
Orange	Tangential Length, Width
Magenta	Tangential Length, Height
Cyan	Tangential Width, Height
Grey	Oblique

The **Microphone Positions** controls set the distances for the additional listening positions from the main position. They can also be adjusted by dragging the crosses on the room view.

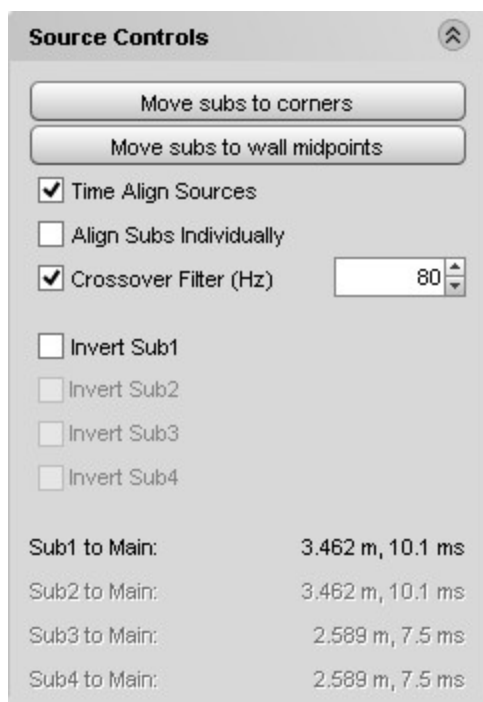


Microphone Positions

Distances from Main

Left of main	0.30 m
Right of main	0.30 m
In front of main	0.30 m
Behind main	0.30 m
Above main	0.30 m
Below main	0.30 m

The **Source Controls** allow subwoofers to be relocated to the corners or wall midpoints. Sources can also be time aligned at the main listening position and, if multiple subs are being simulated, the effect of time aligning each sub individually can be observed (note that if a symmetric placement of multiple subs is being used to minimise modal excitation the subs should **not** be individually aligned). Crossover filters can be applied to the subwoofers and main speakers at the frequency selected here, and individual subwoofers can be inverted. The distances and times of flight to each source are shown at the bottom of this panel.



Source Controls

Move subs to corners

Move subs to wall midpoints

☒ Time Align Sources

☐ Align Subs Individually

☒ Crossover Filter (Hz) 80

☐ Invert Sub1

☐ Invert Sub2

☐ Invert Sub3

☐ Invert Sub4

Sub1 to Main:	3.462 m, 10.1 ms
Sub2 to Main:	3.462 m, 10.1 ms
Sub3 to Main:	2.589 m, 7.5 ms
Sub4 to Main:	2.589 m, 7.5 ms

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