

Space Optimisation

Revision 3.7, October 13th, 2023

To achieve the full potential of Space Optimisation you should:

- > **accurately measure your room dimensions, including all room features, and correctly identify the construction material of each surface, and enter these into the Space Optimisation user interface.**
- > **correctly identify the ideal locations for your speakers, even if you are then required to relocate them to more practical locations and enter these into the Space Optimisation user interface.**
- > **accurately measure the environmental conditions of your room and enter these into the Space Optimisation user interface.**

If you correctly follow these steps, Space Optimisation should provide an optimisation that will not need any further adjustment. This user guide should therefore be required for reference only.

Space Optimisation is a toolset available to all Linn DS/DSM system owners which uses highly sophisticated acoustic modelling to build up a complete picture of how your speakers, their placement, and the unique characteristics of your room interact to affect the sound you hear. Space Optimisation takes account of the characteristics of your speakers, such as the position of each drive unit and the response of bass reflex ports, and of the characteristics of your room, such as room dimensions, construction materials, and features like doors and windows, to accurately model these interactions. It then precisely identifies frequencies that are artificially distorted by your environment, and reduces their energy and decay time, to reveal the music that would otherwise be hidden. It also applies a delay to each speaker to ensure the content from each speaker reaches your ears at the same time.

Given any, and all external inputs to a Linn DS/DSM system, Space Optimisation is applied to all analogue outputs and can also be applied to TOSLINK & SPDIF, if selected. However, note that DSD audio will not be optimised, as this would require a conversion to PCM, and that the HDMI, and headphone outputs will not output optimised audio, as these outputs pass the unprocessed audio feed.

Significant changes have been made to the application of Space Optimisation through your Linn account. If you have a Linn DS/DSM system optimised through Linn Konfig guidance on importing and applying these optimisations through your Linn account, along with clarification of the general changes, is presented in §1.

The procedure for basic setup of Space Optimisation on Linn DS/DSM systems is then presented in §2.

Finally, the procedure for advanced setup of Space Optimisation on Linn DS/DSM systems is presented in §3.

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1 Significant changes

In this section the most significant changes to the application of Space Optimisation are detailed.

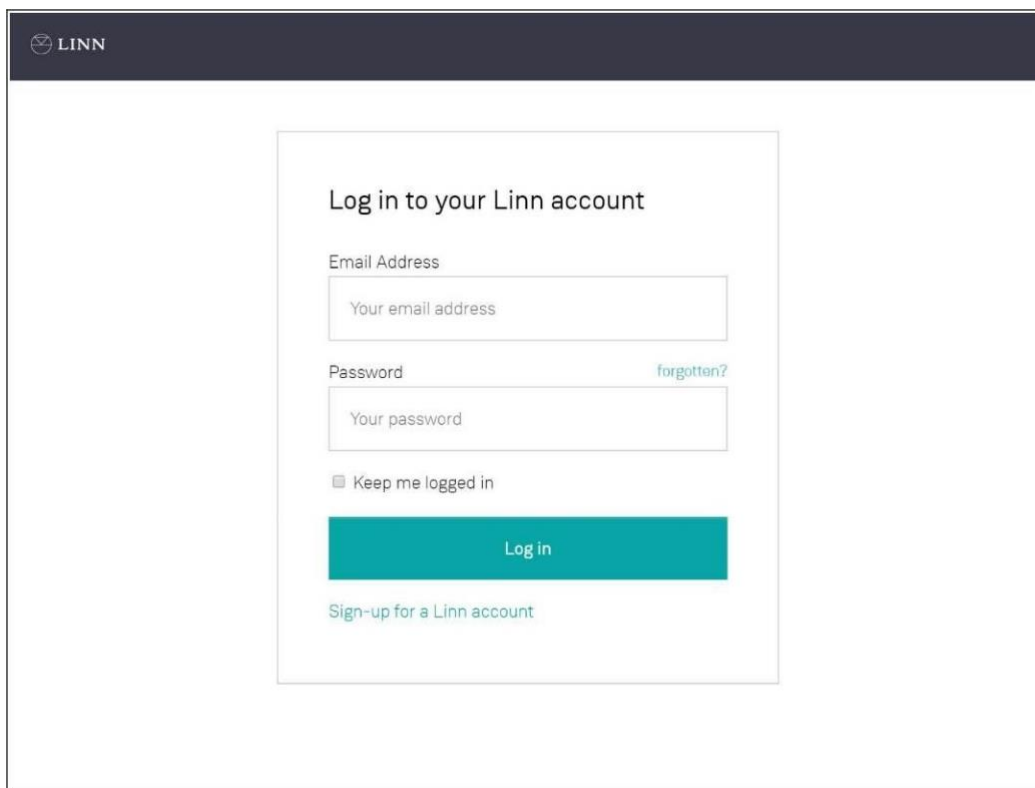
To utilise Space Optimisation your music system must be added to your Linn account; this procedure is detailed in [§1.1](#).

The optimisation algorithm has been updated to deliver an improved optimisation; these updates are detailed in §1.2.

Guidance on importing and applying previous optimisations from Linn Konfig through your Linn account are detailed in §1.3.

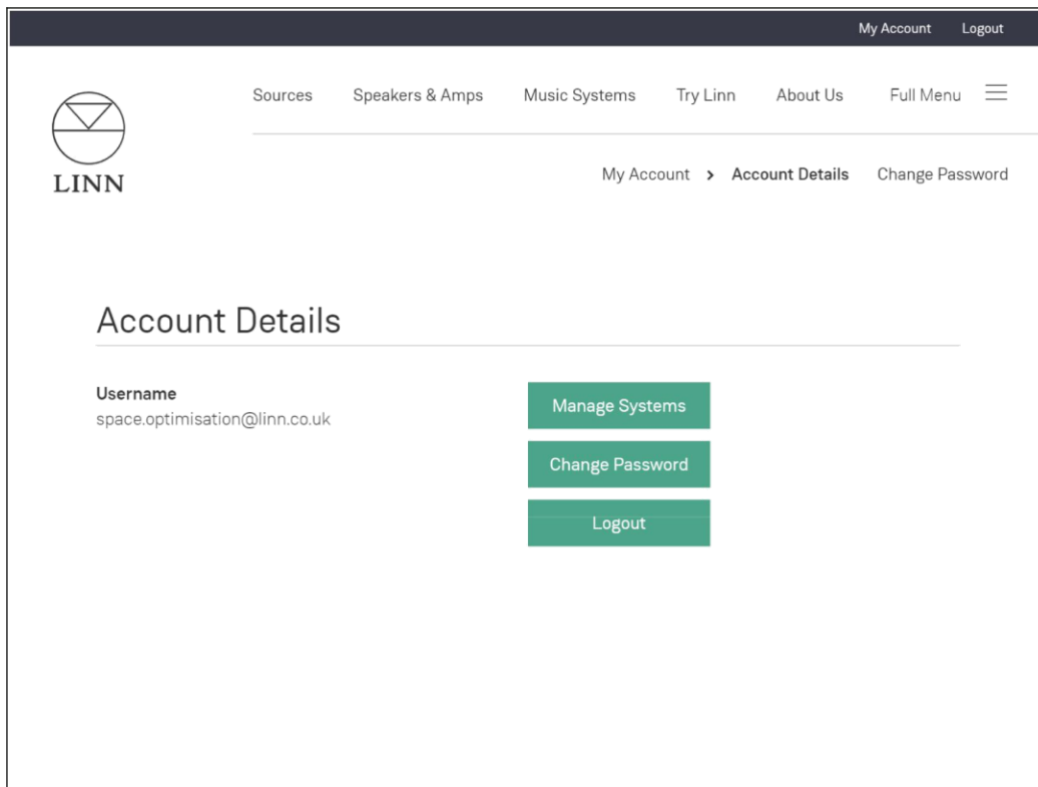
1.1 Your Linn account

Navigate to the [Linn account](#) webpage, as shown below, in your browser of choice. If you have already created a Linn account, enter your credentials and click on the **Log in** button; otherwise, click on the **Sign-up for a Linn account** link and follow the instructions to create a Linn account.



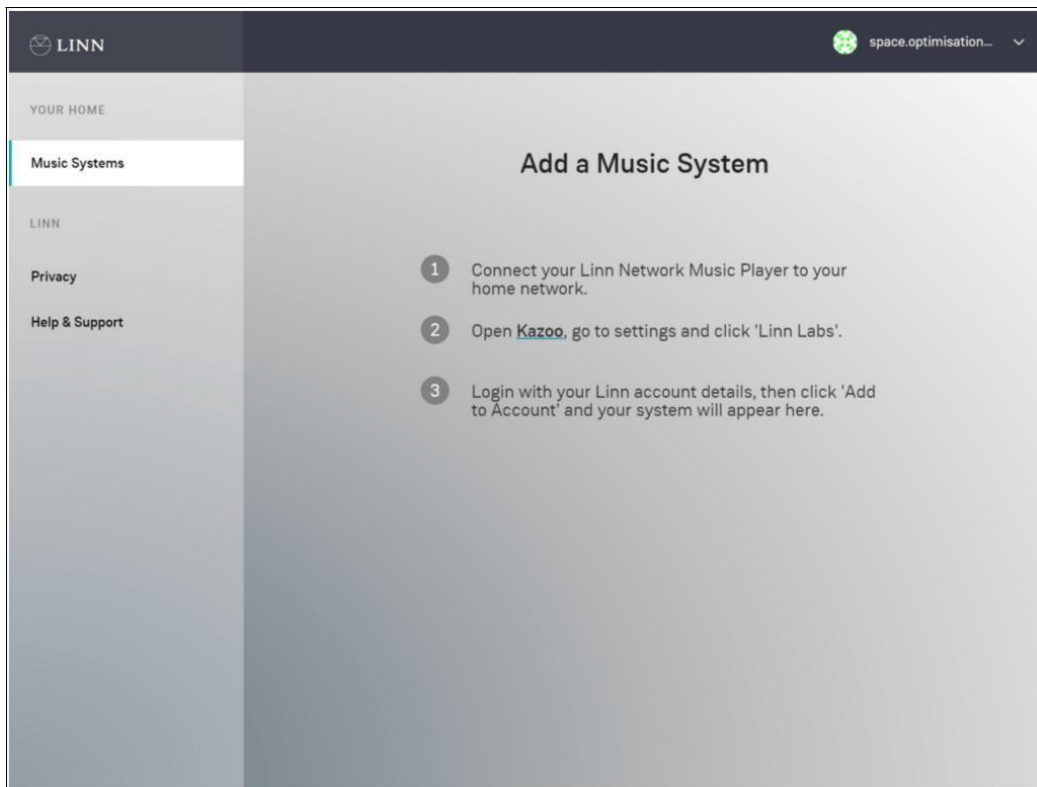
The image shows a screenshot of the Linn account login page. At the top left, there is a dark header with the Linn logo and the word "LINN". The main content area is white and contains a central login form. The form is titled "Log in to your Linn account". It has two input fields: "Email Address" with the placeholder text "Your email address" and "Password" with the placeholder text "Your password". To the right of the password field is a link that says "forgotten?". Below the password field is a checkbox labeled "Keep me logged in". At the bottom of the form is a teal "Log in" button. Below the button is a link that says "Sign-up for a Linn account".

Within your Linn account, as shown below, you can edit your account details or manage your music systems; your Linn account is accessible from any device, allowing you to manage your music systems from your PC, laptop, tablet, or phone.

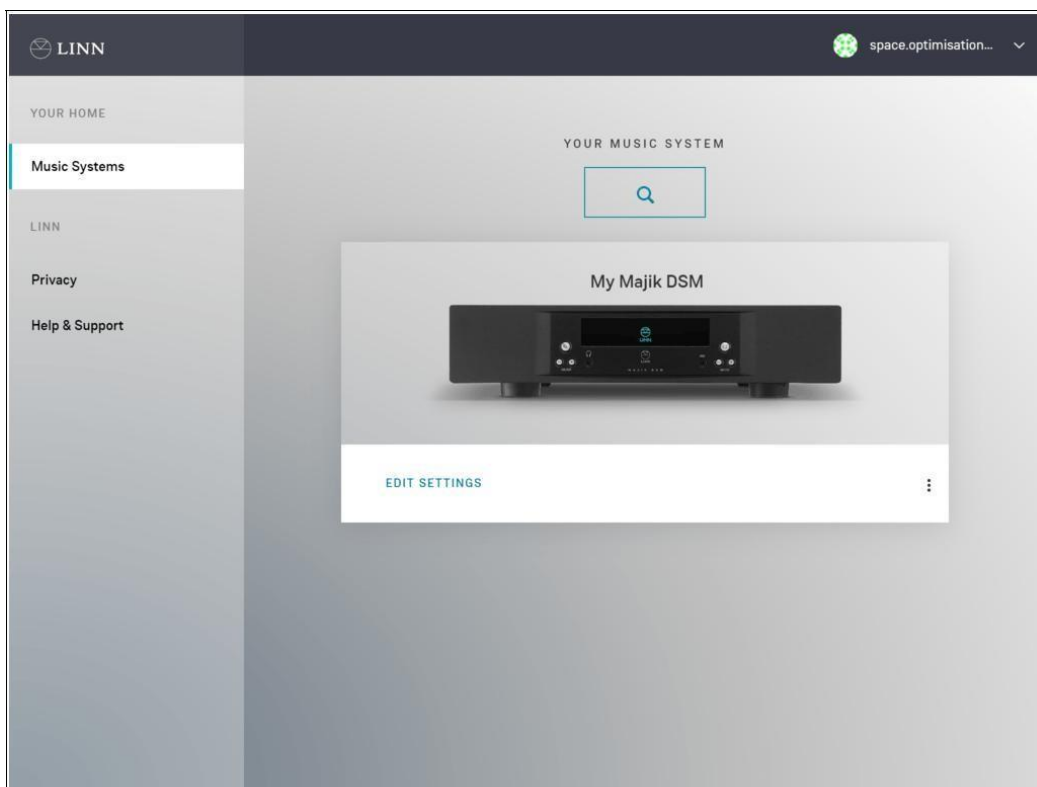


1.1.2 Adding your music system to your Linn account

Click on the **Manage Systems** button; you will be taken to the **Music Systems** page. If no music systems have previously been added to your Linn account you will see instructions for adding a music system, as shown below; follow these instructions to add your music system to your Linn account.

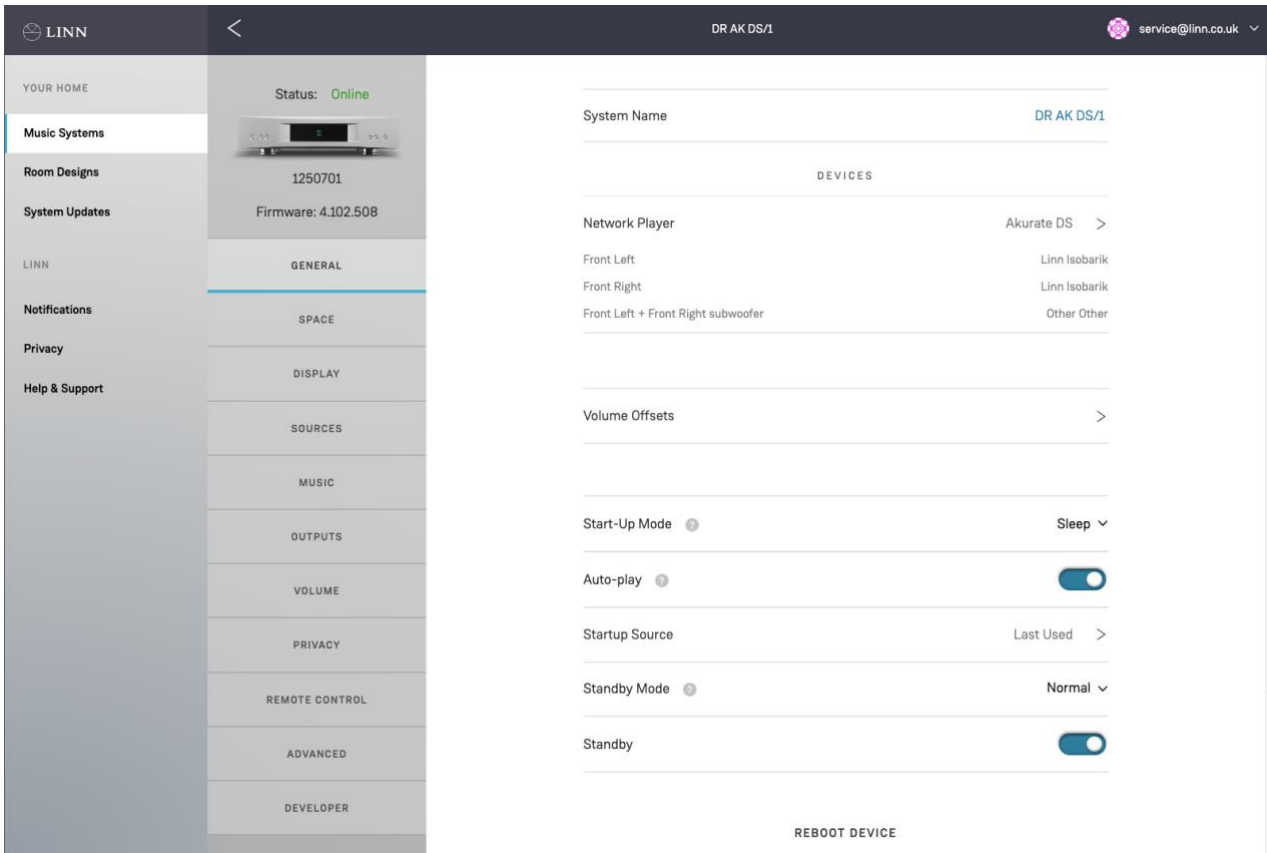



Once your music system has been added to your Linn account it will appear on the **Music Systems** page, as shown below.

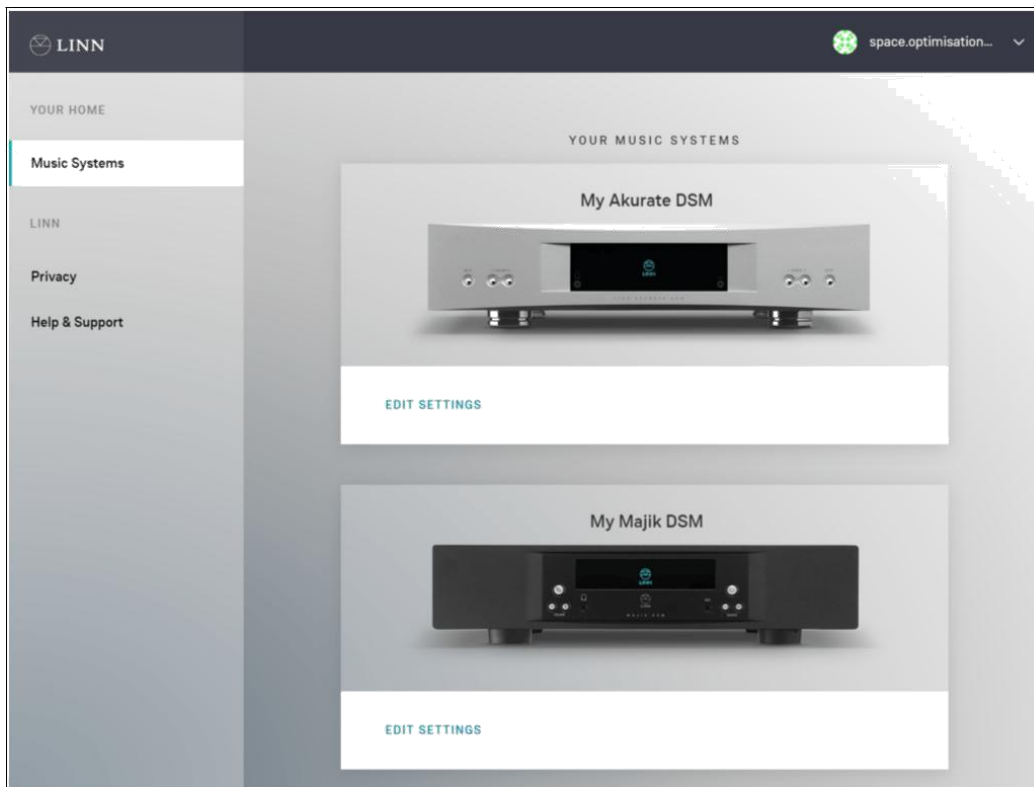


Click on the **Edit Settings** link under your music system; you will be taken to the settings page for your music system, as shown below. You can configure all your music system's settings here. You can rename your music system at any time by clicking on the system name under the **General** tab; note that music

systems and rooms are now considered as separate entities within your Linn account, therefore when renaming your music system, you may wish to avoid names such as 'Living Room' or 'Kitchen', instead opting for names such as 'My Majik DSM' or 'My Akurate DSM'.



You may also add multiple music systems to your Linn account; each music system will then be listed on the **Music Systems** page, as shown below. Note that you can also remove a music system from your Linn account at any time by clicking on the  drop-down menu under the music system and clicking on **Remove**, or through [Linnapp](#) or [Linn Kazoo](#).



1.2 Optimisation algorithm updates

In this section the most significant updates to the Space Optimisation algorithm are detailed.

The optimisation algorithm has been updated to support non-rectangular rooms with depth and height features and variable height ceilings; this update is detailed in §1.2.1.

The optimisation algorithm has also been updated based on psychoacoustic research; this update is detailed in §1.2.2.

Finally, the updates to the optimisation algorithm have resulted in a longer calculation time; this issue is detailed in §1.2.3.

1.2.1 Support for non-rectangular rooms

In earlier versions of Space Optimisation, previously available through Linn Konfig, all rooms were assumed to be rectangular. This assumption allowed for the use of analytical acoustic modelling of the interactions between your speakers and room; while sufficiently valid for minimally non-rectangular rooms, this assumption was invalid for general non-rectangular rooms. To account for this sometimes invalid assumption users were given the ability to adjust individual room modes and add custom filters to arrive at a valid optimisation.

In the new version of Space Optimisation, available through your Linn account, non-rectangular rooms with room features and non-flat ceilings may now be modelled. This new capability is allowed for using highly sophisticated acoustic modelling of the interactions between your speakers and room; validity is thus assured for all rooms. Due to this assured validity the ability to adjust individual room modes and add

custom filters has been removed; any adjustments will now be dictated by either refinement of the model inputs or user preference, and may be made through the advanced settings, as outlined in [§3](#) §3.

1.2.2 Optimisation based on psychoacoustic research

Psychoacoustic research has shown that listeners have a preference not only to a flat frequency response, but also to a uniform decay time. A non-flat frequency response may be associated with the perception of 'one note bass', where a particular bass notes masks other notes around it, leading to a monochromatic bass line. A non-uniform decay time may be associated with the perception of 'boominess', where a particular bass note rings out for longer than other notes around it, leading to a booming bass line.

In earlier versions of Space Optimisation, previously available through Linn Konfig, the optimisation precisely identified frequencies that were artificially distorted by the environment and reduced their energy to give a flat frequency response.

In the new version of Space Optimisation, available through your Linn account, the optimisation can also identify how these artificial distortions change over time, and reduce their decay times to give a uniform decay time. Furthermore, the optimisation has been updated to give a better balance of low- and midfrequency energy. The user is also able to adjust the optimisation according to their preference, as outlined in §3.3.

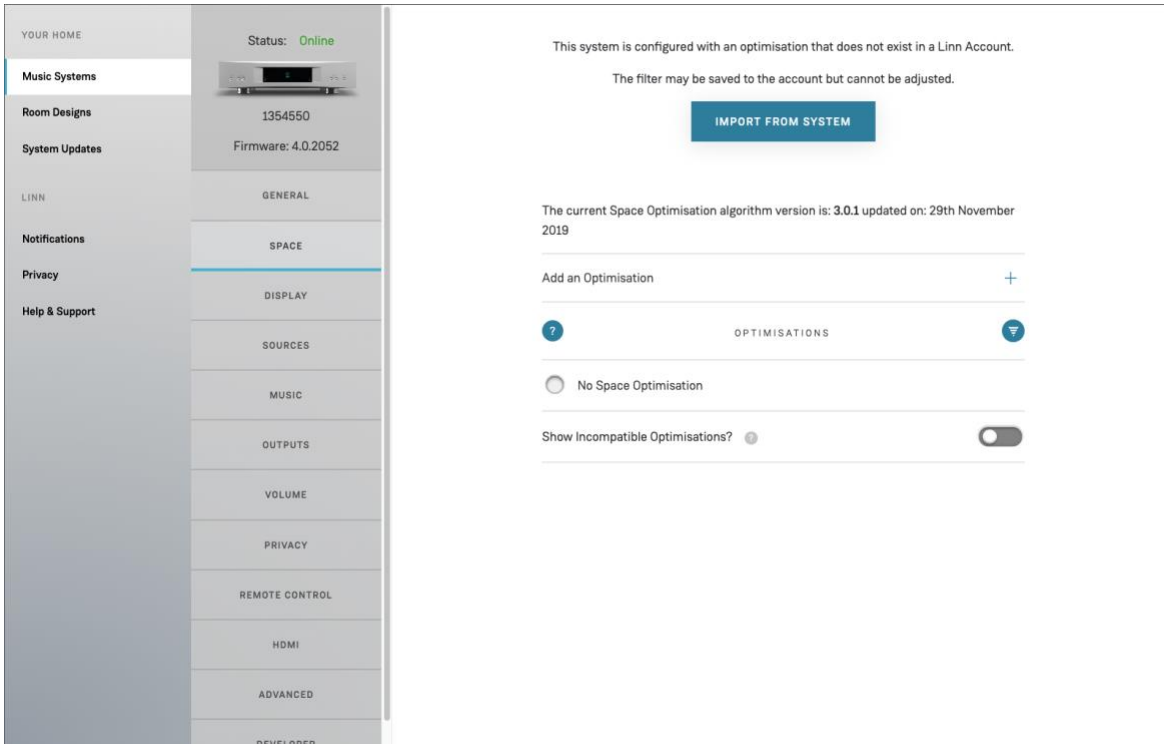
1.2.3 Optimisation calculation time

Due to the use of highly sophisticated acoustic modelling in the new version of Space Optimisation, available through your Linn account, optimisations may take slightly longer to calculate than earlier versions of Space Optimisation, previously available through Linn Konfig; this calculation time will depend on your room and speakers, with large rooms containing multiple speakers taking longer to calculate than small rooms containing few speakers.

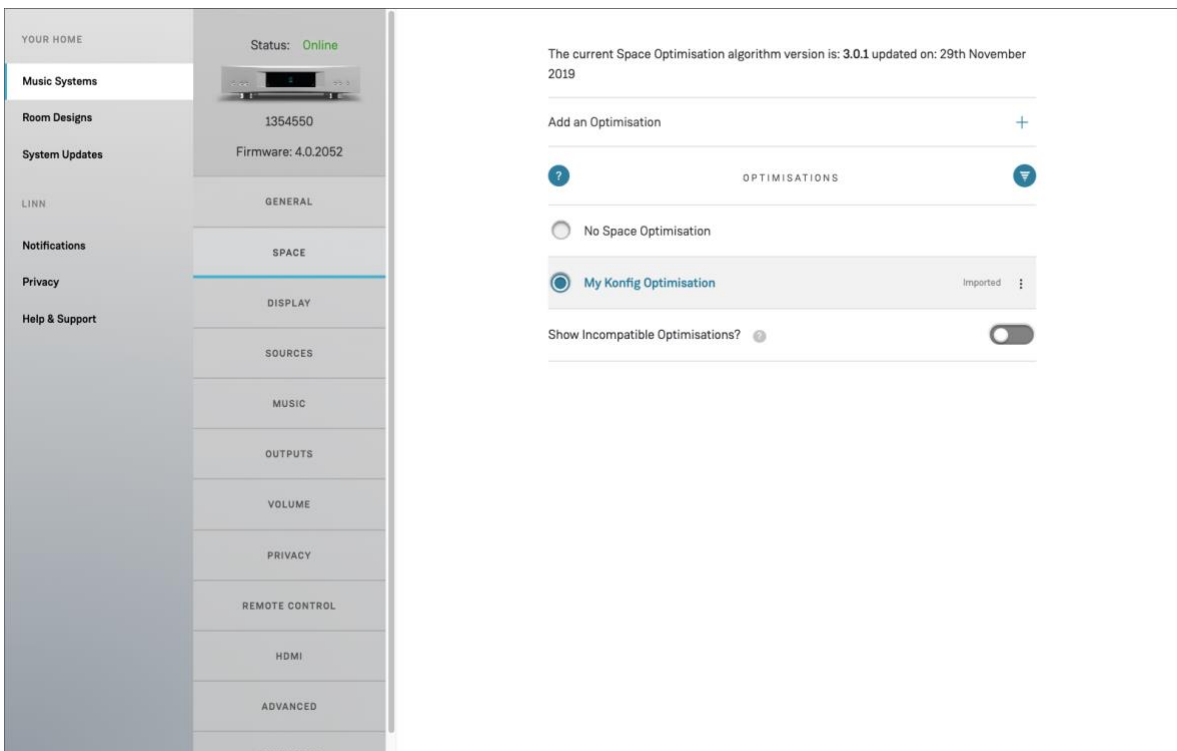
However, the benefits of the new version of Space Optimisation, outlined in §1.2.1 and §1.2.2, massively outweigh this slight increase in calculation time.

1.3 Importing a previous optimisation

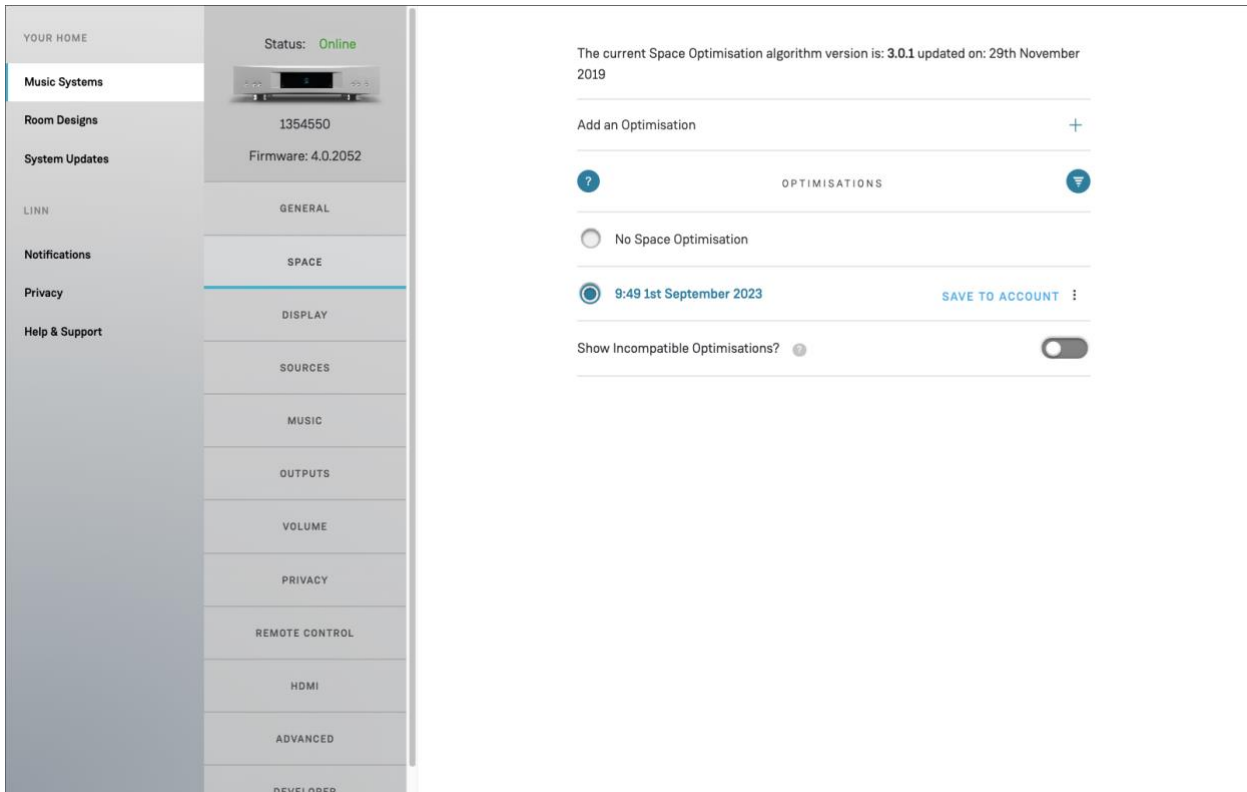
In the case that your Linn DS/DSM system has already been optimised, through either Linn Konfig or a different Linn account, a Space tab will be visible on the Music Systems page for that system, as shown below.



Click on the **Import from System** button to extract the optimisation from your Linn DS/DSM system. The optimisation will be added to a list of optimisations below the **Optimisations** heading; this optimisation will be flagged as being imported, as shown below. Note that this optimisation contains only the resultant data of the optimisation, and not the optimisation inputs such as room information or speaker and listening locations.

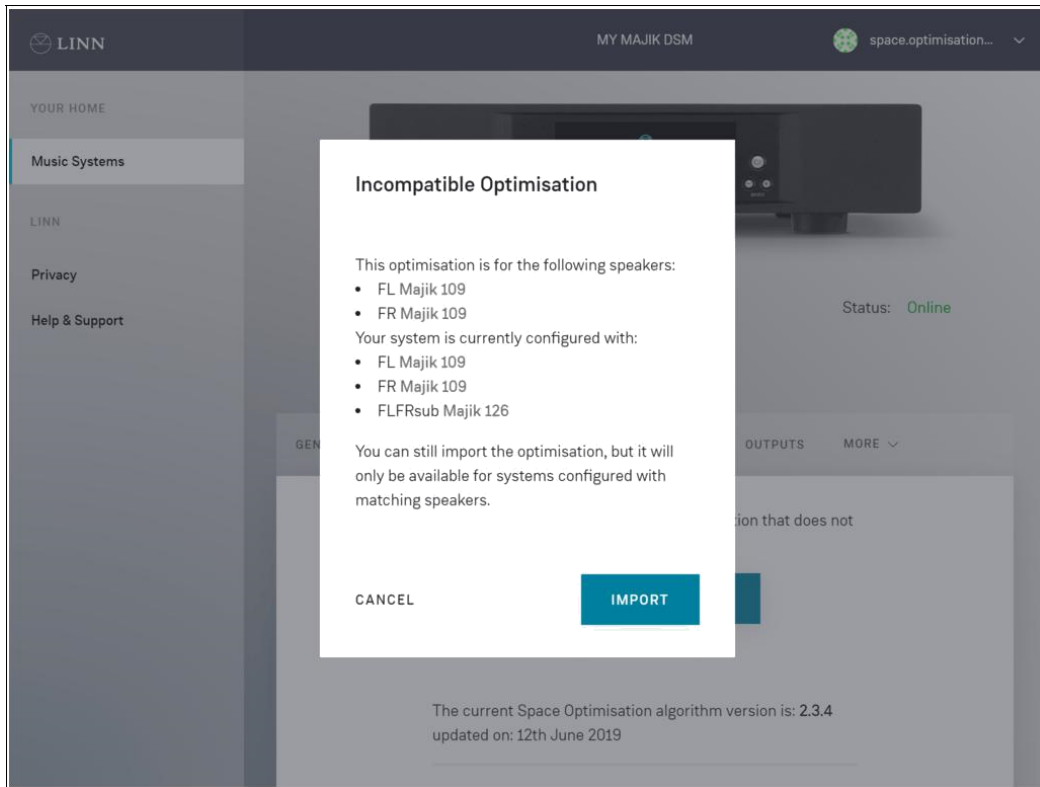


If your system is optimised with an optimisation from a different account that this device is shared with, you may perform **Save To Account**. You will get a copy of the full optimisation and room model details in your account and will be able to adjust those without affecting the original room and optimisation.



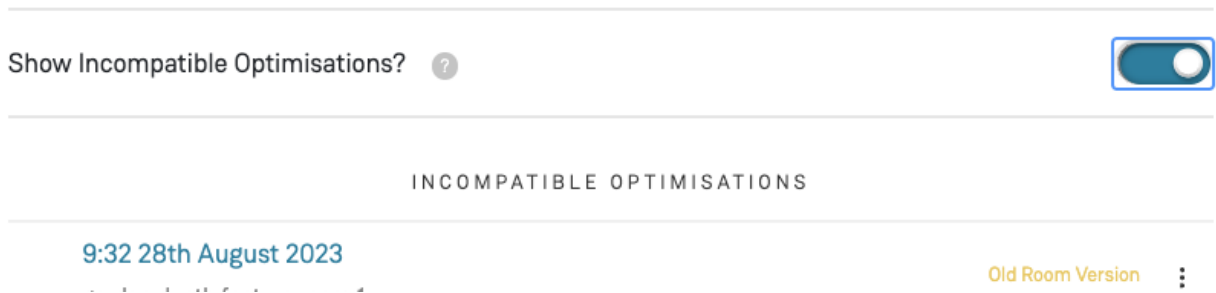
Note that if the music system and speakers for the optimisation you wish to import does not match that specified in your Linn account, a dialog warning you of this incompatibility will appear, as shown below. Clicking on the **Import** button will import the optimisation; however, the optimisation will not show in the list of optimisations below the **Optimisations** heading, as this list shows only the optimisations which are compatible with your music system and speakers.

1.4 Incompatible Optimisation



Should you wish to import further Linn Konfig optimisations, you may apply these through Linn Konfig whilst logged in to your Linn account, then follow the procedure outlined above to extract them from your Linn DS/DSM system and add them to the list of optimisations. However, it is recommended that you redefine any previous optimisations through your Linn account, to take advantage of the improvements in the new version of Space Optimisation over earlier versions.

To view these incompatible optimisations, you can turn on this viewing option in the SPACE tab:



2 Basic setups

Before commencing optimisation, please ensure that your music system has been added to your Linn account, as outlined in §1.1.1

2.1 Installing your speakers using Tune Dem

2.1.1 Installing your speakers

When installing your speakers you should first decide along which axis of the room the speakers should be installed; for example, in a rectangular room the speakers will usually sound best along the short axis of the room. The [Tune Dem](#) method should then be used to find the ideal locations for your speakers; these are the locations where it is easiest to follow the tune. Correct identification of the ideal locations for your speakers is essential if you wish to achieve the full potential of both your music system and Space Optimisation; Space Optimisation is able to recreate the sound of your speakers in their ideal locations, even if you have been forced to move them to a more practical location due to domestic constraints, to give you the best of both worlds.

If you are unsure of how to find the ideal locations for your speakers please contact your expert Linn retailer.

2.1.2 Installing your additional subwoofers

Additional subwoofers may be connected to your Linn DS/DSM via the analogue outputs; note that the term additional subwoofer here refers to a subwoofer connected to an analogue output to which speakers are also connected. When installing your additional subwoofers you should aim to locate them close to your speakers; for example, in a 2.1 system the additional subwoofer will usually sound best equidistant between the speakers, and in a 2.2 system the additional subwoofers will usually sound best close to the speakers. Again, the [Tune Dem](#) method should be used to find the ideal locations for your additional subwoofers. Correct identification of the ideal locations for your additional subwoofers is essential if you wish to achieve the full potential of both your music system and Space Optimisation.

Additionally, when installing your additional subwoofers, you should bung any ports on your speakers, and then aim to match the roll off setting on your additional subwoofer's internal DSP unit to the roll on of your speakers; depending on the method of filtering applied by your additional subwoofer's internal DSP unit you may also require a phase inversion to get the best sound.

Finally, note that you should aim to locate your additional subwoofers such that your speakers and additional subwoofers are equidistant from the listening location; as your speakers and additional subwoofers share an analogue output, Space Optimisation is unable to apply separate delays to the

speakers and additional subwoofers to ensure the content from the speakers and additional subwoofers reaches your ears at the same time.

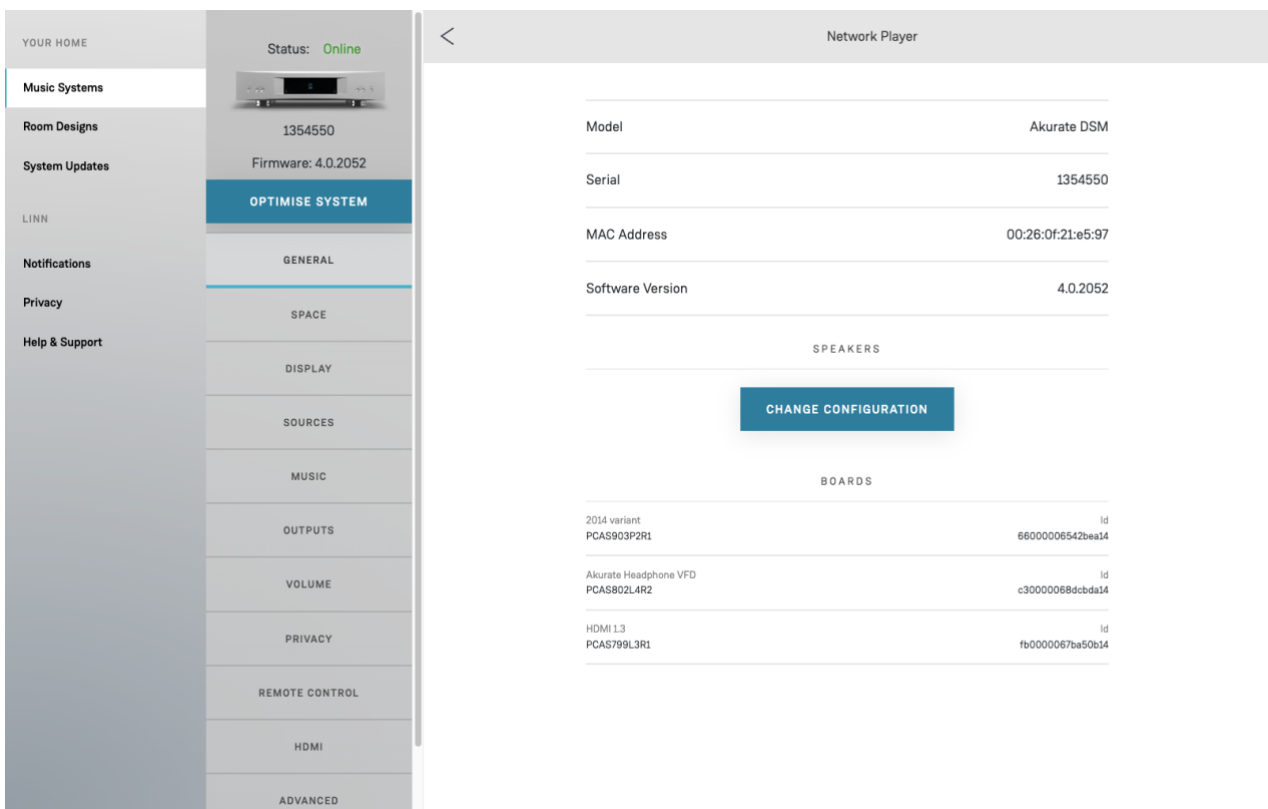
If you are unsure of how to find the ideal locations for your additional subwoofers, please contact your expert Linn retailer.

2.2 Adding your speakers to your music system

Space Optimisation takes account of the characteristics of your speakers, such as the position of each drive unit and the response of bass reflex ports. You must therefore inform your Linn account of the speakers being used with your music system before Space Optimisation can be applied.

2.2.1 Adding your speakers

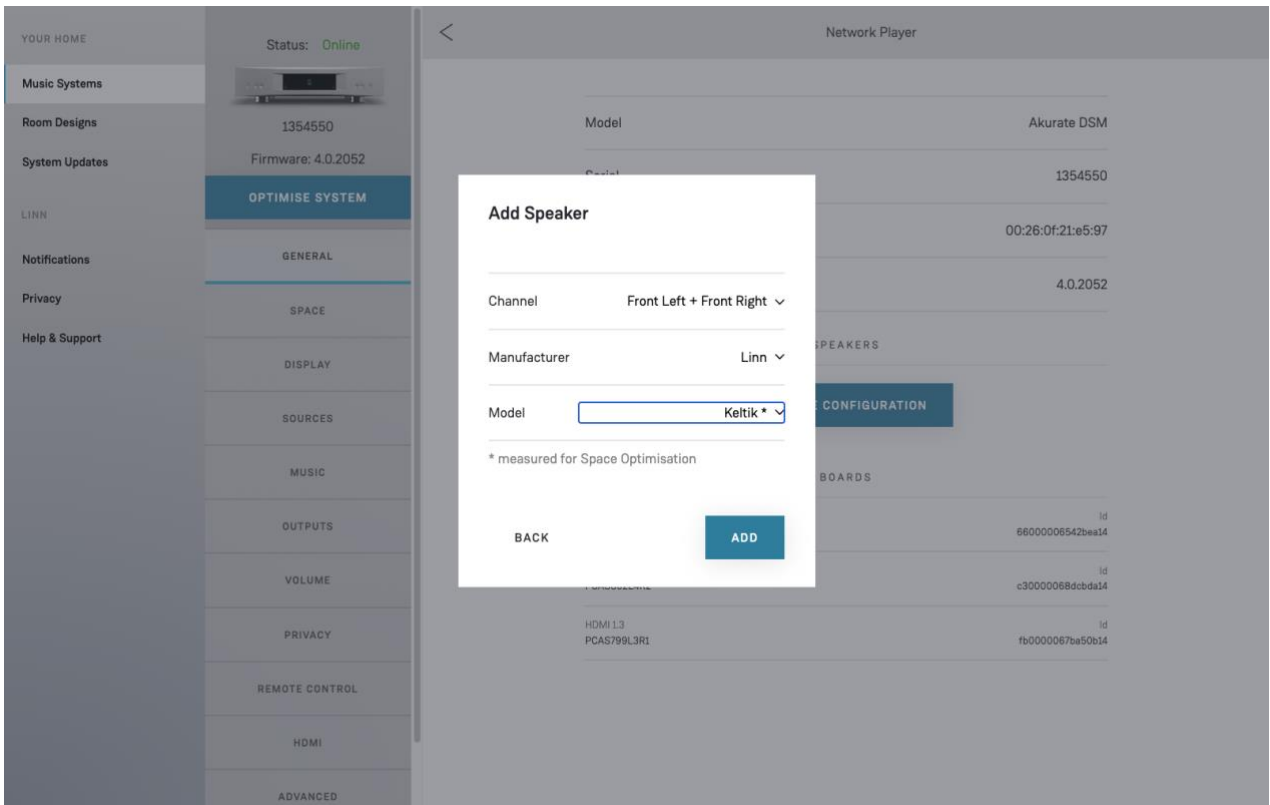
Navigate to the **General** tab on the **Music Systems** page for the system you wish to optimise. If no speakers have previously been added to your music system, navigate into the **Network Player** link and press the **Change Configuration** button to add speakers.



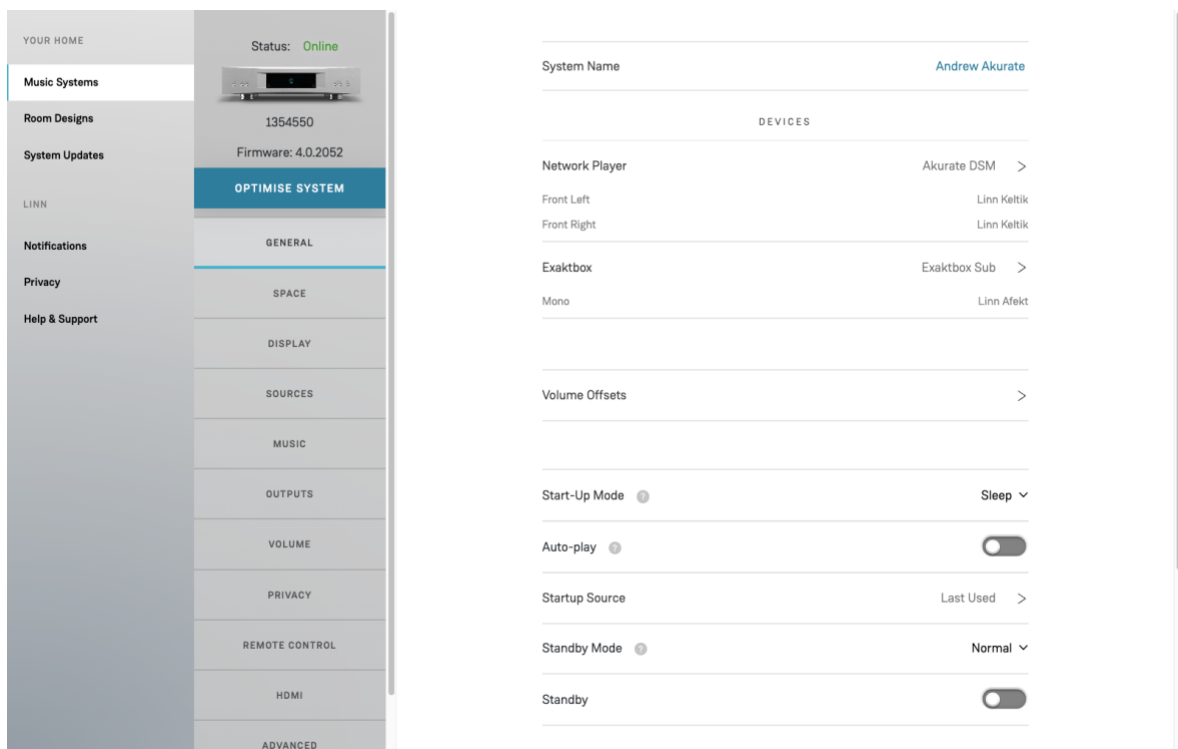
Click on either the **Add Speakers** button or link; a dialog prompting you to provide the make and model of your speakers will appear, as shown below. Select the make and model of your speakers using the drop-down menus, then click on the **Add** button; if your speakers' make or model does not appear in the drop-down menu, select **Other**. If your speakers have been measured for Space Optimisation an asterisk will appear next to your speakers' model; this means that Space Optimisation can take account of the characteristics of your speakers, such as the position of each drive unit and the response of bass reflex

ports. Otherwise, your speakers will be modelled as point sources; this means that you can still benefit from the room and placement optimisation functionality of Space Optimisation.

If you wish to have your speakers measured for Space Optimisation, please contact your expert Linn retailer.

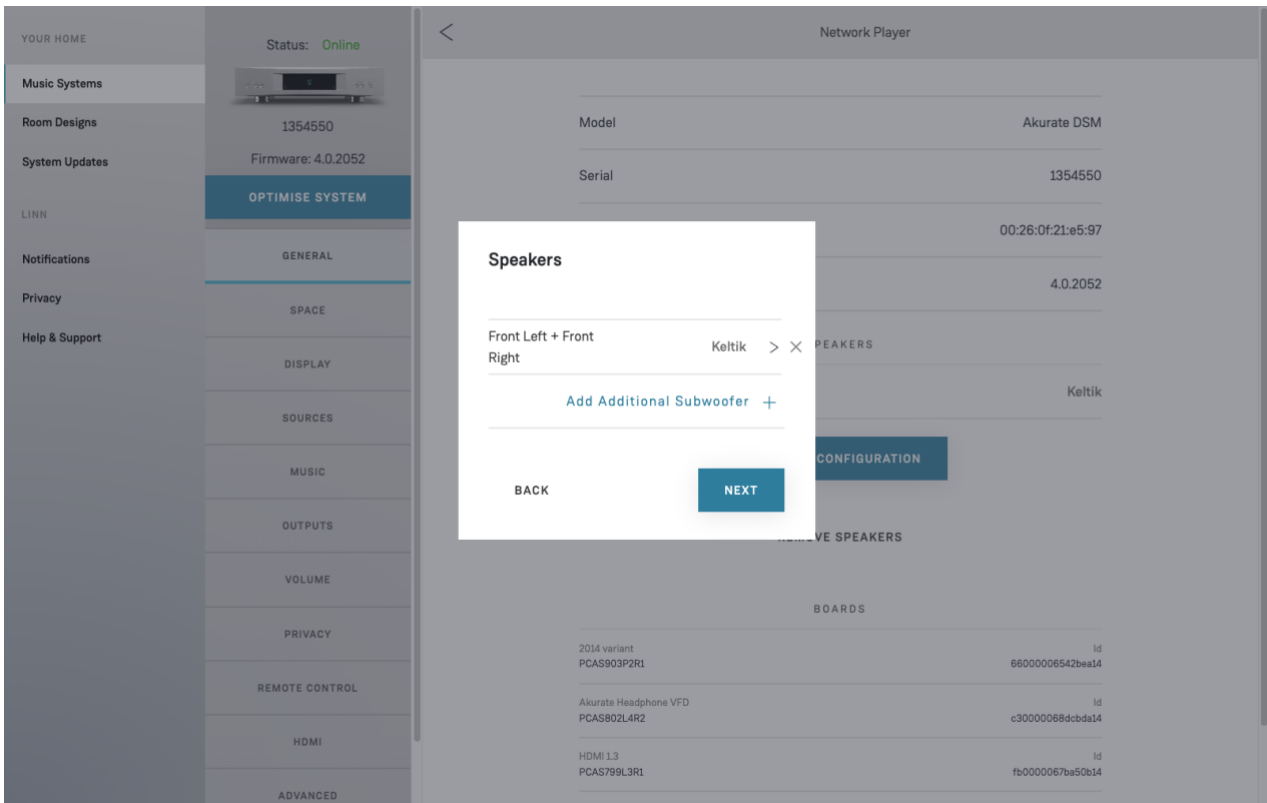


Once your speakers have been added to your music system they will appear under the **General** tab, as shown below; note that you can remove your speakers at any time by clicking on the speakers' name under the **General** tab and clicking on the **Remove Speakers** button.

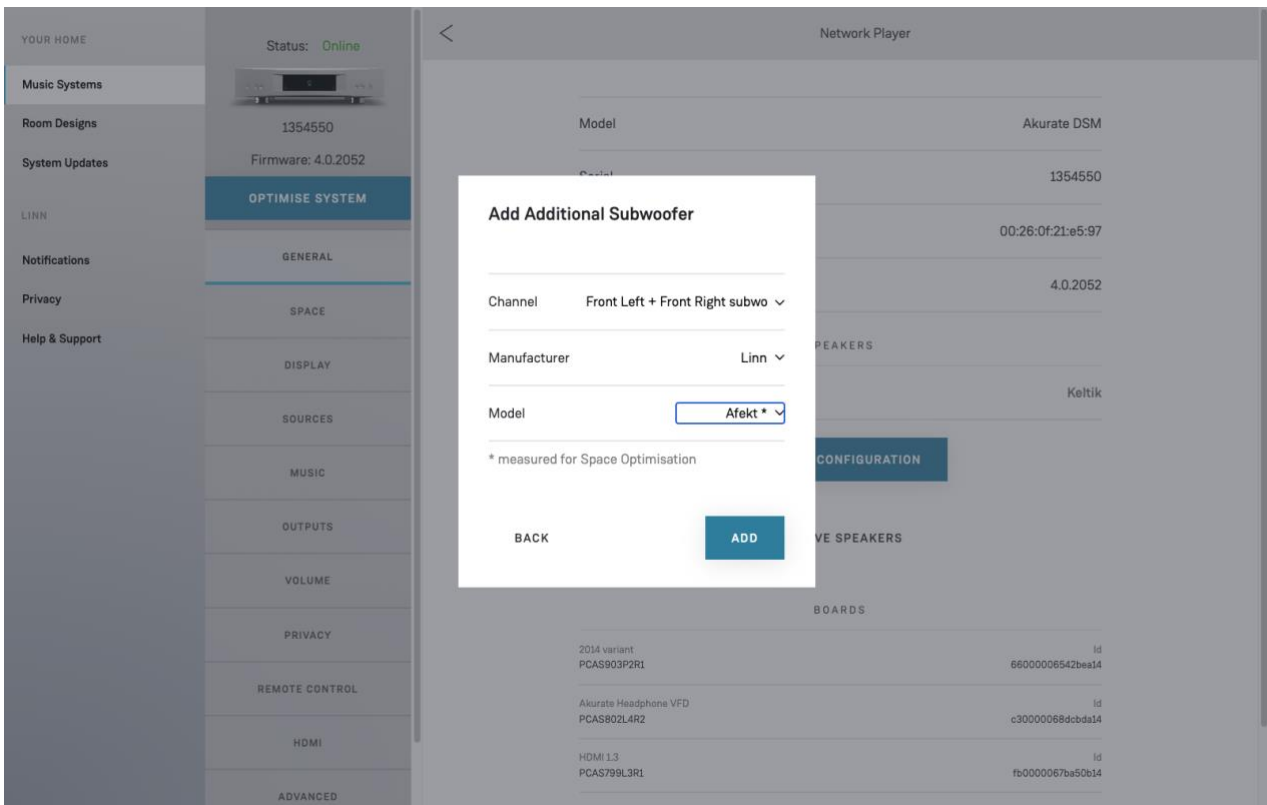


2.2.2 Adding your additional subwoofers

You will also see an **Add Additional Subwoofer** link in speaker setup dialog as shown below.



Click on the **Add Additional Subwoofer** link; a dialog prompting you to provide the channel, manufacturer and model of your additional subwoofer will appear, as shown below. Select the channel, manufacturer and model of your additional subwoofer using the drop-down menus, then click on the **Add** button; if your additional subwoofer's manufacturer or model does not appear in the drop-down menu, select **Other**.



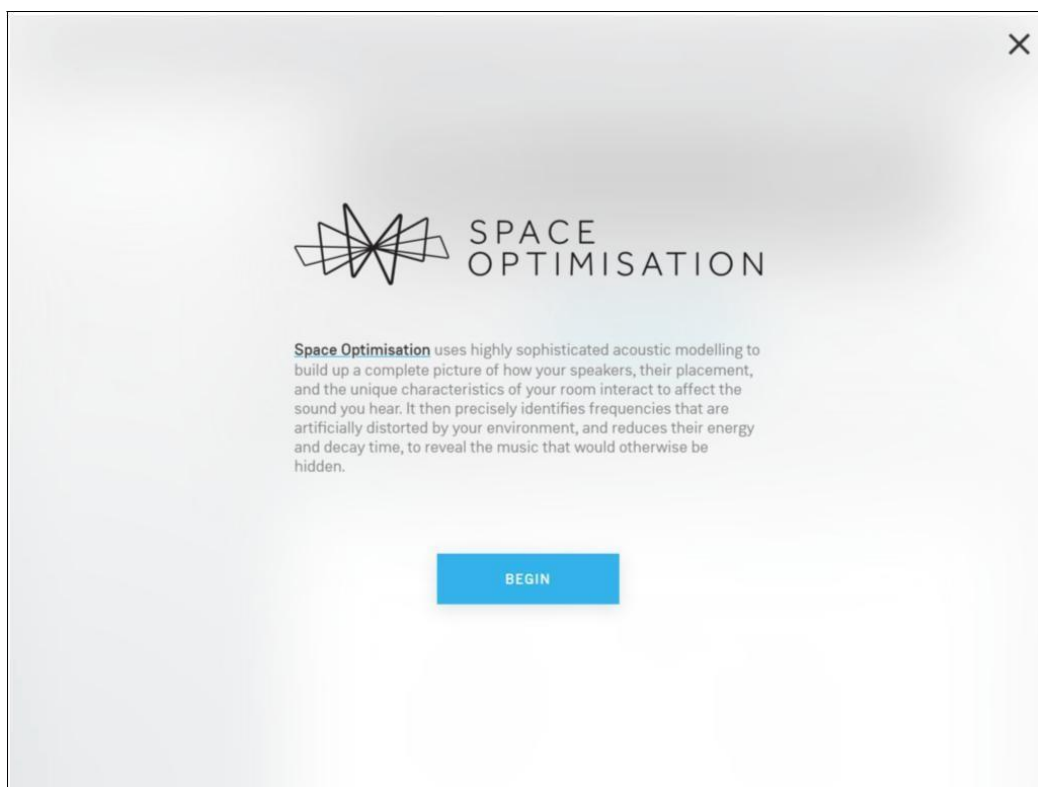
Once your additional subwoofer has been added to your music system it will appear under the **General** tab, as shown below.

Network Player	Akurate DSM >
Front Left	Linn Keltik
Front Right	Linn Keltik
Front Left + Front Right subwoofer	Linn Afekt

You may also add multiple additional subwoofers to your music system; each additional subwoofer will then be listed under the **General** tab, as shown below; note that you can change the assigned channel of an additional subwoofer at any time by clicking on the additional subwoofer's name under the **Change Configuration** dialog and reassigning the channel using the **Channel** drop-down menu or remove it by clicking on the remove **X** button.

2.3 Optimising your music system for the first time

If you are optimising your music system for the first time you will see an **Optimise System** button below the graphic of your music system, as shown above. Click on the **Optimise System** button or the **Add an Optimisation** button in the Space Tab; a dialog with a brief explanation of Space Optimisation will appear, as shown below.



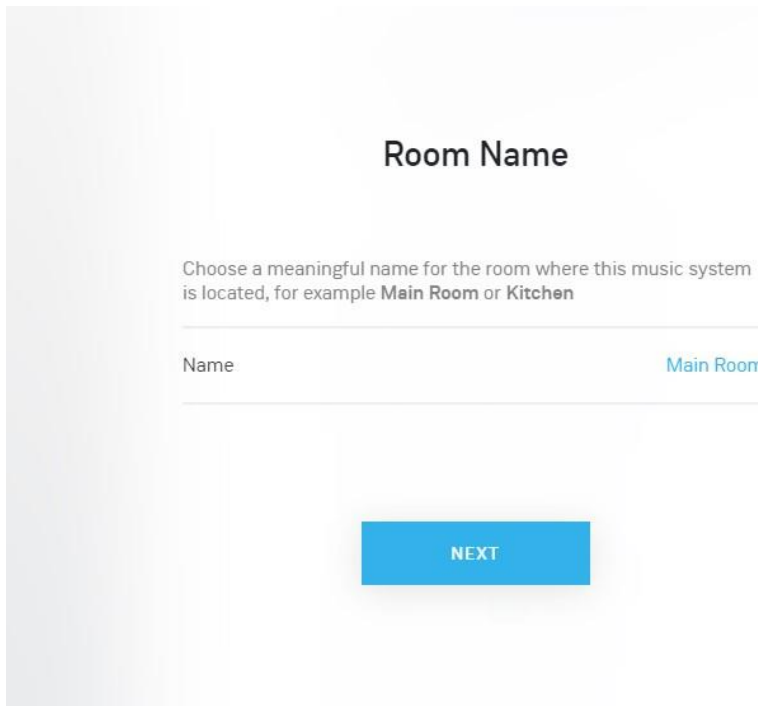
2.4 Room Design

2.4.1 Entering your room information

Space Optimisation takes account of the characteristics of your room, such as room dimensions, construction materials, and features like doors and windows. You must therefore inform your Linn account of your room information. Your Linn account then stores your room information separately from your music system; this makes it quick and easy to upgrade your music system or move your music system to a new room.

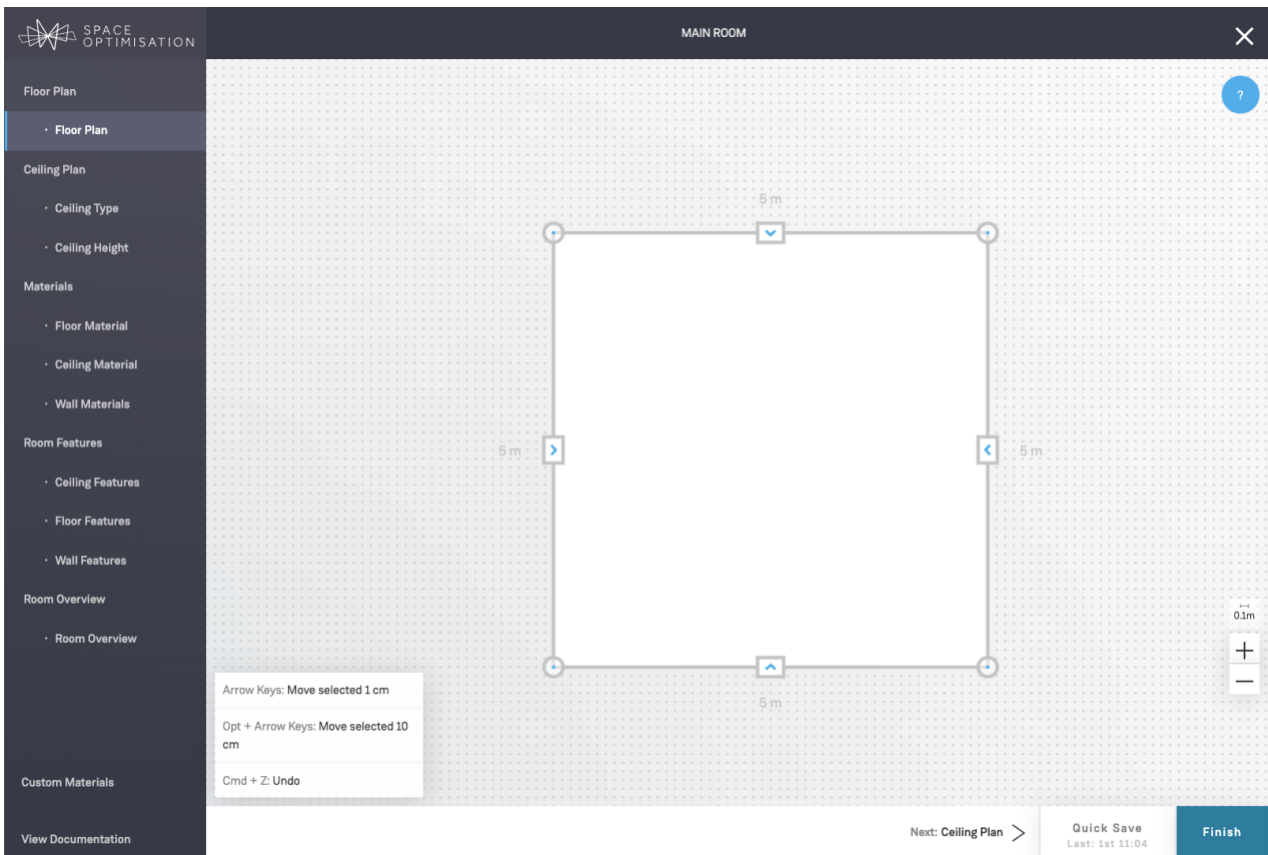
Room name

Click on the **Begin** button; a dialog prompting you to provide a name for your room will appear, as shown below.



The image shows a dialog box titled "Room Name". Below the title, there is a text prompt: "Choose a meaningful name for the room where this music system is located, for example **Main Room** or **Kitchen**". Below this prompt is a text input field with the label "Name" on the left and the text "Main Room" on the right. At the bottom of the dialog is a blue button labeled "NEXT".

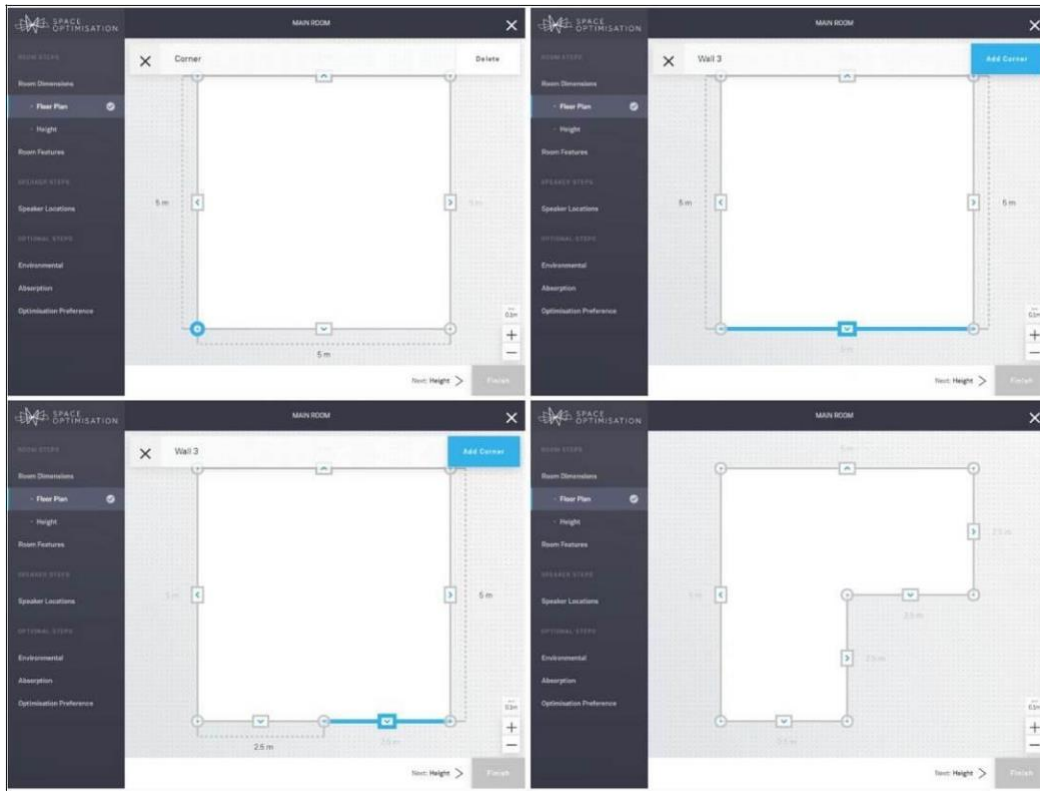
Enter an appropriate name for your room, such as 'Living Room' or 'Kitchen' and click on the **Next** button; the Room Design user interface will appear, as shown below. The Room Design user interface has four key stages: **Floor Plan**, **Ceiling Plan**, **Materials** and **Room Features**. A final **Room Overview** stage allows a preview of the whole design as a 3D rendering to serve as a final check the room has been modelled correctly and represents the model that will be used for calculations. Once the room design has been completed, the Space Optimisation user interface will be navigated to. The Room Design may be edited at any time from the **Room Designs** tab in the home page of the Linn Account and new Room Designs may also be added from there. Note that editing a Room Design after it is used in an Optimisation will show an **Old Room Version** warning against the optimisation, indicating it was created and calculated with an older room design. To avoid this, a Room Design may be cloned first to create a new copy to make adjustments to.



2.4.2 Floor Plan

For Space Optimisation to give you an accurate optimisation you must ensure that you have carefully measured your room; for open plan rooms, all rooms open to the main listening room should be measured. Note that small geometrical features with dimensions less than around 10 cm, such as skirting boards, architraves and windowsills, and any hard furnishings, such as cupboards or wardrobes, should be ignored. All measurements are given in metres.

In the **Floor Plan** step you can define your floor plan using three simple mechanisms, as shown below: you may select any corner with a click, drag it to any desired location, move it in 1 or 10 cm increments using the arrow keys on your keyboard, or delete it by clicking on the **Delete** button in the contextual control bar at the top; similarly, you may select any wall with a click and drag it to any desired location, or move it in 1 cm increments using the arrow keys on your keyboard; and finally, you may add corners to a selected wall by clicking on the **Add Corner** button in the contextual control bar at the top. These mechanisms give you complete control over the floor plan. Note that you can also zoom in and out using the +/- zoom buttons in the bottom right-hand corner or using the scroll wheel on your mouse; the grid size is clearly stated above these buttons. When dragging corners and walls they will snap to the current grid size; adjacent walls will also prefer to snap to a 90-degree angle. Any walls that don't have a precise angle will be highlighted yellow as a warning that there might be a small misalignment between the wall points – try to ensure straight wall angles if this is accurate to the floor plan.



If a mistake is made when creating the floor plan e.g. accidentally deleting a corner or dragging a wall away from the accurate location, the **Undo** button located in the top right can undo a number of previous actions. Note that dragging is composed of a set of actions throughout the drag, so several **Undo's** may be required.

Once your floor plan has been defined click on the **Next: Ceiling Plan >** link in the bottom navigation pane to enter the **Ceiling Plan** stage, as shown below.

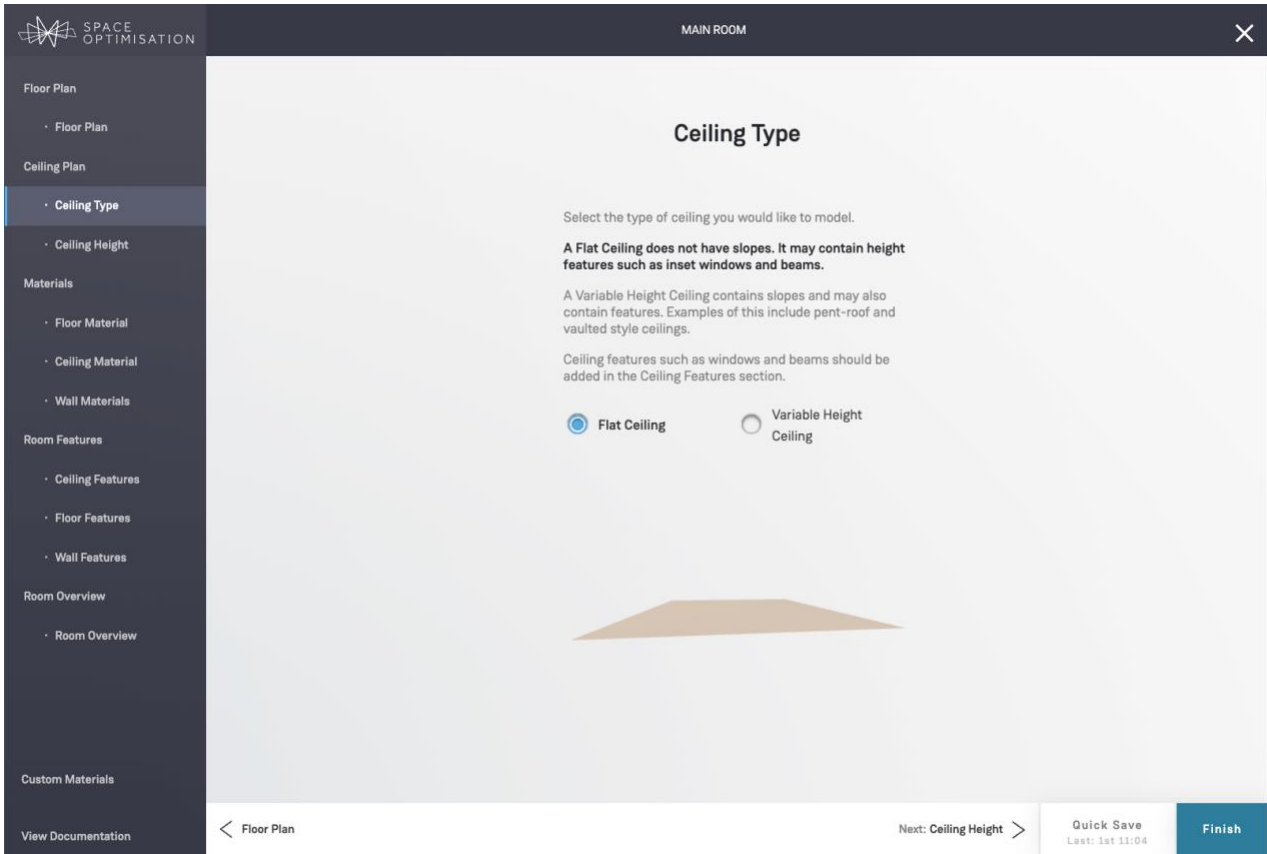
2.4.3 Ceiling Plan

Ceiling Type

The type of modelling steps for the ceiling should be selected first. Selection should be made on the following criteria:

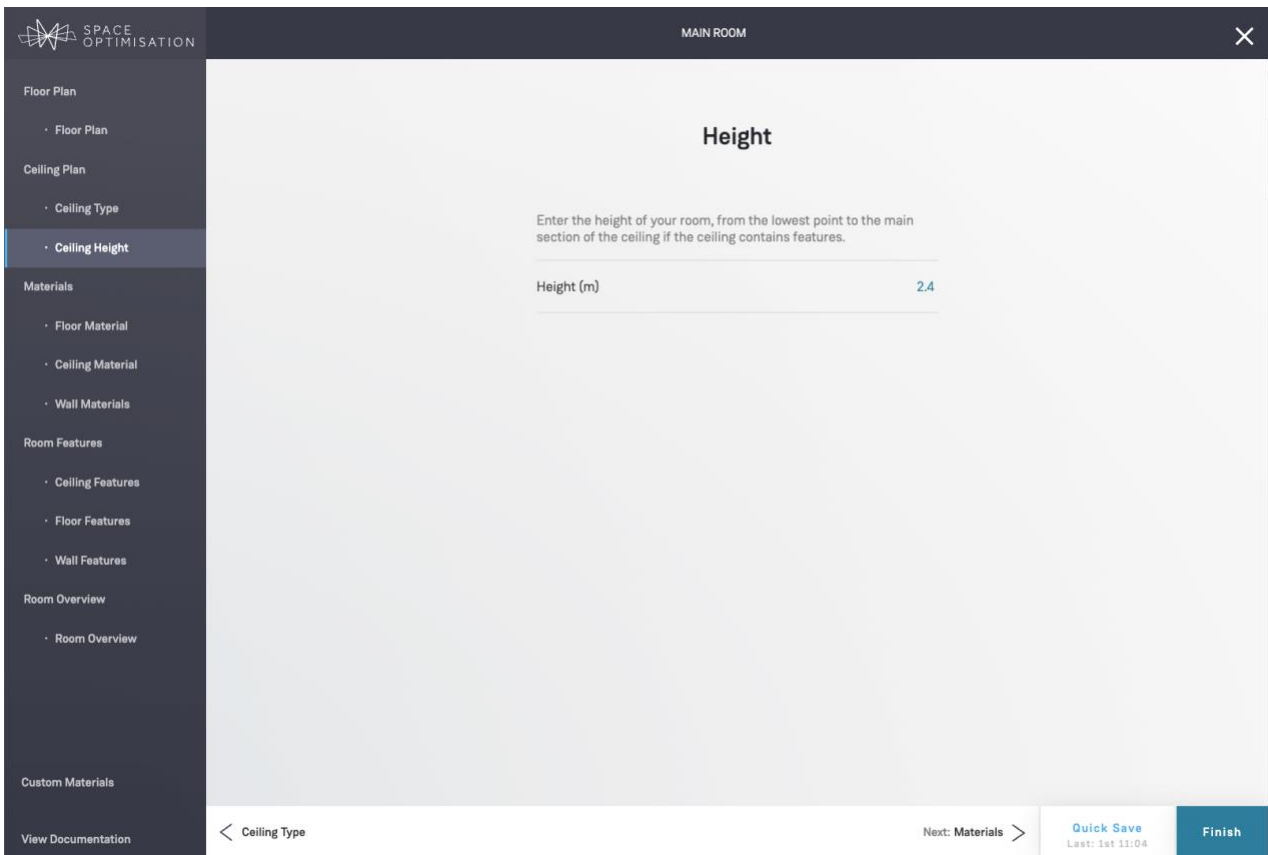
Flat Ceiling: A flat ceiling does not have any sloped but **can** contain features such as inset windows and beams. Steps to model a flat ceiling are much like modelling a floor – the ceiling starts out as a flat surface on which features parallel to it with optional height may be added but the shape of the surface may not be changed. Stepped changes in height may also be applied, similarly to floors. The easiest way to tell if the ceiling should be modelled as a flat ceiling if it is completely flat or if there are features, they are only at 90 degree angles.

Variable Height Ceiling: If the ceiling is more complex and does not meet the **Flat Ceiling** criteria, it may be modelled as a variable height ceiling. This is typically appropriate for ceilings that contain non 90 degree slopes such as pent-roof and vaulted style ceilings. These types of ceilings may also contain ceiling features like inset windows and beams but require extra steps to define the various sections and the shape of the ceiling.



Ceiling Height

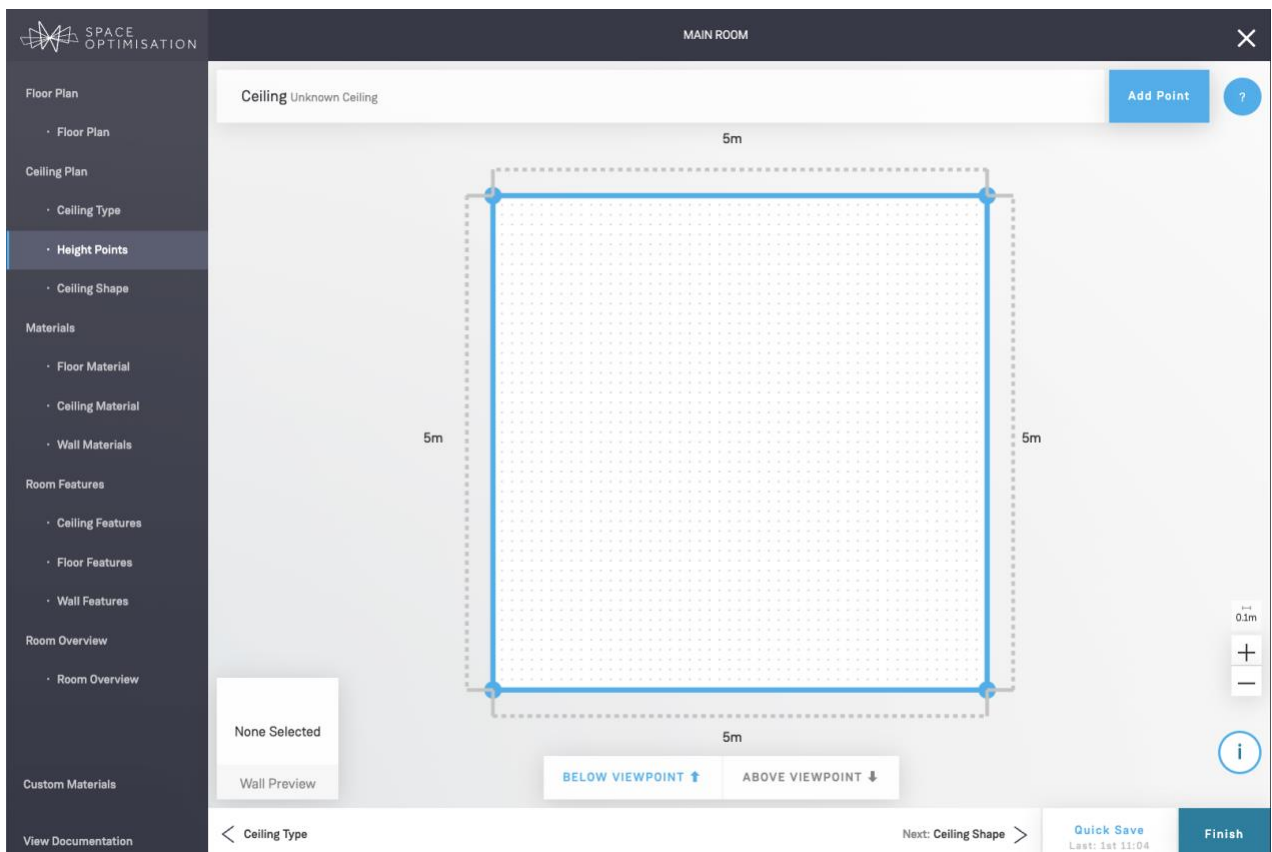
This page only shows up for **Flat Ceiling** types. Here the height of the ceiling is entered as a single measurement. If the ceiling contains no additional features, the height measurement should be from the lowest floor point to any point in the ceiling. If the ceiling contains extruding features such as beams or inset windows, the height measurement should be from the lowest floor point to the most common or biggest area of the ceiling – this will be used as a relative point to define the extrusion height of any ceiling features.



Height Points

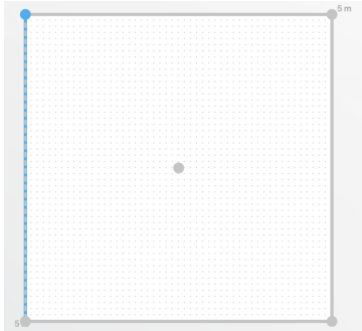
This page only shows up for **Variable Height Ceiling** types.

Here additional height points may be added to accurately model the shape of the ceiling and the height of existing wall corners can be adjusted to define sloped ceilings.

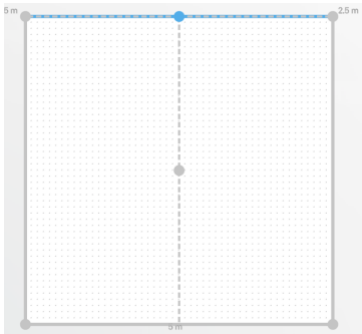


There are 3 types of height points. Clicking on a height point will display the point type in the left side of the top bar.

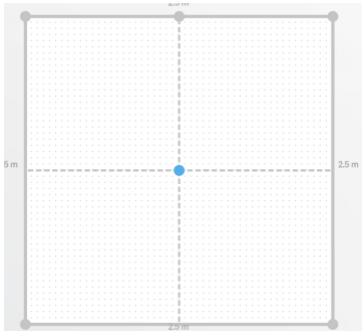
Corner Point: These are points which line up with the points from the floor plan and define the basic two points where a wall joins the ceiling. These points may not be moved (as this will change the floor plan) but the height may be adjusted to lower or raise a corner of the wall.



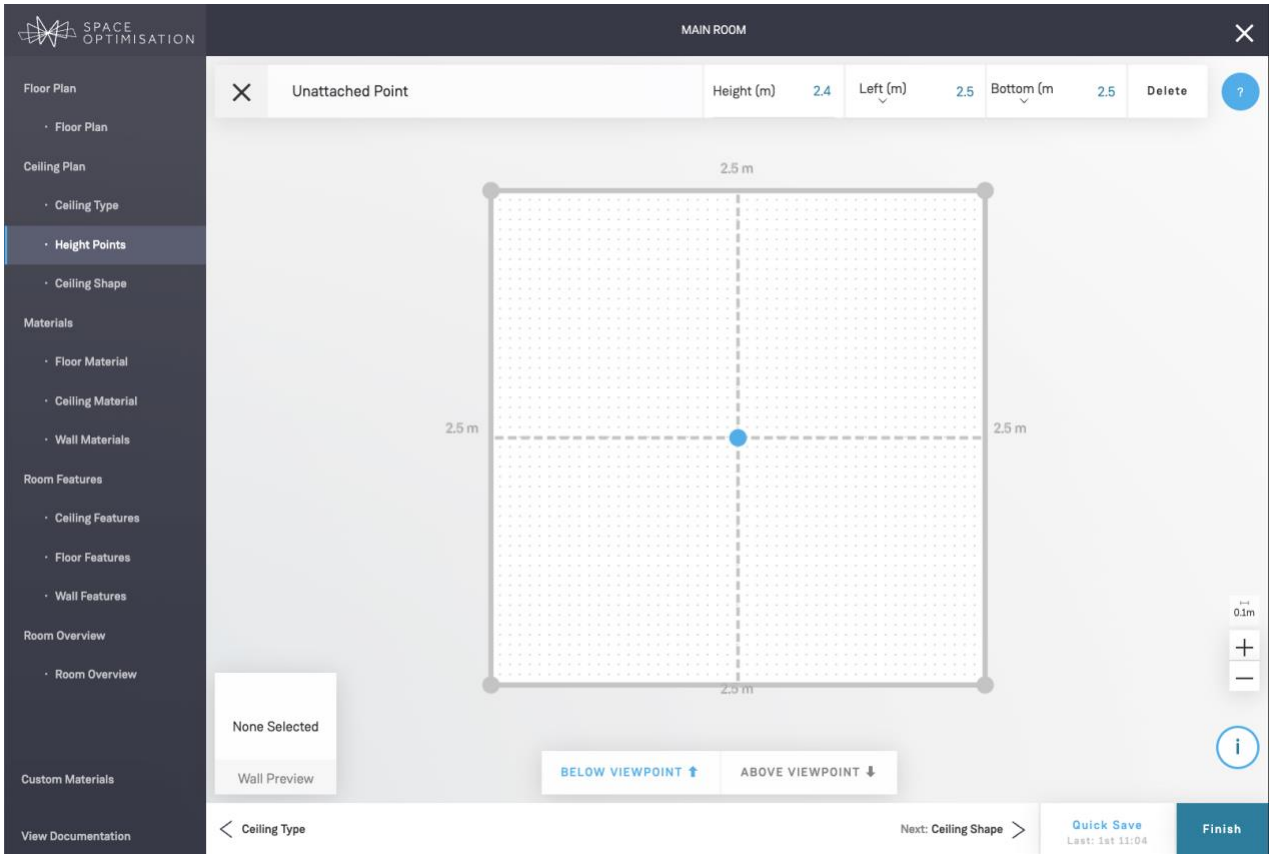
Wall Point: These are additional points where the wall joins the ceiling but may be positioned anywhere along the wall rather than at the corners. These can be used to define pitch-type roofs or more granular changes in height along the wall.



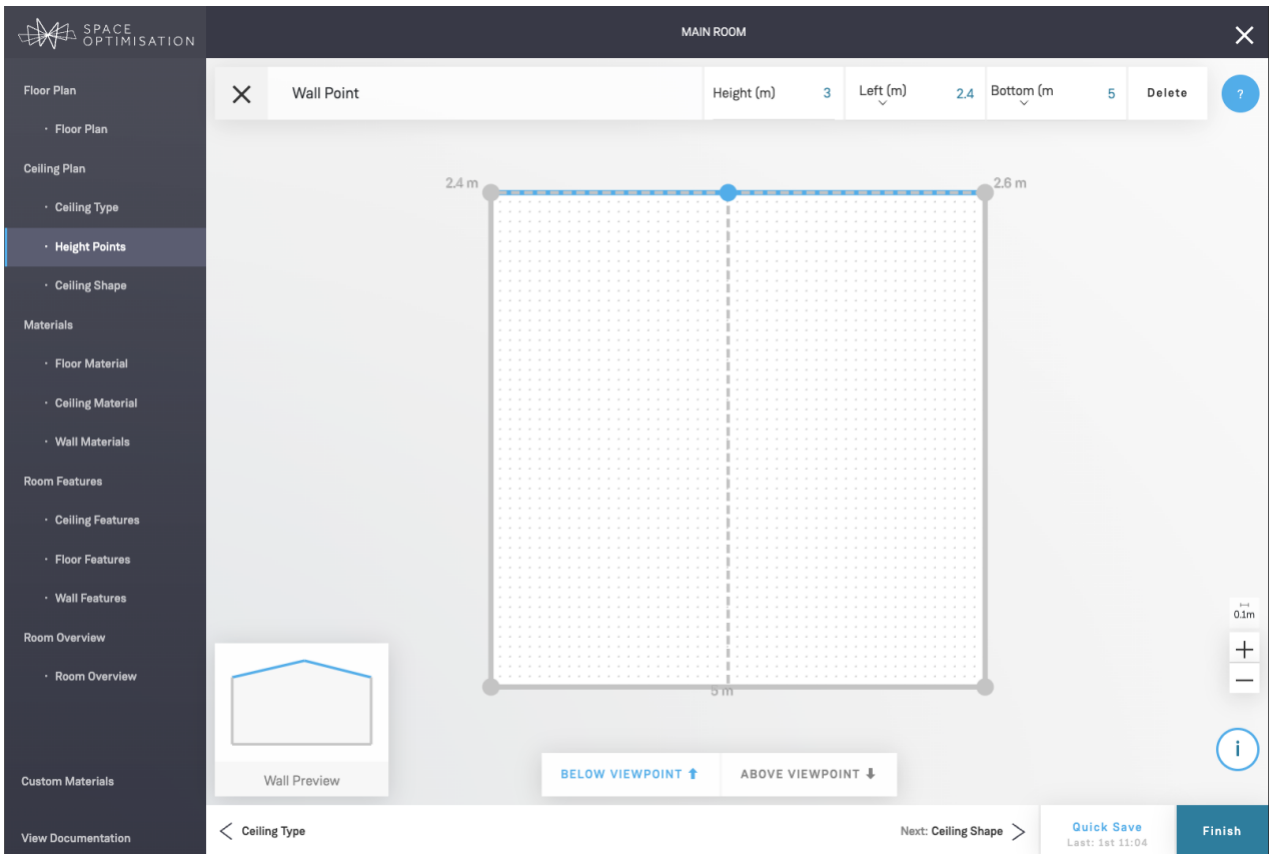
Unattached Point: These are points in the ceiling that define a slope change, but are not part of a wall.



To add a new height point, use the **Add Point** button in the top right of the screen. This will add a new height point to the center of the ceiling. Added height points may be dragged to reposition using the mouse, keyboard arrows or position entry boxes in the top bar. Moving the height point onto a wall line will highlight the wall blue and will change it to a **Wall Point**. Moving a height point away from the wall will change it to an **Unattached Point**.



Clicking on any of the walls will display a **Wall Preview** in the bottom left of the page. This should accurately display the shape of the wall, as looking at it from inside the room. If the shape is incorrect, ensure height points are correctly added to the wall, and all the heights of the wall points are set correctly.



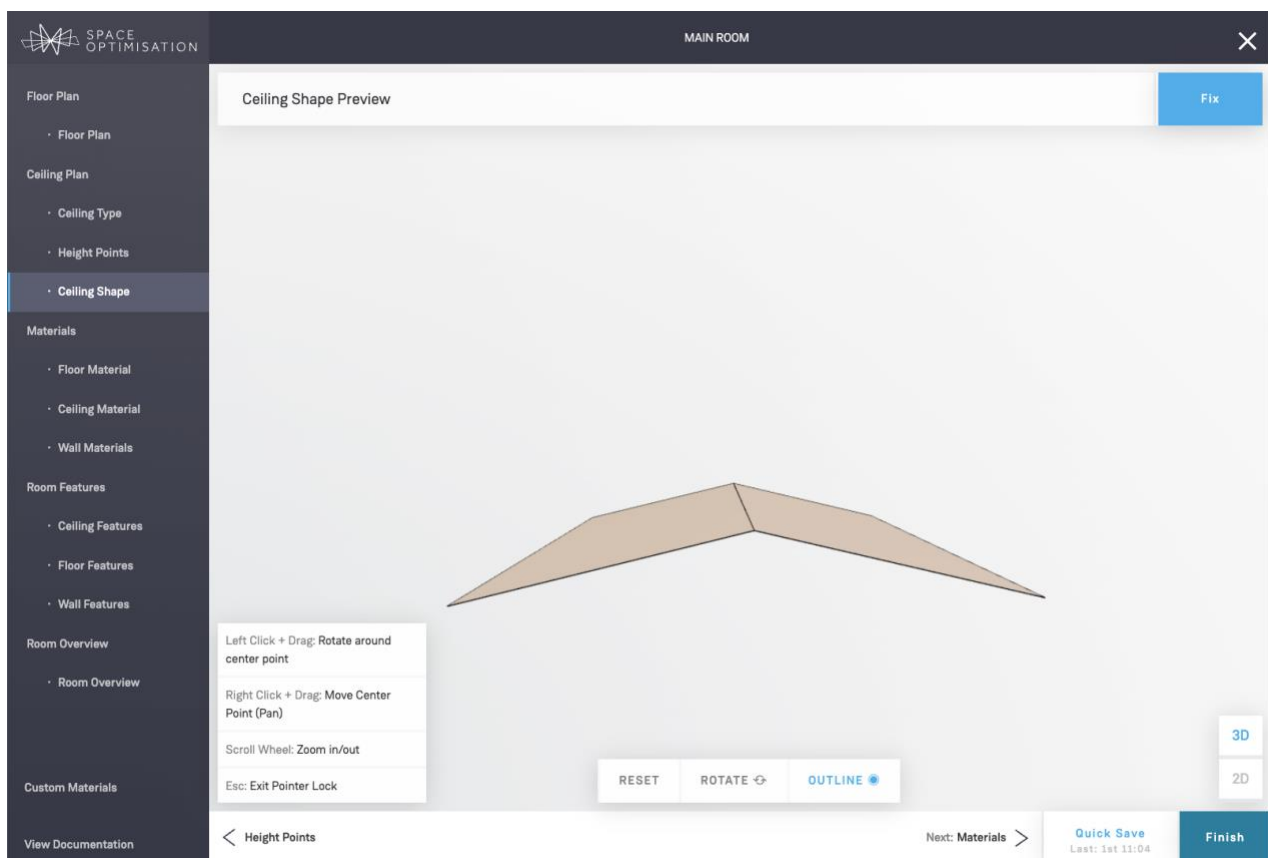
To make measurement and previewing more flexible, Below or Above viewpoints may be toggled at the bottom of various ceiling views. Below Viewpoint renders the plan from the perspective of being in the room and looking up at the ceiling. Above Viewpoint renders the plan from the perspective of being above the room and looking down at the ceiling.



Ceiling Shape

This page only shows up for **Variable Height Ceiling** types.

The **Ceiling Shape** step allows a 3D rendering overview of what the ceiling model looks like, in a way that is hard to see in a 2D plan. The 3D controls are outlined in the bottom left popup. The 3D rendering is initially shown from a side on view as the clearest perspective to judge the various ceiling slopes, however it can be rotated to be viewed from any position using the mouse.

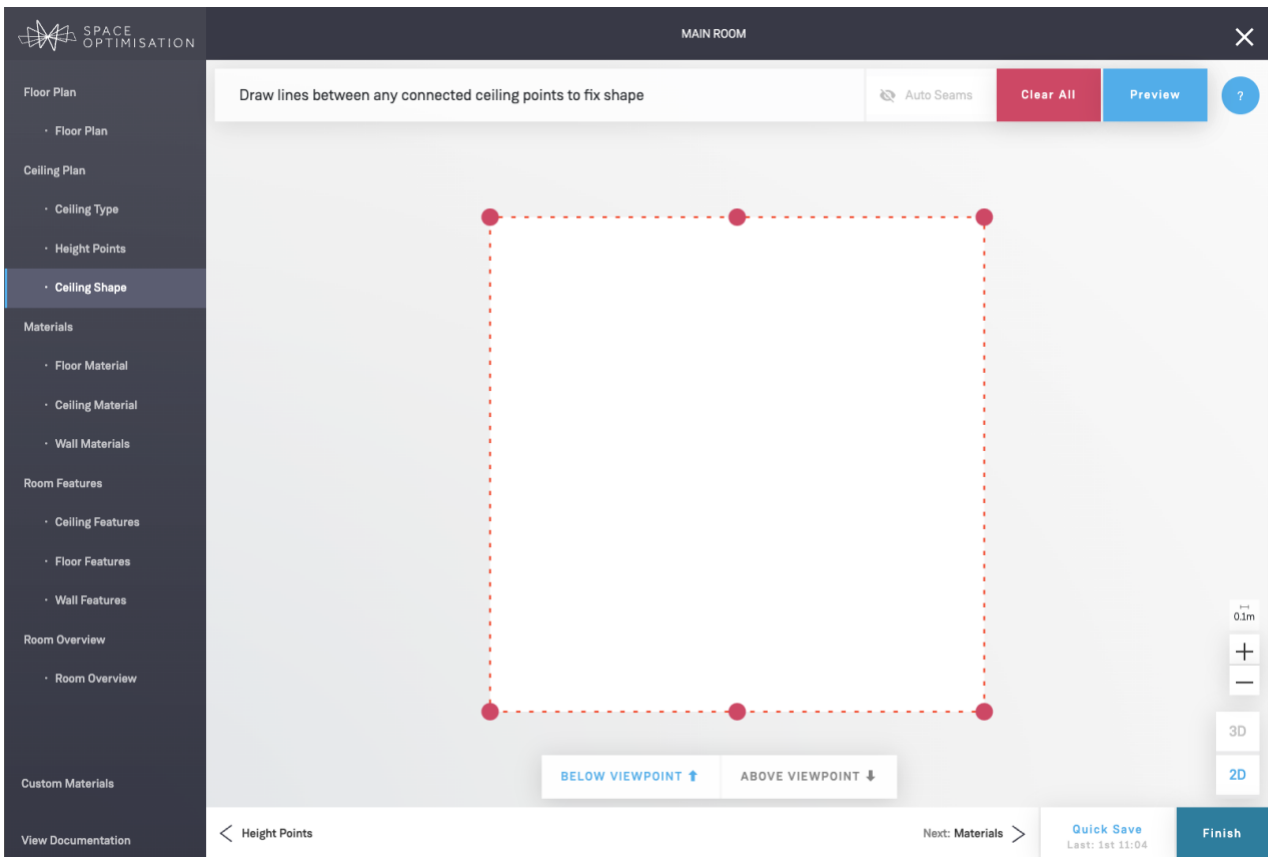


An algorithm is used to determine correct ceiling sections based on the provided height points in previous step. If this shape is correct, the next step (**Materials >**) can be proceeded.

If the shape is not correct, some manual height point connections will need to be defined. The **Fix** button in the top right of the screen can be used to add extra information to correct the model.

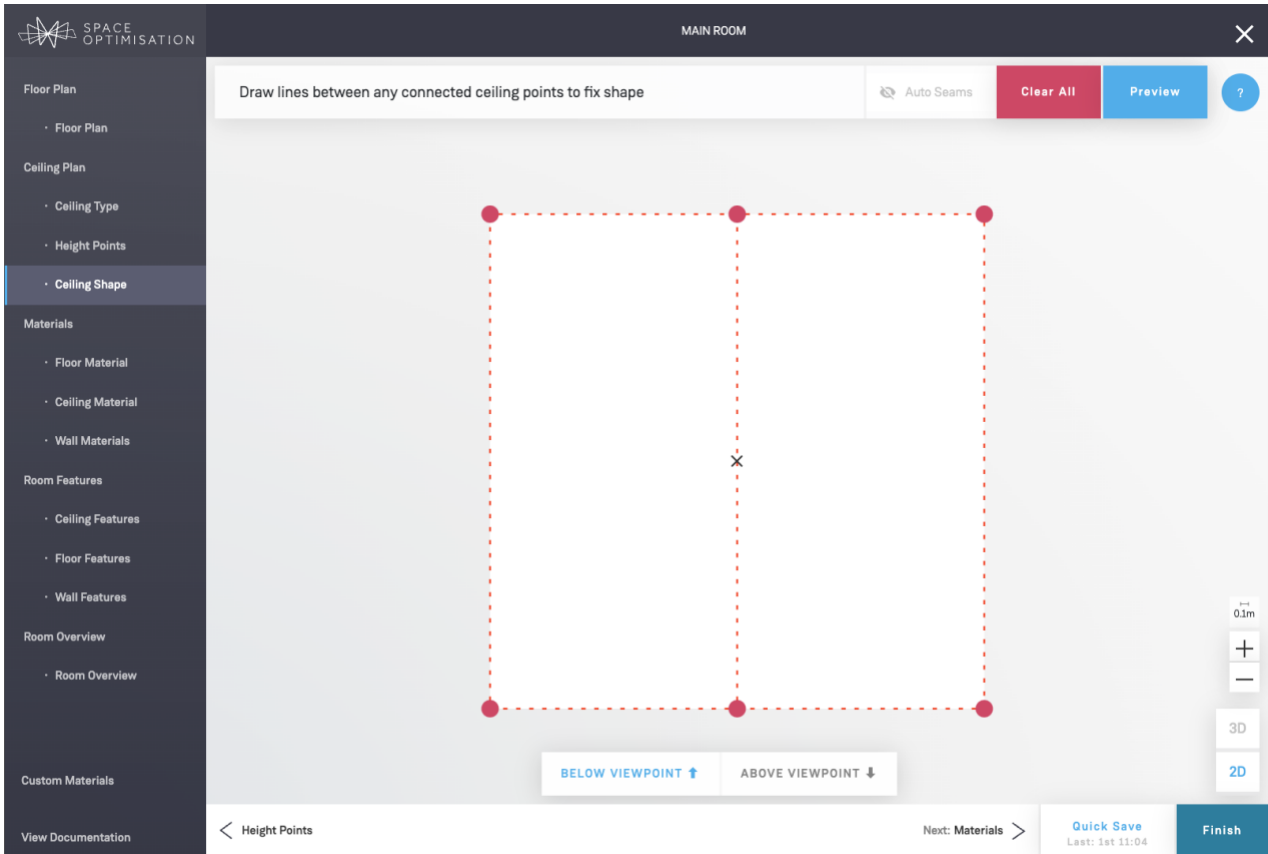
Fix Ceiling Shape

This step is only necessary if the Ceiling Shape Preview does not match up to the shape of the ceiling. For most simple ceilings this step should not be needed or minimal adjustments will need to be made.



To generate the correct variable height ceiling shape, connections between various height points need to be accurately defined. An algorithm tries to do this automatically, but some user adjustments/further input may be required. Toggling the **Auto Seams** visibility button shows the automatic connections generated.

The connections should map onto physical lines/seams that are visible when looking at the ceiling. For example, in a pent-roof ceiling show below, there should be a line visible in the middle of the ceiling that connects the middle height points of the front and back wall. If **Auto Seams** don't automatically generate this, a manual seam can be defined by clicking on the start and end height point of a seam, which will add a line as shown below. This splits the ceiling into two sections, with each section typically representing a non-changing slope. Any changes in ceiling slope should be modelled either automatically in **Auto Seams** or by manual input.



User defined connections may be removed by pressing the remove button **X** in the middle of the seam or the model can be reset deleting all user defined connections by pressing **Clear All** in the top bar.

After defining any connections it's advised to preview the 3D rendering of the changed model by pressing **Preview** in the top bar. This iterative approach is advised to avoid manually inputting unnecessary connections.

2.4.4 Materials

The **Materials** sections consists of **Floor Material**, **Ceiling Material** and **Wall Materials**. In these views the construction material for the floor, ceiling and wall surfaces should be specified from the dropdowns. Room feature materials will be specified in the following **Room Features** section.

Concrete describes any solid or heavy construction, including concrete or stone.

Suspended Floor describes any suspended construction, including suspended floorboards.

Suspended Ceiling describes any suspended construction, including suspended plasterboard or ceiling panels.

Unknown Floor/Ceiling/Wall material provides an averaged absorption coefficient which should be used when the construction material is unknown.

If the desired material for a surface is not available from the dropdowns, the closest matching material may be selected and its absorption adjusted in the Absorption section. Description of Custom Material usage can be found in [Custom Materials 2.3.9](#) section.

2.4.5 Room Features

In the **Room Features** step you can define features like doors and windows as well as any stepped height/depth changes on each surface. You now have the ability to correctly place the features on each surface; the new version of Space Optimisation correctly considers the effects of the placement of features

on the interaction between your room and your speakers. Note that any soft furnishings, such as carpets and curtains, and any decorations, such as paintings and mirrors, should be ignored.

All Room Feature views share similar views and mechanisms for adding, editing and previewing features. Details of their usage is provided below.

Adding a Feature

When a room surface is selected in a 2D view, the **Add Feature** button in the top bar can be used to add a new feature to the surface. If any features are selected, clicking the surface will re-select it.



Editing a Feature

Once a feature is added via the **Add Feature** dialog, its parameters can be edited at any time by selecting the feature and using the options presented in the top bar.

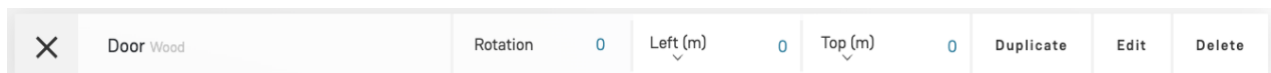
Rotation: rotates the feature clockwise around the center point. Negative rotations may be entered for convenience but will be automatically converted to positive rotations in the opposite direction.

Left/Right/Top/Bottom: Re-positions the feature relative to a measurement line in a particular direction. Clicking on the Left/Top label switches it to the opposite direction input.

Duplicate: Creates a copy of the feature with the same parameters.

Edit: Brings up an edit dialog that can be used to edit remaining feature attributes.

Delete: Deletes the feature.



Feature Parameters

Add Wall Feature

Type	Door	▼
Material	Wood	▼
Width (m)	1	
Height (m)	1	
Depth (m)	1	?
Inset Materials	Default	>

CANCEL ADD

Type: Convenience preset to provide a default name and materials for a particular feature.

Material: Construction material of the surface of the feature.

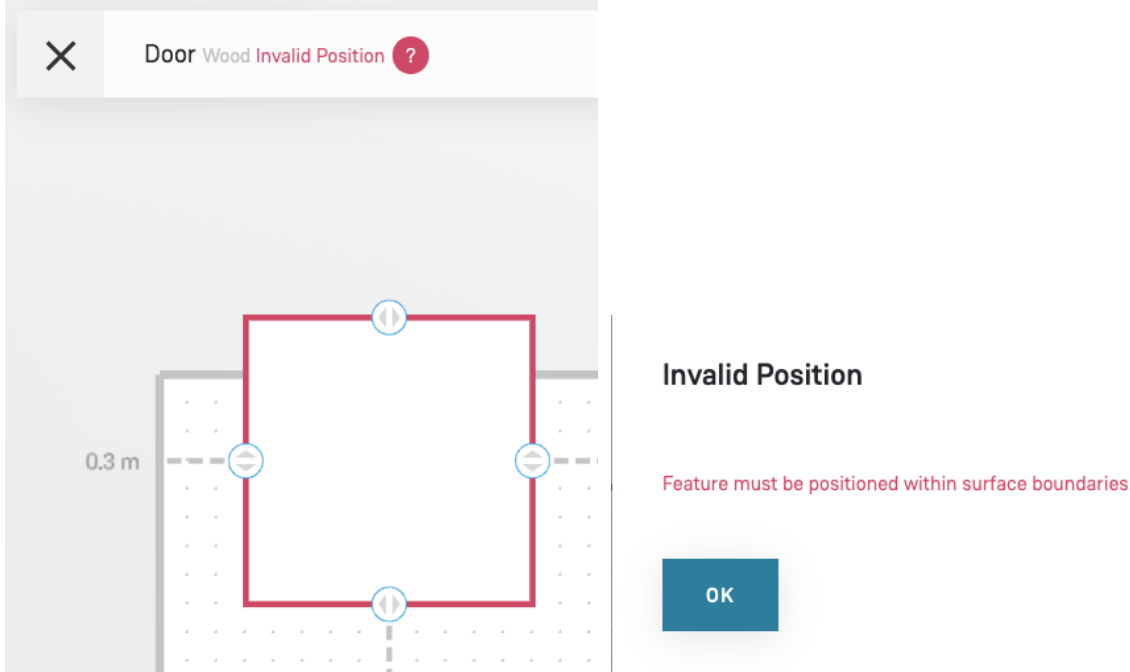
Inset Materials: Applicable to wall depth features and floor/ceiling height features. Allows customization of the materials of the insets of the feature e.g. an inset window might have wooden insets.

Resizing a feature

Features provide drag-to-resize controls, which may be useful if a feature sits inside a particular section of the room. Clicking and dragging a side of a feature allows stretching the feature from any side to resize as needed.

Feature Positioning

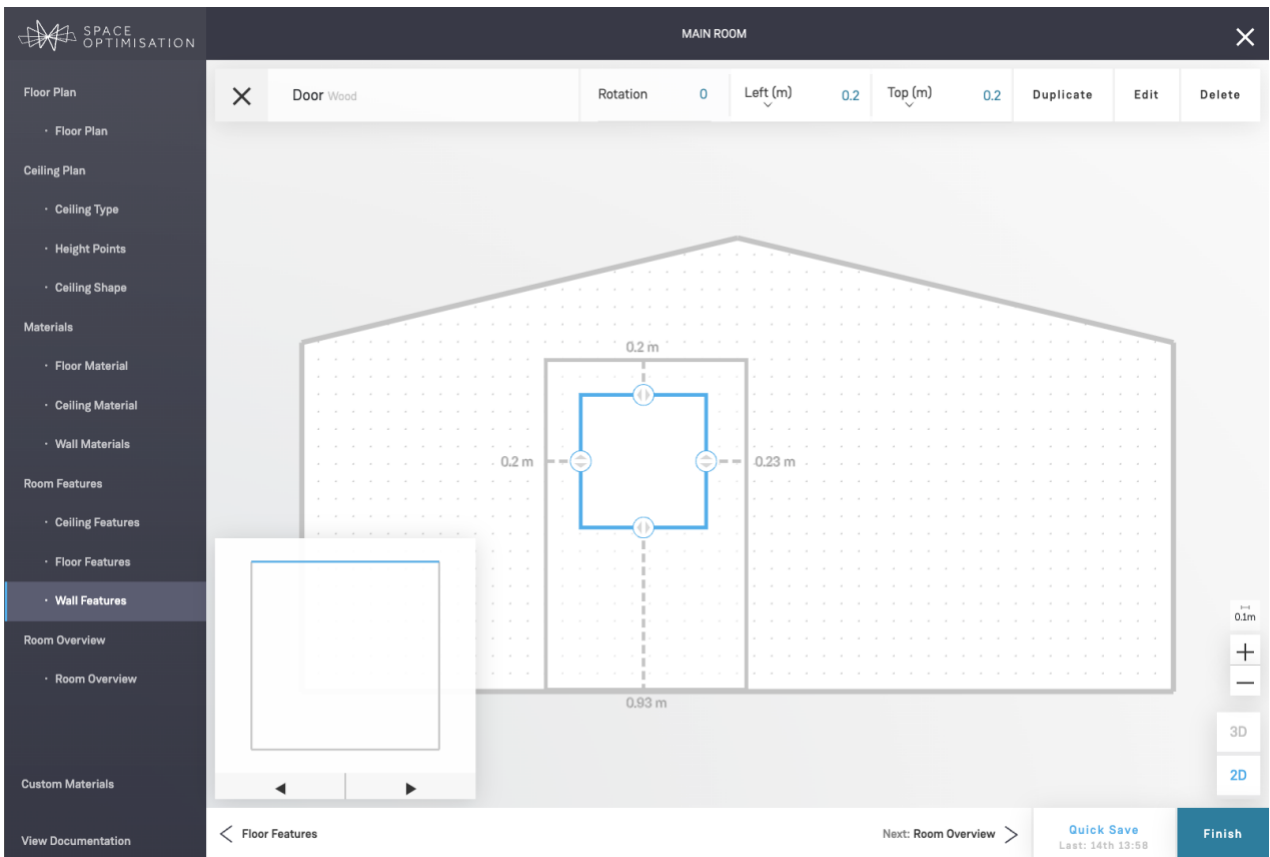
If a feature is placed in an invalid position it will be highlighted red. The description for the error can be seen by clicking on the red question mark in the top bar.



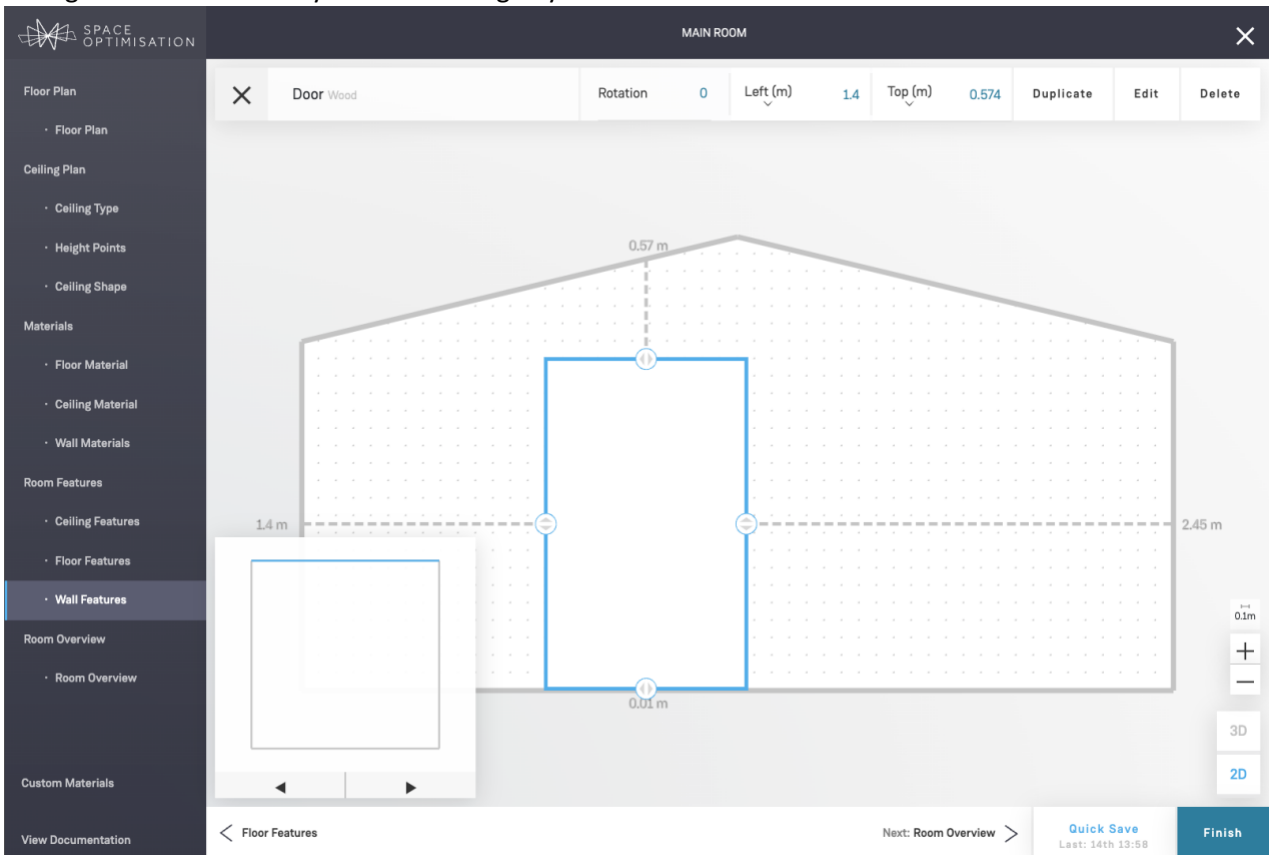
Overlaying Features

Features can be overlaid on top of each other to model complex features like doors with a window inside it. The last placed feature takes priority when clipping, so features should be added in order of largest first, to ensure larger features don't overlap smaller features, much the same way features are added on top of the wall/floor/ceiling surface. The layering effect can be previewed when placing features.

If the door is created first with the window added afterwards, the window goes on top of the door and is visible from within the room.

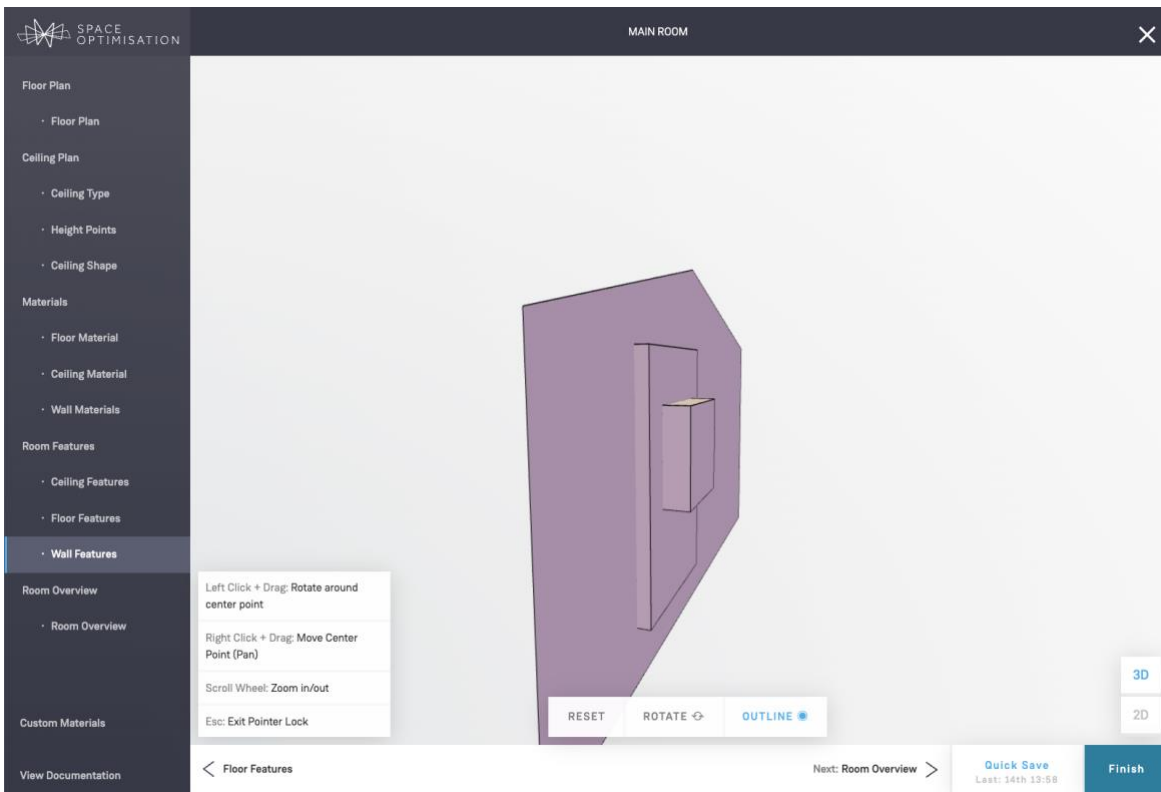


If the window was created first with the door added afterwards, the door would go on top of the window, hiding the window entirely without having any effect.

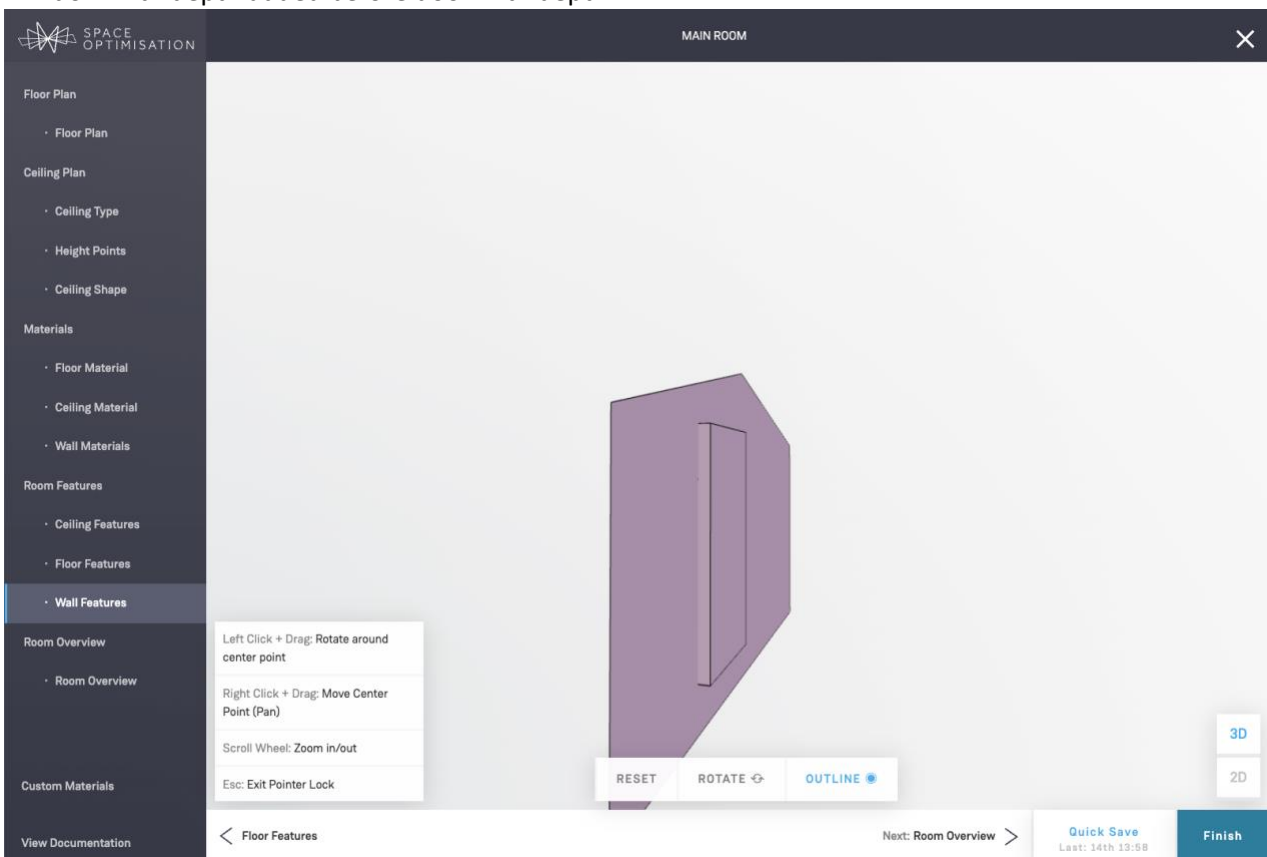


The same effect takes place for depth/height features. This can be previewed in the 3D rendering.

Door with depth added before window with depth:



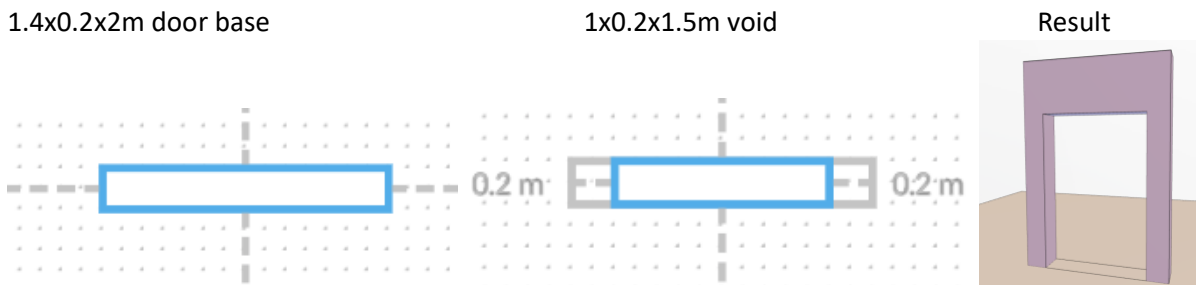
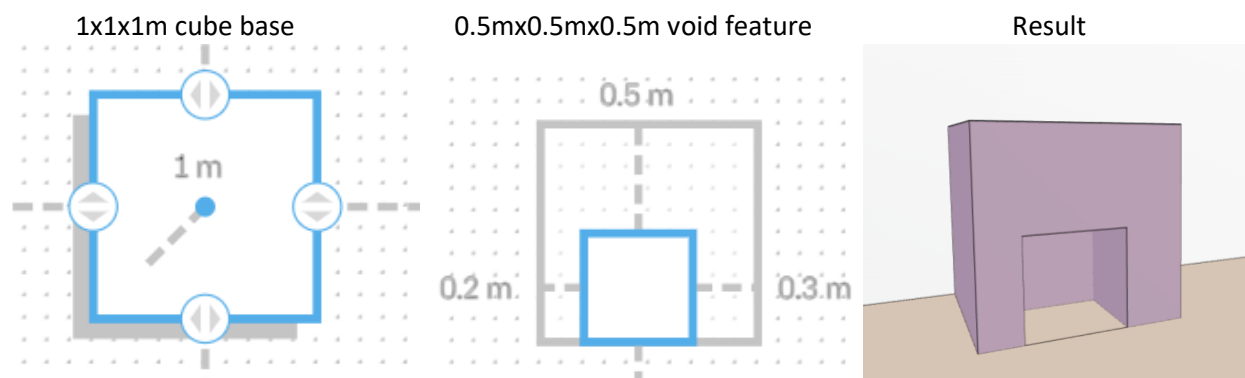
Window with depth added before door with depth:



Void Features

Most complex feature shapes can be modelled by composing multiple depth features next/on top of each other. However, in some cases, an empty space needs to be created at the bottom section of a feature that cannot be modelled by stacking features, as all features typically join the surface they are on.

Adding a **Void Feature** (specifiable via the tick box in the Add Feature dialog) creates an empty space that can be used to carve out a section from an existing feature. The void feature needs to be inside another feature and bordering at least one of its edges to have the desired effect. The void can be added after the base feature is created and positionally behaves the same as a normal feature, with its height/depth extending from the base surface. This can be used to carve out a small section of the feature such as a fireplace or create a void all the way through a feature such as an open doorway. Examples below.



Zooming

All 2D rendering views can be zoomed in and out by using the mouse wheel or the +/- buttons in the bottom right of the screen. The size in meters of the surface grid will be indicated by the number above the zoom buttons. Selecting on a particular object e.g. feature or height point will zoom the view centred on that object.



Dragging

All 2D rendering views can be repositioned on the screen by clicking the surface or background of the view and dragging the mouse.

3D Preview

All surface feature views have a 2D/3D toggle in the bottom right of the screen. The 2D view can be used to position and edit features, with the 3D view providing a helpful way to preview depth.

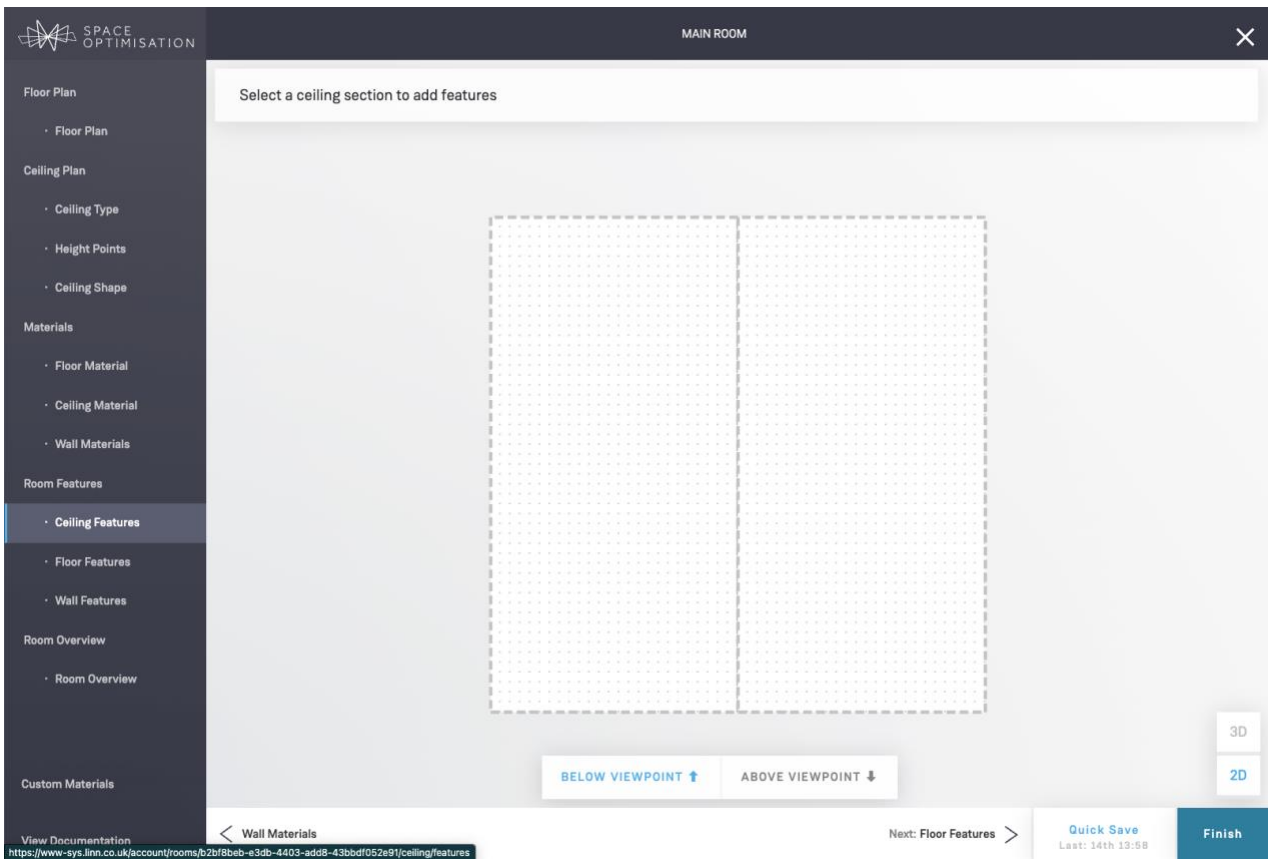


2.4.5.1 Ceiling Features

Ceiling features such as skylights, inset windows, beams and stepped height changes can be modelled as ceiling features.

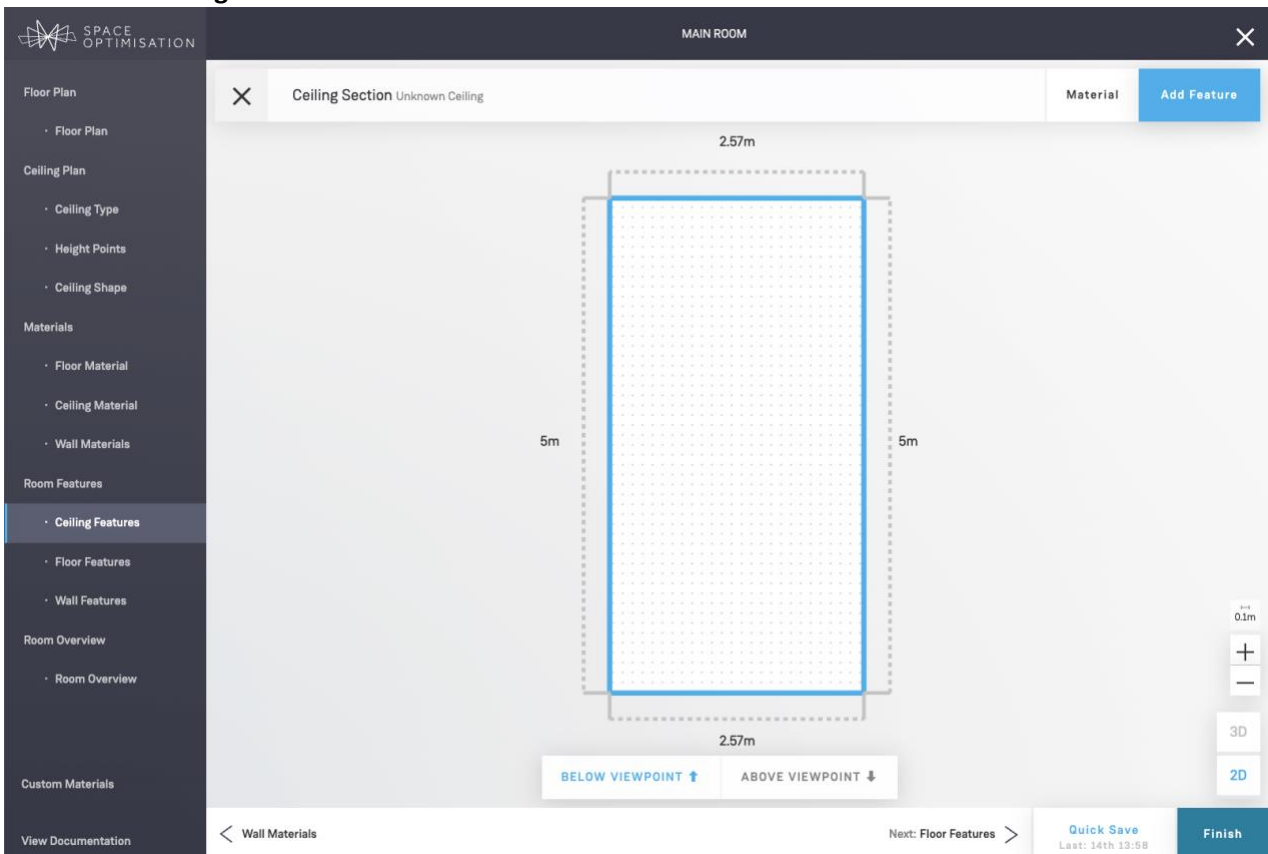
Ceiling Sections

Non flat ceilings will be split into sections of the same slope. If the ceiling features sections of various slopes, features need to be added per section. The 3D shape of the overall ceiling with features can be previewed from this view.



Ceiling Section

Upon selecting a ceiling section from the previous view or if the ceiling only has one slope, the below view will be shown. If adding features to multiple sections, using the close button in the top bar will navigate back to the **Ceiling Sections** view.



In this view, features can be added to a ceiling section and previewed. Below/Above viewpoint toggle may be used depending on user preference of viewing the drawing from above or below the ceiling perspective.

2.4.5.2 Floor Features

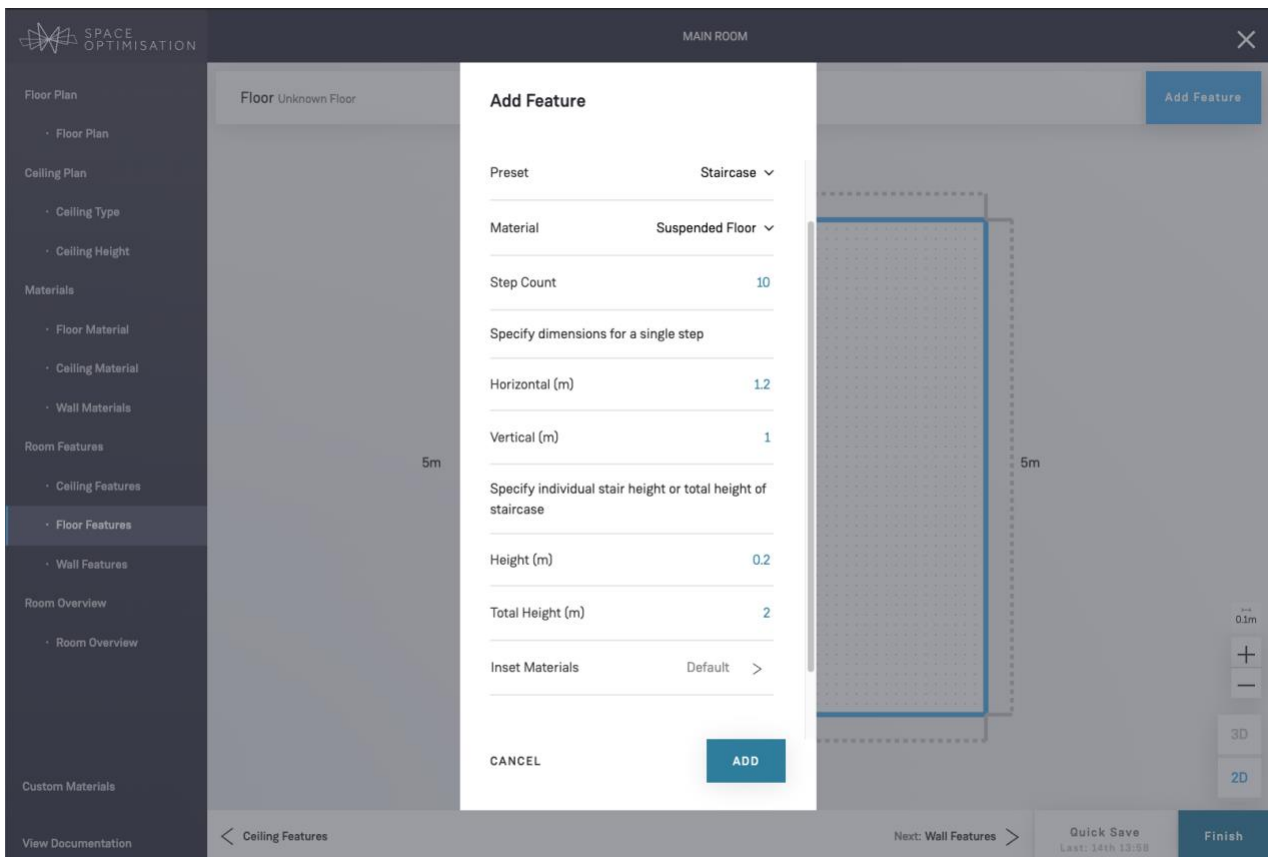
Several categories of floor features may be modelled in this step.

Basic floor features

Simple features like kitchen islands or pillars, that are touching the floor and may border a wall or ceiling. These can be modelled in the same fashion as wall and ceiling features.

Staircases

Staircases may also be modelled as a floor feature. These may be built up from a floor feature for each step or use the **Staircase** preset.

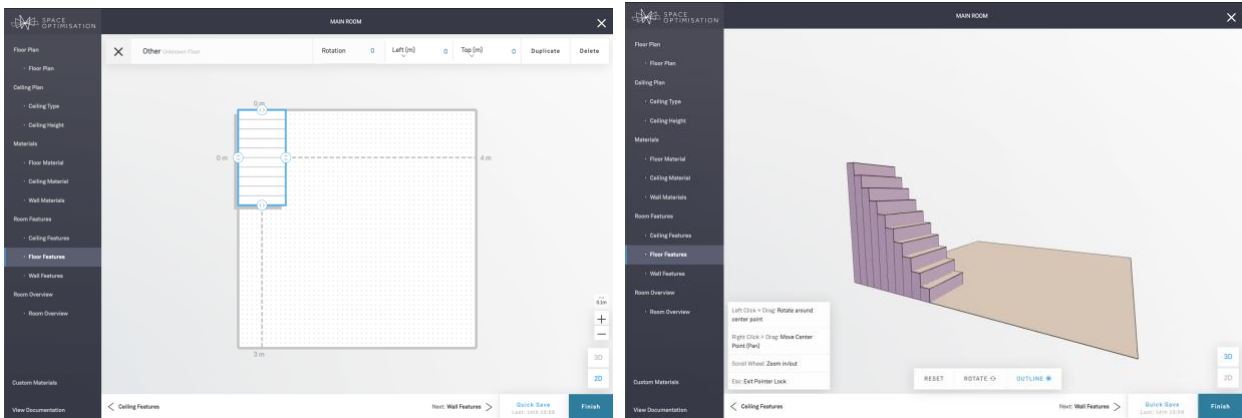


Step Count: Specifies how many steps are in a staircase. This helps to work out correct shape, providing the dimensions of a single stair.

The height may be provided in one of two ways.

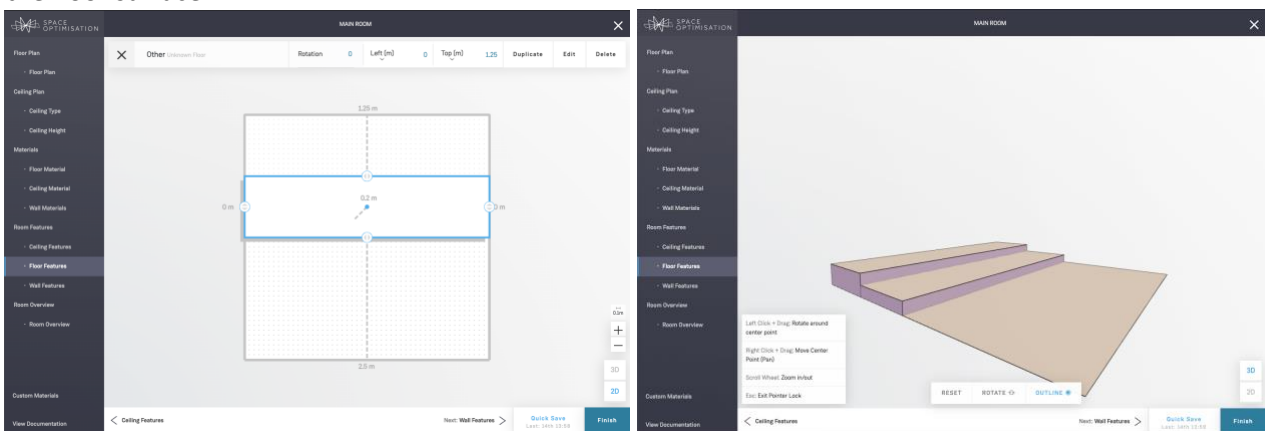
Height: The height of the first step, assuming all steps are equal height. If the staircase goes up to the ceiling, provide **Total Height**.

Total Height: Total height of the staircase. Can be provided instead of individual step height to avoid rounding errors and calculates the step **Height** based on the number of steps.



Stepped Floors/Raised areas

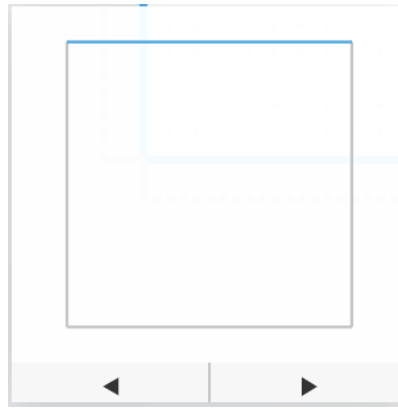
Stepped floors or changes in floor level may also be modelled as a floor feature. Similar steps to adding a normal feature can be taken, with different floor levels being modelled as features with height on top of the floor surface.



2.4.5.3 Wall Features

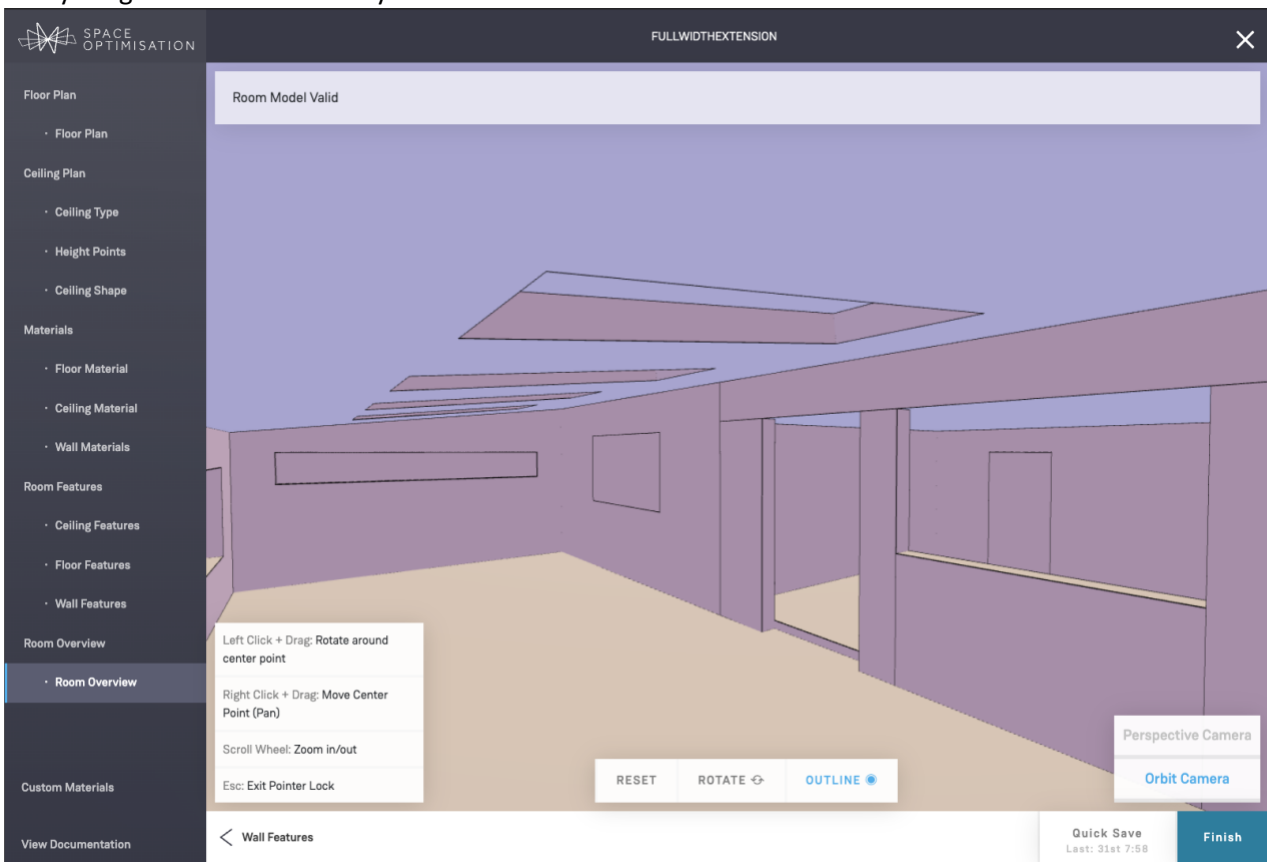
Features that sit or extrude from a wall such as doors, windows, alcoves or fireplaces can be modelled as wall features. Partition walls may be modelled as a wall or floor feature, depending on what is simpler based on rotation and room layout. It is recommended to model all open spaces extending from within the main room, however in the cases of extended open spaces, far away rooms may have diminishing returns, and entrances to these rooms may be modelled as a wall feature with full absorption (**Anechoic** material) to model all sound entering these rooms not returning back to the listening room. Decoration features such as paintings or mirrors should not be modelled as their light construction material will have negligible effect.

The floor plan mini-map in the bottom left corner shows the currently selected wall. Left/Right arrows at the bottom of the mini-map can be used to cycle through the walls in the room, or a wall on the mini-map can be clicked directly. Note the 2D wall renderings shown when placing features are always rendered from the viewpoint of looking at them from within the room rather than from the outside the room.



2.4.6 Room Overview

As the final step in the Room Design, the overall room model can be previewed as a 3D rendering, ensuring everything is modelled correctly.

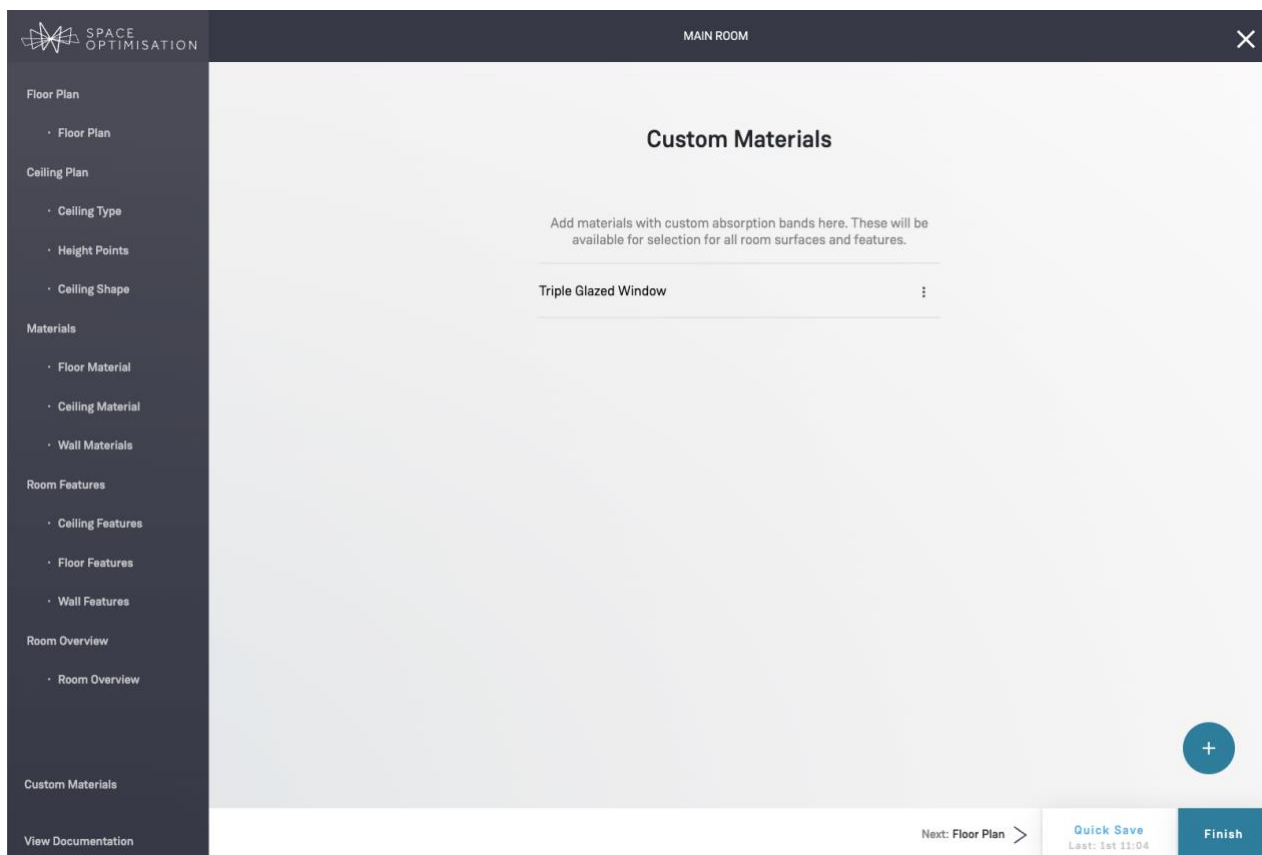


The status in the top bar will indicate whether the algorithm has managed to create a valid 3D model that can be used for optimisation calculations. “Room Model Valid” indicates everything is good with the model and it can be used for calculations. “Room Model Invalid” will show if there are any errors when creating the model for complex rooms e.g. gaps in the room that could not be closed or overlapping features that were not correctly cropped. The 3D rendering should highlight any problematic portions of the room in red – it’s advised to simplify or move any features around those sections if this error occurs.


This view features an additional **Perspective Camera** which may be selected in the bottom right of the screen. This allows first-person like controls for movement and mouse rotation that may be more useful when looking around the room. Controls for both cameras are shown in the bottom left of the screen.

2.4.7 Custom Materials

Custom Materials can be added to allow any room surface to use a non-default construction material. The Custom Materials management view can be found in the bottom of the left navigation bar. These require a precise value input of absorption coefficients so this feature is best used for materials that provide this information such as acoustic panels or materials with values that may be approximated from existing construction materials. Otherwise, the [Absorption 3.3](#) step adjustments may provide less error prone tweaking.



Here Custom Materials for a particular room can be created, edited or removed.

To create a new custom material, click on the add button in the bottom left . In this view, the name and the absorption coefficients can be specified. The absorption coefficients are values from 0 to 1 indicating a material that reflects 100% of the sound at 0 and absorbs 100% of the sound at 1. The template dropdown can be used to browse coefficient values of the default materials. If unsure, the custom values are best kept low unless modelling things like acoustic panels designed to be absorptive.

Add Material

Custom materials require absorption octave bands centered on 31.5 Hz and 63 Hz. Products like acoustic panels usually have an absorption chart that should provide these values. If unsure, these are best kept low for typical construction materials - usually around 0.1.

A template can help provide starting values for absorption coefficients from one of the default materials.

Template	Glass - Double Glazed
Name	Glass - Triple Glazed
Band 32	0.2802
Band 63	0.2714

CANCEL SAVE

The band32 and band63 refer to octave bands centered around 31.5 and 63hz. These can usually be found on manufacturer's website if using materials such as acoustic panels. The values from manufacturers may be provided in Sabin units rather than absolute absorption coefficients, with Sabins being relative to the size of the feature. In which case a conversion will have to be calculated to get the absolute values, with the below formula.

$$c = \text{sabins} / \text{area}$$

Where:

C = absorption coefficient value we need for a frequency band

S = sabin values provided for the same frequency band

Area = surface area of the feature sabins are provided for, typically in square feet

As a simple example, given a 4ft wide x 4ft high acoustic panel where a manufacturer graph states absorption at 63hz is 10 sabins, calculate the coefficient value for band63 as follows:

$$\text{surface area} = 4 * 4 = 16\text{ft}^2$$

$$a = 10 / 16 = \mathbf{0.625}$$

2.5 Speaker and Listening Locations

Space Optimisation takes account of the characteristics of your speakers, such as the position of each drive unit and the response of bass reflex ports. You must therefore inform your Linn account of your speakers' locations, as well as your listening location.

Click on the **Finish** button in the bottom navigation pane to save your Room Design and enter the **Speaker Locations** stage; you will be prompted to select the speaker location scenario that best matches your situation, as shown below. The **Speaker Locations** stage is then split into one or two stages, **Practical** and/or **Ideal**, depending on your speaker location scenario. It is recommended that you determine the ideal locations for your speakers using the [Tune Dem](#) method to achieve the full potential of both your music system and Space Optimisation; however, sometimes you may need to make a compromise and move your speakers to more practical locations, or you may not have the ability to determine the ideal locations.

2.5.1 Speaker Locations

SPACE OPTIMISATION ALL FLOOR

SPEAKER STEPS

Speaker Locations

· Ideal

OPTIONAL STEPS

Environmental

Optimisation Preference

Absorption

View Documentation

Speaker Locations

Space Optimisation is able to recreate the sound of your speakers in their ideal locations, from your preferred, practical locations to give you the best of both worlds.

Our recommended approach for determining the ideal locations of your speakers is the [Tune Dem](#) method.

My speakers are in their ideal locations

My speakers are in their practical locations and I am able to determine their ideal locations

My speakers are in their practical locations but I am unable to determine their ideal locations

Next: Ideal > Finish

Ideal locations only

If you have determined the ideal locations for your speakers, and they can remain in these ideal locations, select the **My speakers are in their ideal locations** radio button and click on the **Next: Ideal >** link in the bottom navigation pane to enter the **Ideal** stage.

Practical and ideal locations

If you have determined the ideal locations for your speakers, but have been forced to move them to more practical locations, select the **My speakers are in their practical locations and I am able to determine their ideal locations** radio button and click on the **Next: Practical >** link in the bottom navigation pane to enter the **Practical** stage. Define your speakers' practical locations as outlined above.

Once your speakers' practical locations have been defined, click on the **Next: Ideal >** link in the bottom navigation pane to enter the **Ideal** stage. Define your speakers' ideal locations as outlined above.

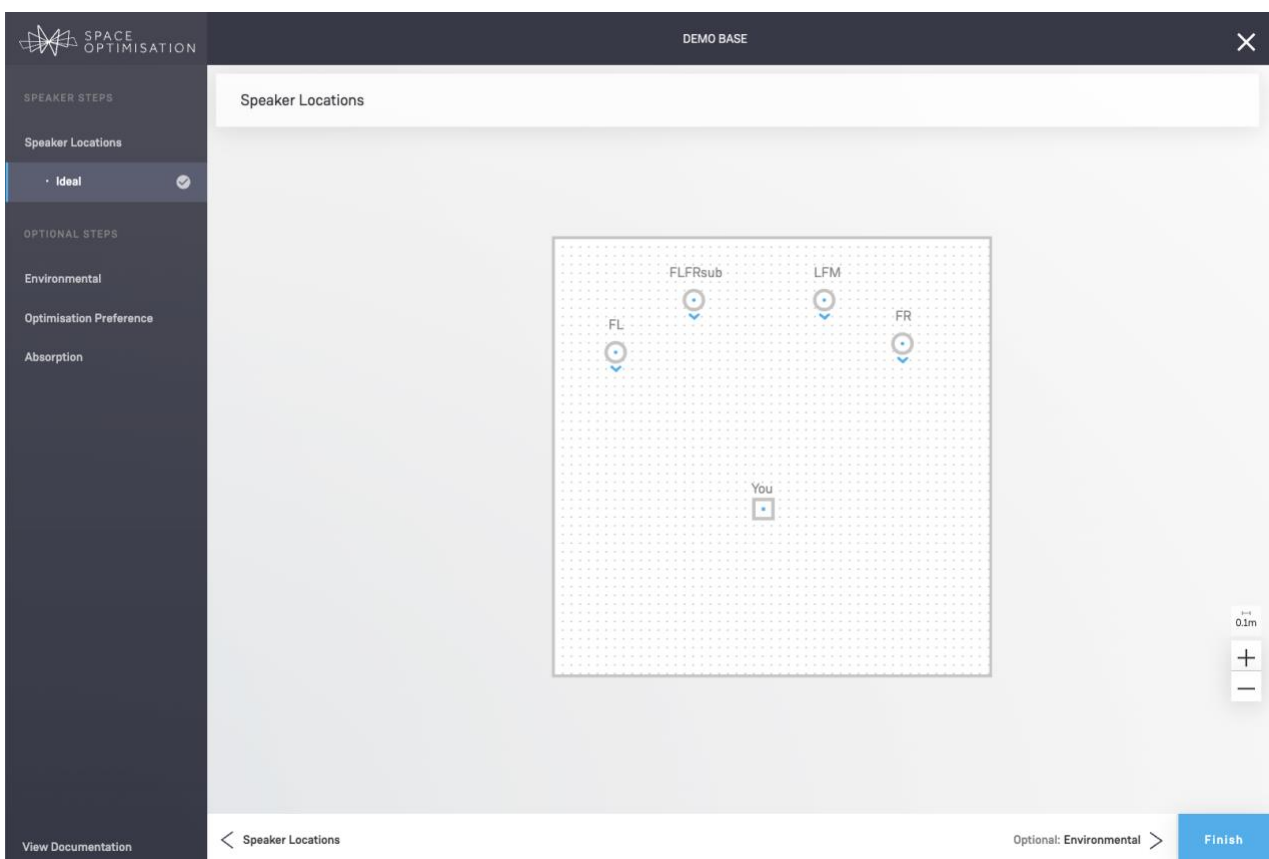
Practical locations only

If you are unable to determine the ideal locations for your speakers select the **My speakers are in their practical locations and I am unable to determine their ideal locations** radio button and click on the **Next: Practical >** link in the bottom navigation pane to enter the **Practical** stage. Define your speakers' practical locations as outlined above.

If you are unable to determine the ideal locations for your speakers, you may be able to achieve the full potential of both your music system and Space Optimisation by using the Virtual Tune Dem method outlined in §3.5.


2.5.2 Speaker Placement

Your speakers will automatically appear, labelled according to their assigned channel, alongside your listening location, labelled as **You**, as shown below.



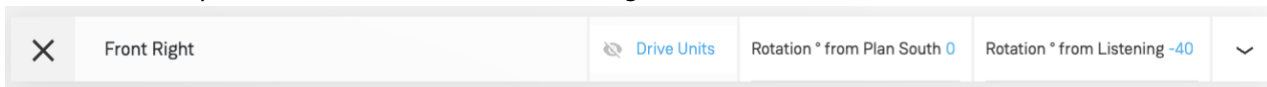
You can select any speaker with a click; when a speaker is selected, helpful hints will appear in the bottom left-hand corner with guidance as to where measurements should be made to on the speaker. Once a speaker has been selected you can define its location and orientation using three simple mechanisms, as shown below: you may drag the speaker to any desired location, move it in 1 cm increments using the arrow keys on your keyboard,

or enter the measurements in the contextual control bar at the top, switching between the **Left (m)** and **Right (m)** measurements, and similarly between the **Front (m)** and **Back (m)** measurements, by clicking on the button below the appropriate measurement; you may enter the speaker's **Height (m)** measurement by clicking on the far-right drop-down menu in the contextual control bar at the top, selecting **Height**, and entering the measurement. These mechanisms give you complete control over the speaker's location and orientation. Similarly, you can select the listening location with a click, and define its location with the same mechanisms as those for the speaker locations; this listening location should be measured to the average location of the centre of your head during normal listening.

Note that if your room has any angled walls, you may view the measurement to any angled wall by clicking on the  icon in the contextual control bar at the top.

Speaker Rotation

Speaker Rotation can be selected from the drop down menu of the speaker contextual bar and may be defined in one of two ways: from Plan South and from Listening Position.



Rotation from Plan South: This defines a 0-degree rotation of the speaker as facing the Plan South of the room plan (pointing down on the screen). From this base, positive degrees rotate the speaker in a clockwise direction and negative degrees anticlockwise to a maximum of 180 degrees either way.

Rotation from Listening Position: This defines a 0-degree rotation as the measurement point of speaker pointing directly towards the listening position. From this base, positive degrees rotate the speaker in a clockwise direction and negative degrees anticlockwise to a maximum of 180 degrees either way. This input mode may be useful for oddly shaped room plans where measuring the rotation from the south wall is tricky or as an easy way of approximating the rotation if the speaker is pointing towards the listener and no rotation measuring tools are available.

Speaker Height

Speaker height may be defined in one of two ways, toggled by pressing the multi-value numerical input:



Absolute Height:

Absolute height value is defined as the height of the measurement position from the base floor point. This is the height of the floor ignoring any features, raised floor areas etc. For example if the speaker is standing on a raised floor section modelled as a floor feature 0.5m high, the absolute height of the speaker is 0.5m.

Relative Height:

The relative height value is defined based on the closest surface underneath the measurement point. For non in-ceiling speakers, this will be the distance to the closest room feature directly underneath the measurement point for example if the speaker is standing on top of a floor feature 0.5m high the relative height will be 0 since the measurement point is directly on top of the raised floor surface. If the speaker was 0.1m above the raised floor section the relative height would be 0.1m with the absolute height being 0.6m. If there is no room features underneath the measurement point, the absolute and relative heights will be the same.

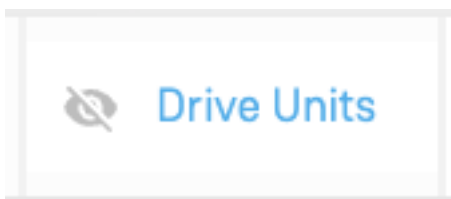
For in-ceiling speakers this is the value relative to the ceiling at the current measurement position. For example if the measurement position is 0.1m underneath the ceiling with the speaker extruding into the room, the relative height will be -0.1m.

Changing the relative value will automatically update the absolute value and vice versa. The relative height value is not static but dynamically calculated if absolute height changes, so this will need set after the speaker is moved to the desired location, to calculate the relative height based on the location.

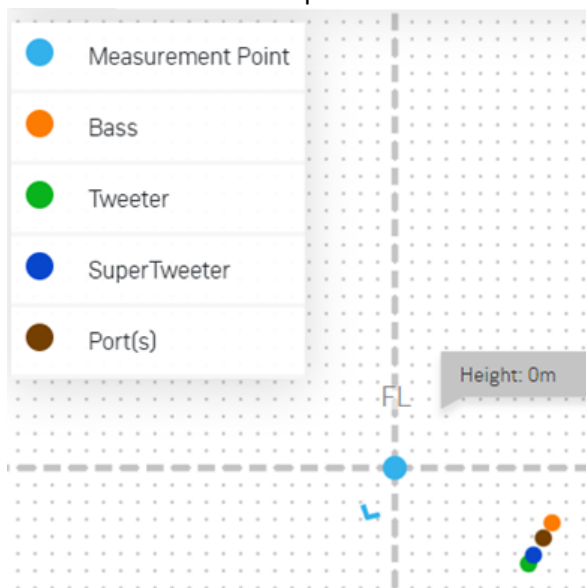
Subwoofer Roll-off

For additional subwoofers, you may also enter the additional subwoofer's **Roll off frequency (Hz)** by clicking on the far-right drop-down menu in the contextual control bar at the top, selecting **Roll Off**, and enabling roll off and entering the setting.

Drive Units Preview



For speakers that are measured for Space Optimisation (* measured for Space Optimisation in Add Speaker dialog), a show/hide Drive Units toggle is available as a way to preview drive unit and port positions in the floor plan when placing speakers. This may be used as an aid when placing speakers near a wall and as a check to make sure the speakers are measured from the correct measurement point.

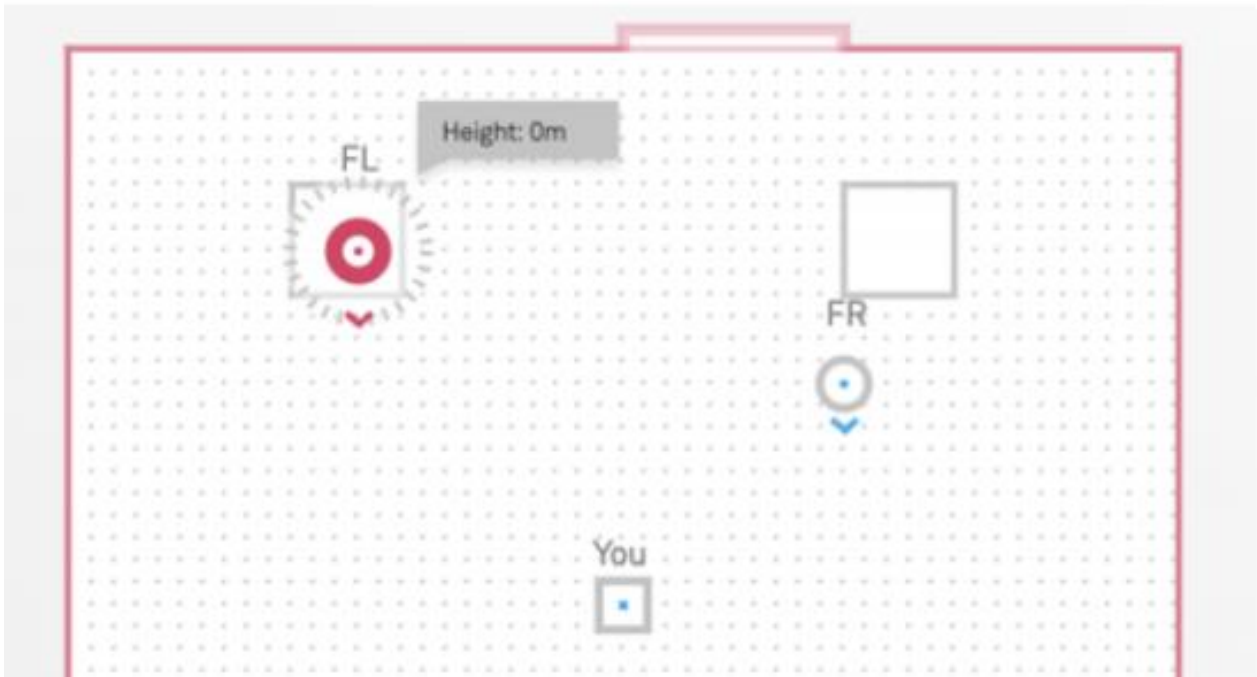


When toggled on, the speaker drive units and ports are shown on the grid, representing their position in the room. A legend in the top left of the screen indicates whether the colour represents a drive unit, port or measurements point. The drive unit/port items are for information only and non-interactive.

Floor Features

Floor Height features will be visible as unavailable areas if the specified height of the selected speaker or listening position is lower than the height of the floor feature to indicate areas where placement is not allowed (as the item would be inside the feature).

Note - The speaker base height is measured relative to the lowest floor height (zero point).



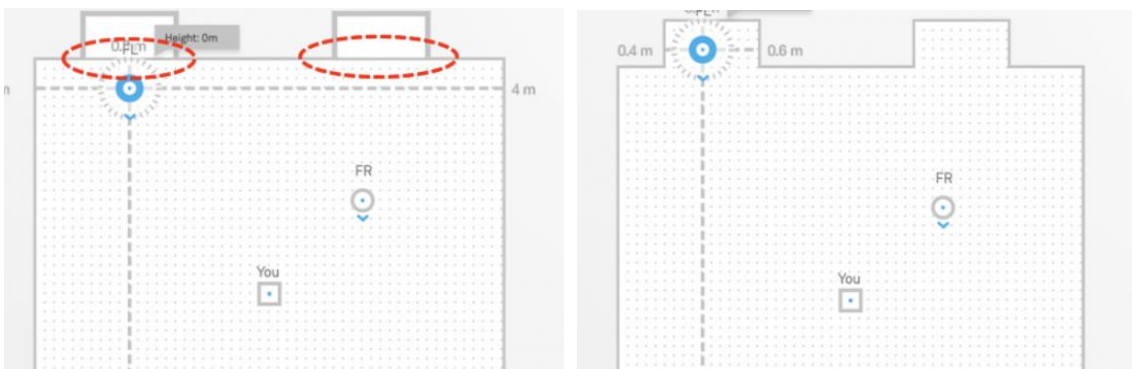
Wall Depth Features

Wall Depth features will show as unavailable areas if the specified height of the speaker or listening position is lower than the height of the feature, off the floor. Or if the physical height of the speaker does not match the height range of the feature.

That is, if the available height is less than the loudspeaker height, then a line drawn to show the loudspeaker positioning restrictions. That is, you cannot fit 360 loudspeakers into a 1M high alcove!

Or the loudspeaker has a height position of 0M, but you are trying to place it in a feature/zone that has a raised or lowered floor height area, Changing the specified position height of the loudspeaker, so it would fit inside the feature location at the same heights.

Or double check that the loudspeaker will actually fit within the feature area, and you have entered all the dimensions correctly within Manage System Room Design.

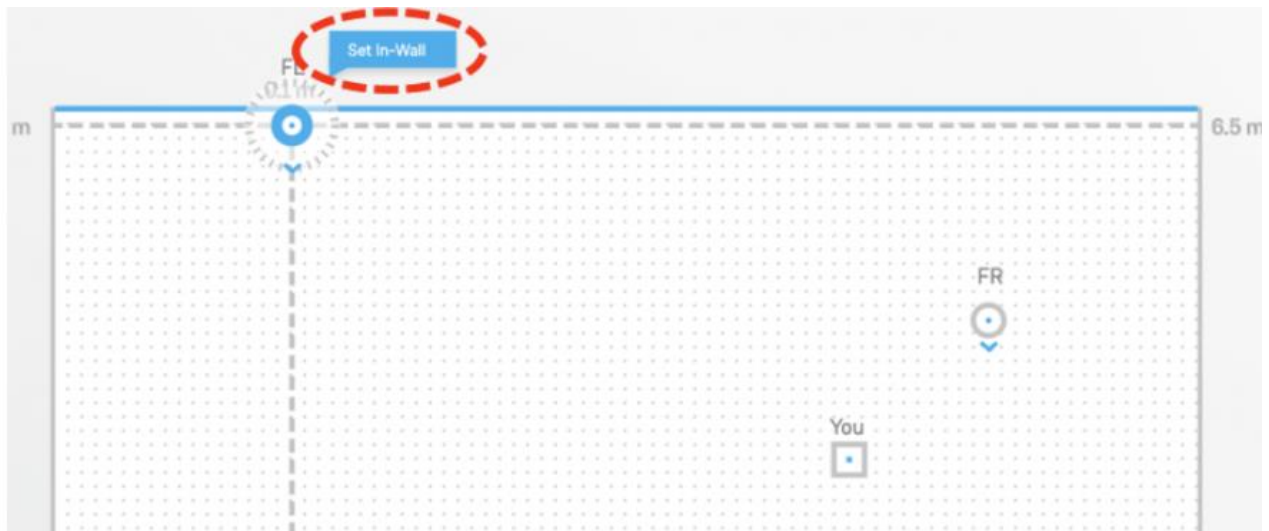


In-Wall Speakers

Speakers that are partially or fully in-wall may now be positioned as such in the 'Speaker Locations' step. To specify a speaker as in-wall, drag a speaker position next to a wall until a 'Set In-Wall' button appears above a speaker. The speaker may need to be rotated so the measurement point can come close to the wall without drive units going outside and causing an error highlight. A wall will be highlighted blue, indicating which wall the speaker is to be set in.

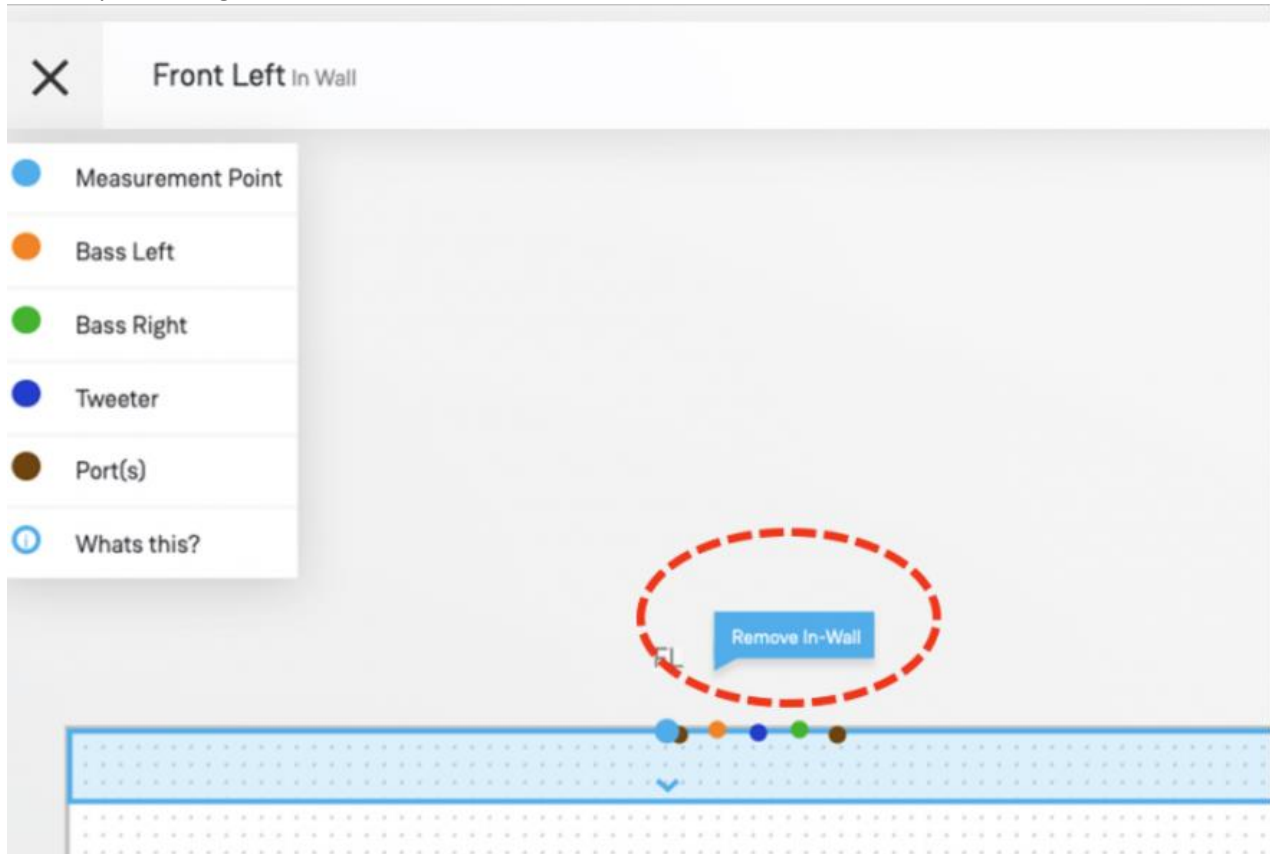
Adding in-wall speakers:

Pressing the 'Set In-Wall' button marks the speaker as an in-wall speaker and allows drive unit positions to be outside the wall boundary.



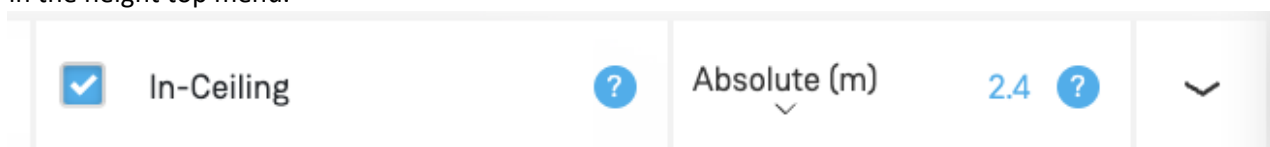
Removing in wall speakers:

Pressing the 'Remove In-Wall' button removes this ability. A blue area will appear, indicating the allowed area of positioning.



In-Ceiling Speakers

If the speaker position is within the ceiling, it may be defined as such by checking the **In-Ceiling** checkbox in the height top menu.

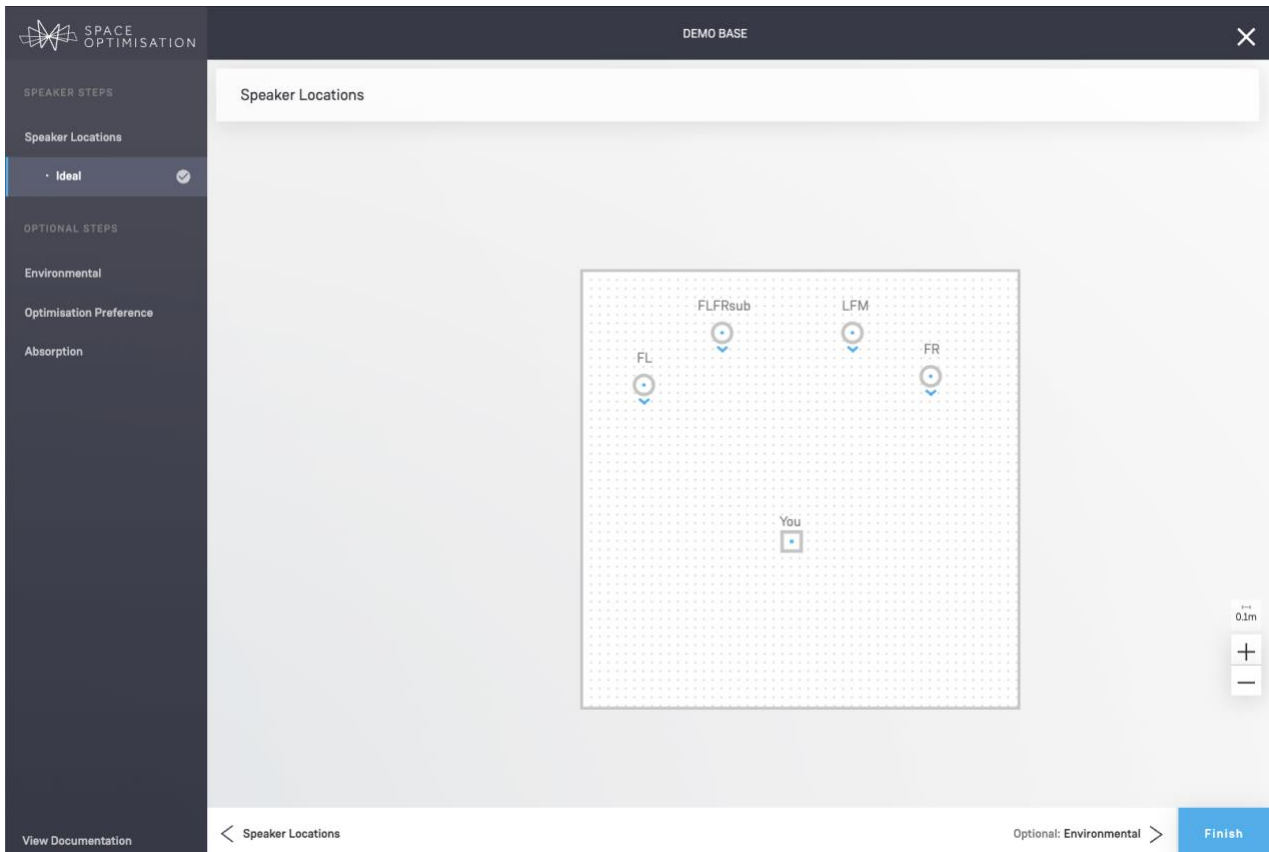


This will rotate the speaker and the drive units to face downwards into the room. The usual rotation parameter can be used to rotate the speaker on the XY axis to the desired position. Moving the speaker

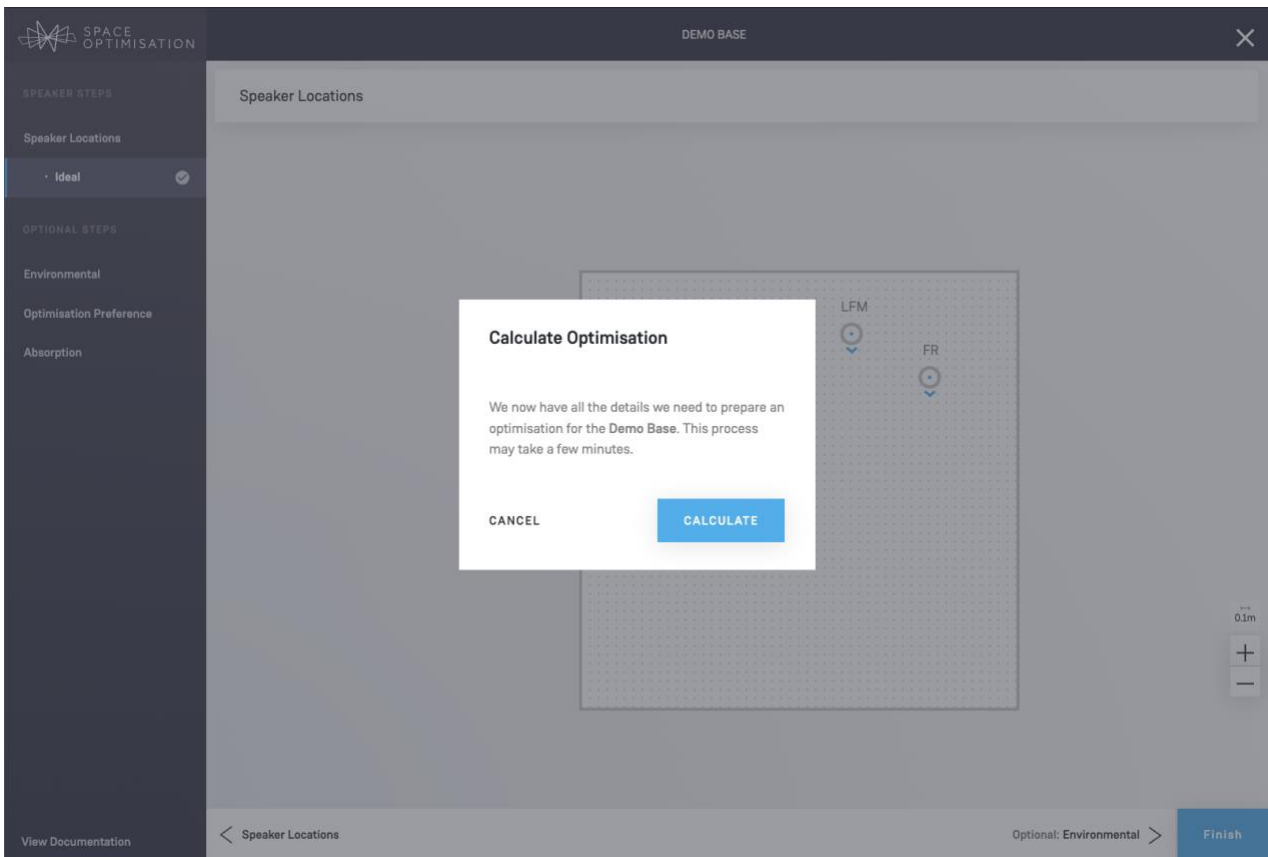
around the room will automatically update the height parameter to match the ceiling height at that position. This can be manually updated if the measurement point of the speaker is vertically offset from the ceiling. The **Relative** height input may be particularly useful for this to define the offset of the measurement point from the ceiling.

2.5.3 Calculating the optimisation

Once speaker locations have been defined, the **Finish** button in the bottom navigation pane will turn blue, as shown below.



Click on the **Finish** button; a confirmation dialog will appear, as shown below. Click on the **Calculate** button to calculate your optimisation; this may take a few minutes.



Whilst your optimisation is calculating you will be taken to the **Space** tab on the **Music Systems** page for your system, where your optimisation will be added to a list of optimisations below the **Optimisations** heading; it will be named with a time stamp, and flagged as **Starting**, as shown below, indicating the information has been sent away and put in a queue to start calculating.



Once the calculation process begins, the status will change to **Calculating** indicating the process is underway.




2.5.4 Applying the optimisation

Once calculated, the optimisation may be applied to your music system by clicking on the radio button next to its name, as shown below.



2.5.5 Resuming an incomplete optimisation

Note that you can exit the optimisation procedure at any time by clicking on the button in the top righthand corner of the Space Optimisation user interface. The optimisation will be added to a list of optimisations below the **Optimisations** heading under the **Space** tab on the **Music Systems** page for your system; this optimisation will be flagged as being incomplete, as shown below. You may resume an incomplete optimisation at any time by clicking on the  drop-down menu to the right of its name and clicking on **Resume**; the process of defining the optimisation now proceeds as outlined above.

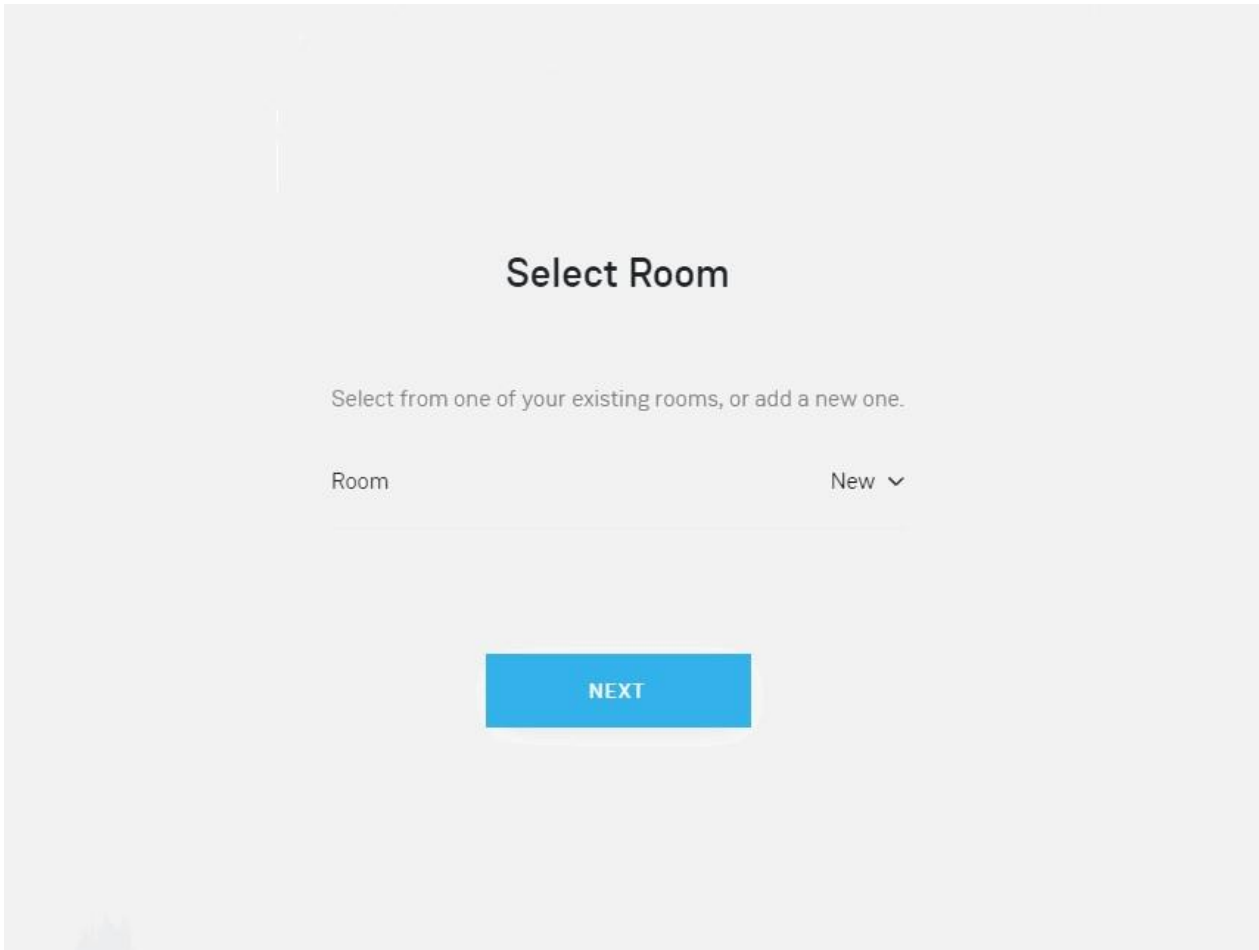
16:30 1st September 2023	Incomplete 
All Floor	

2.4 Re-optimising your music system


2.4.1 Adding an optimisation

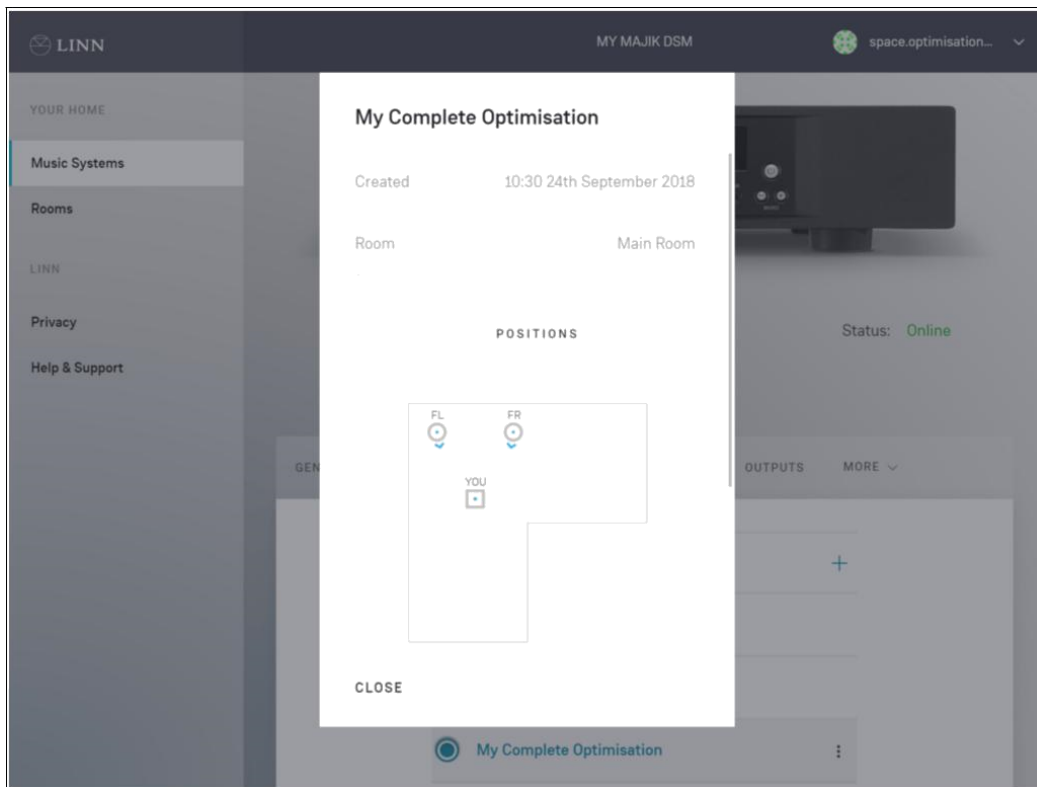
Once you have optimised your music system through your Linn account the **Optimise System** button below the graphic of your music system will disappear; you can now add further optimisations by clicking on the **Add an Optimisation** link under the **Space** tab on the **Music Systems** page for that system.


Click on the **Add an Optimisation** link; the dialog with a brief explanation of Space Optimisation will appear. Click on the **Begin** button; a dialog prompting you to choose the room you wish to create an optimisation for, or whether you wish to define a new room, will appear, as shown below. Choose a room to optimise or select **New** and enter an appropriate name for your room and click on the **Next** button; the process of defining the optimisation now proceeds as outlined in §2.3.




2.4.2 Adjusting an optimisation


You may view the details of any complete optimisation created through your Linn account by clicking on the  drop-down menu to the right of its name and clicking on **Details**. A dialog with the details of the optimisation will appear, as shown below; within this dialog will be a graphic of your room and speaker setup, with further links to more detailed information on speaker and listening locations.



Should the details of an optimisation not match what you desire, the optimisation may be adjusted by clicking on the  drop-down menu to the right of its name and clicking on **Adjust**. The process of defining the optimisation now proceeds as outlined in §2.3; however, note that all information will already be defined as per the original optimisation, allowing you to make only the necessary adjustments.

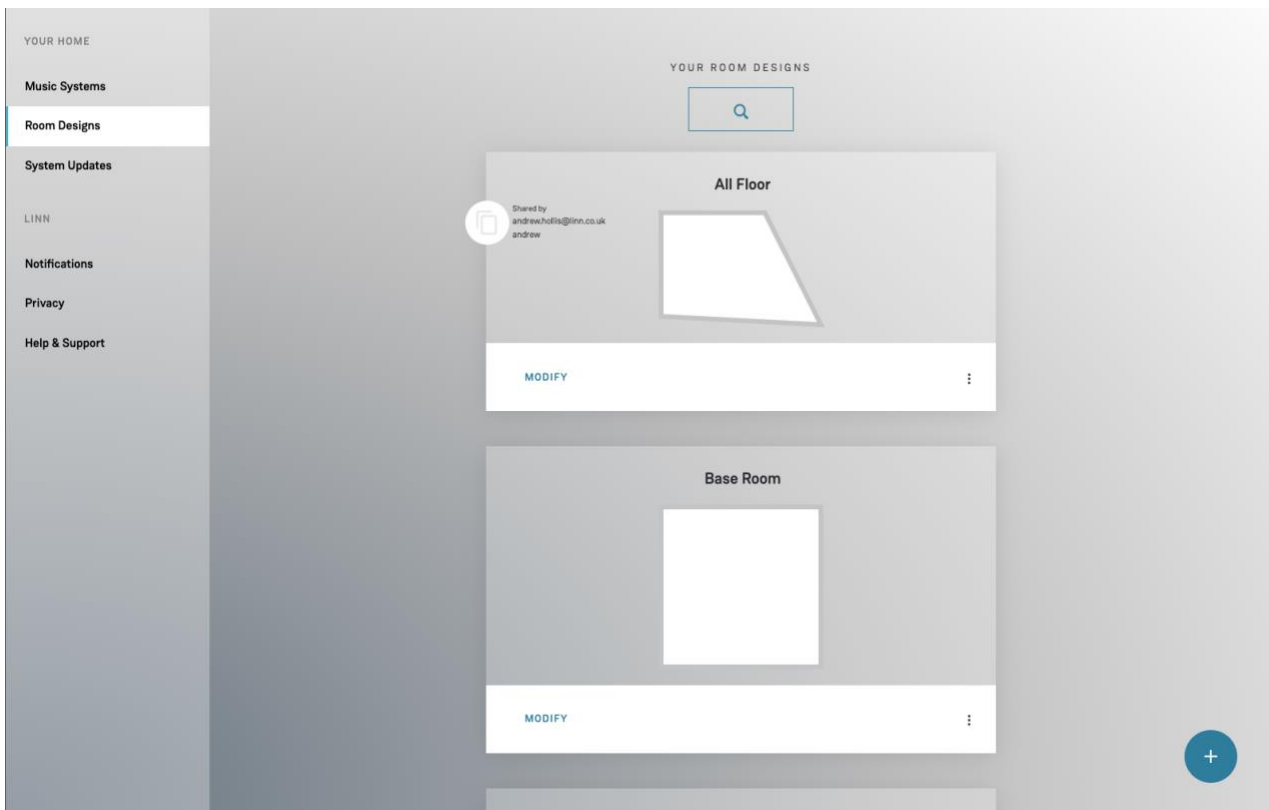
2.5 Optimisation history

Should the details of an optimisation not match what you desire, the optimisation may be adjusted by clicking on the  drop-down menu to the right of its name and clicking on **Adjust**. The process of defining the optimisation now proceeds as outlined in §2.3; however, note that all information will already be defined as per the original optimisation, allowing you to make only the necessary adjustments. Note that this process will create a new optimisation with the adjustments and will not affect the settings of the original optimisation.

You can rename any optimisation by clicking on its name, resume any incomplete optimisation as outlined in §2.3.5, adjust any complete optimisation created through your Linn account as outlined in §2.4.2, or delete any optimisation by clicking on the  drop-down menu to the right of its name and clicking on **Delete**.

2.6 Rooms

Your Linn account stores your room information separately from your music system; this makes it quick and easy to upgrade your music system, or move your music system to a new room, as outlined in §2.4.1. You can view all of your rooms on the **Room Designs** page, as shown below.



Note that a room may be deleted at any time by clicking on the **Delete** button below its graphic; deleting a room will not affect any completed optimisations, but you will no longer be able to adjust any optimisations made using that room. It is therefore advised that rooms be deleted only when you no longer have access to that room, for example if you move to a new house.

3 Advanced setups

Space Optimisation produces a very accurate model of the interaction between your room and speakers using highly sophisticated acoustic modelling; however, there exist cases where some adjustment of the optimisation inputs is required.

If the environmental conditions of your room are different to the standard environmental conditions the optimisation may incorrectly predict the frequencies that are artificially distorted; the methodology for entering your room's environmental conditions is outlined in §3.1.

If the construction materials of your room do not closely match the options provided the optimisation may incorrectly predict the amount of correction required at the artificially distorted frequencies; the methodology for adjusting the absorption of your room's construction materials is outlined in §3.2.

The optimisation has been designed to give a good balance of low- and mid-frequency energy. However, your personal preference may differ to the default balance; the methodology for adjusting the low- and mid-frequency energy balance is outlined in §3.3.

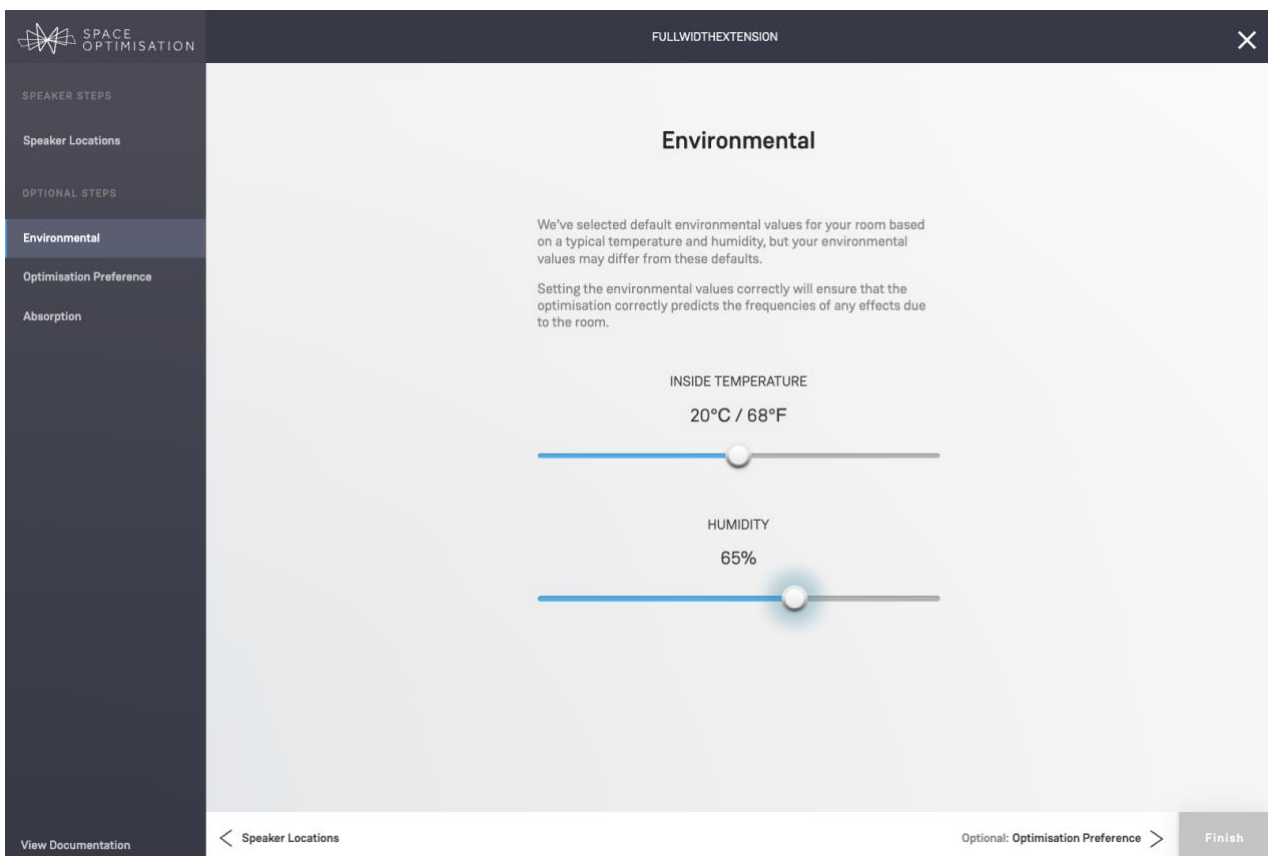
If your room does not have a flat floor or ceiling the optimisation may incorrectly predict the frequencies that are artificially distorted; the methodology for simplifying your room's dimensions to better fit the flat floor and ceiling model is outlined in §3.4.

Finally, if you are unable to determine the ideal locations for your speakers, you may be able to achieve the full potential of both your music system and Space Optimisation by using the Virtual Tune Dem method; this method is outlined in §3.5.

3.1 Environmental

If the environmental conditions of your room are different to the standard environmental conditions the speed of sound used in the optimisation will be incorrect, and so the frequencies that are artificially distorted may be incorrectly predicted; the environmental conditions must therefore be entered to give the correct speed of sound.

Whilst creating an optimisation, click on the **Environmental** link in the left-hand navigation pane to enter the **Environmental** stage, as shown below.



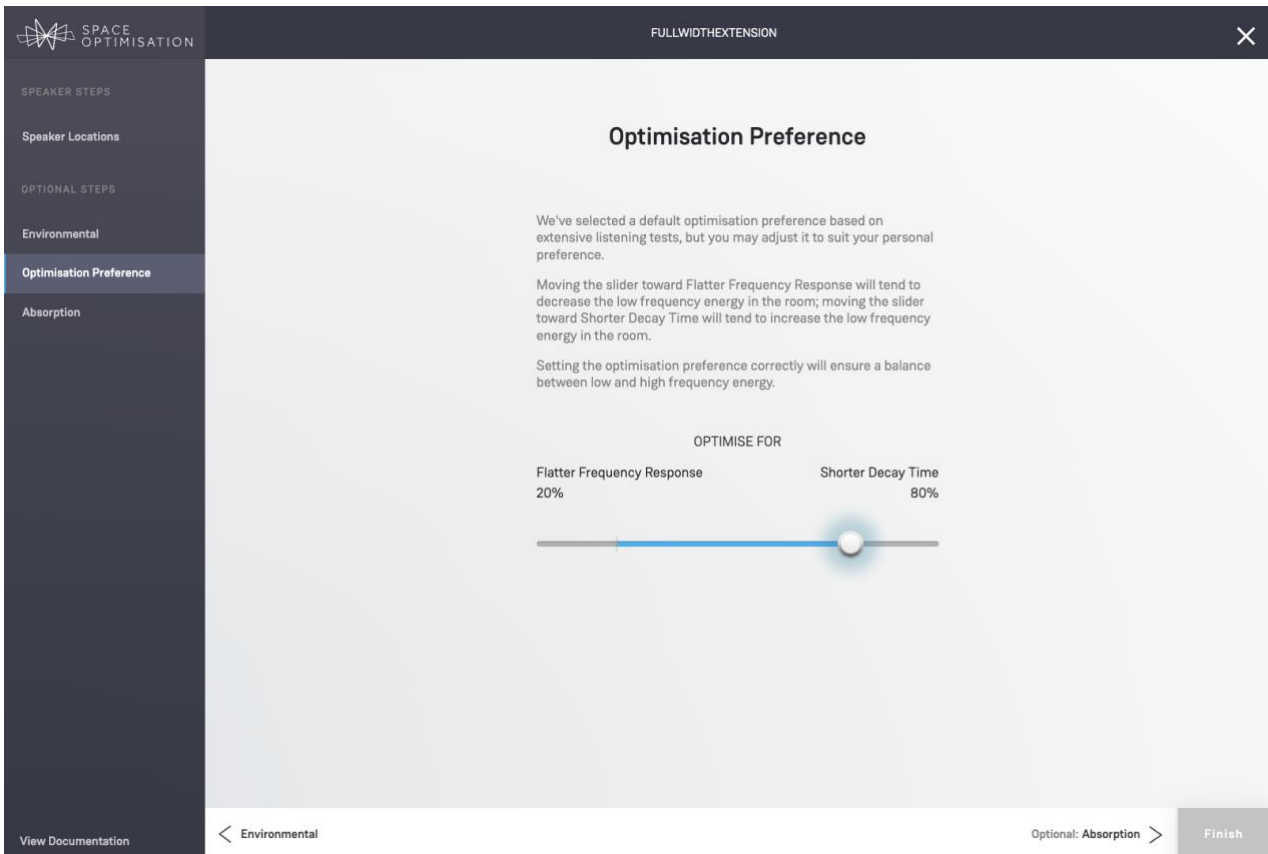
Using a thermometer and hygrometer measure the temperature and humidity in your room and enter the values using the **Inside Temperature** and **Humidity** sliders: increasing the temperature or humidity will increase the speed of sound, therefore increasing the frequencies that are artificially distorted; decreasing the temperature or humidity will decrease the speed of sound, therefore decreasing the frequencies that

are artificially distorted. Once the temperature and humidity values have been set, click on the blue **Finish** button in the bottom navigation pane to recalculate the optimisation.

3.2 Optimisation preference

The optimisation has been designed to give a good balance of low- and mid-frequency energy. However, your personal preference may differ to the default balance; the optimisation can therefore be adjusted to match your preference.

Whilst creating an optimisation, click on the **Optimisation Preference** link in the left-hand navigation pane to enter the **Optimisation Preference** stage, as shown below.



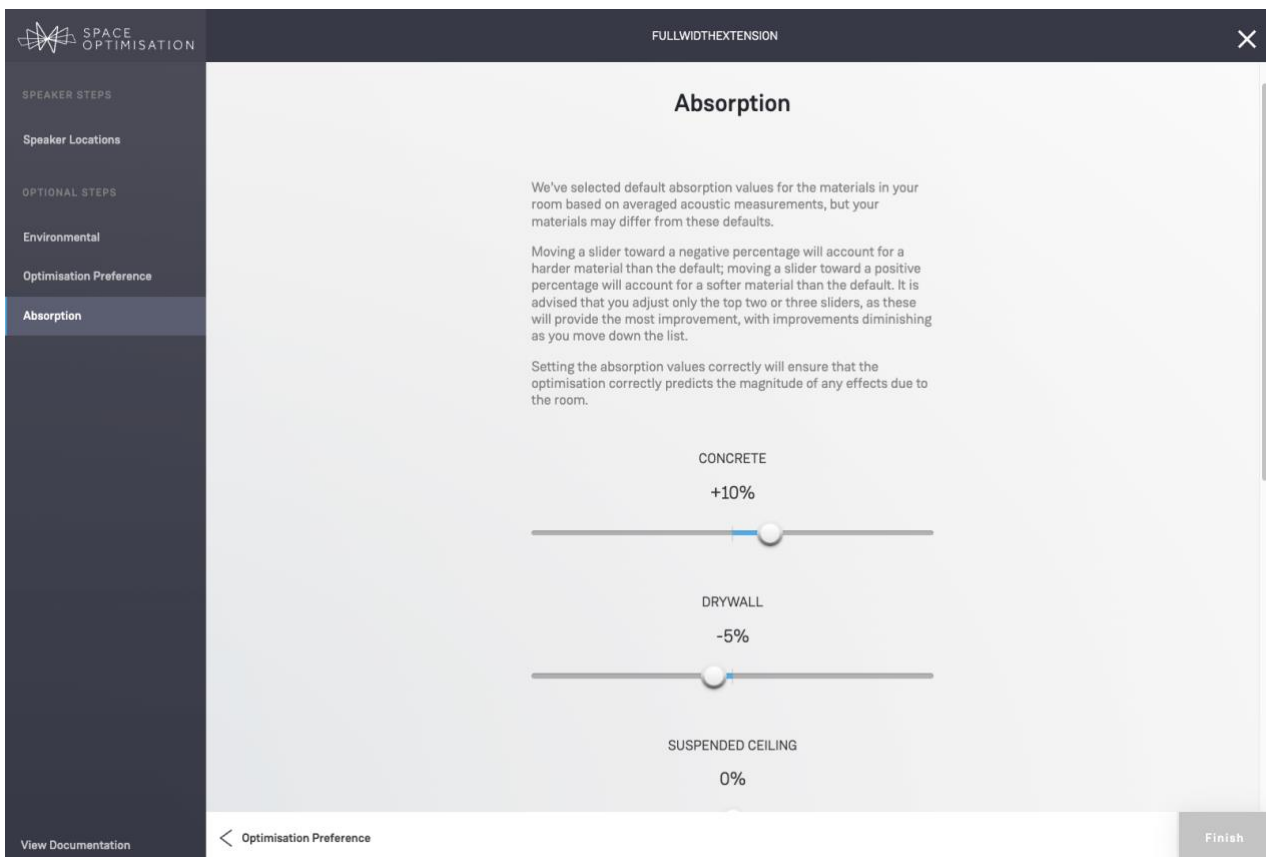
If the optimisation does not suit your preference, the optimisation preference can be adjusted here: moving the slider toward **Flutter Frequency Response** will result in an optimisation that takes deeper cuts and applies less decay control at the artificially distorted frequencies; moving the slider toward **Shorter Decay Time** will result in an optimisation that takes shallower cuts and applies more decay control at the artificially distorted frequencies. Once the optimisation preference has been adjusted, click on the blue **Finish** button in the bottom navigation pane to recalculate the optimisation.

You should adopt a Tune Dem method for varying the optimisation preference, similar to that outlined at the end of §3.2.

3.3 Absorption

If the construction materials of your room do not closely match the options provided their absorption characteristics will be incorrect, and so the optimisation may incorrectly predict the amount of correction required at the artificially distorted frequencies; the absorption characteristics of the construction materials must therefore be adjusted to give the correct behaviour.

Whilst creating an optimisation, click on the **Absorption** link in the left-hand navigation pane to enter the **Absorption** stage, as shown below. The construction materials of your room will be listed, in order of decreasing absorption area.



If a particular construction material does not closely match the options provided its absorption characteristics can be adjusted here: decreasing the absorption will result in an optimisation that takes deeper, sharper cuts at the artificially distorted frequencies; increasing the absorption will result in an optimisation that takes shallower, broader cuts at the artificially distorted frequencies. Note that adjusting the absorption of construction materials at the top of the list will have more effect than those at the bottom of the list. Once the absorption characteristics of any offending construction materials values have been adjusted, click on the blue **Finish** button in the bottom navigation pane to recalculate the optimisation.

You should adopt a Tune Dem method for varying the absorption characteristics: increase the absorption of the first offending construction material in the list by a large amount and recalculate the optimisation; then decrease the absorption of the first offending construction material in the list by a large amount and recalculate the optimisation. Then perform an AB demonstration to compare the two adjusted optimisations and note down any characteristics that you like from each adjusted optimisation. You should

then adjust the absorption of the first offending construction material to an appropriate average value depending on your preference from the two previous adjusted optimisations and recalculate the optimisation; this process should be repeated iteratively until the absorption characteristics of the first offending construction material closely match those of your room surfaces. You should then apply this process for each offending construction material.

3.4 Virtual Tune Dem

If you are unable to determine the ideal locations for your speakers for physical reasons you may be able to achieve the full potential of both your music system and Space Optimisation by using the Virtual Tune Dem method.

To perform a Virtual Tune Dem, whilst creating an optimisation click on the **Speaker Locations** link in the left-hand navigation pane to enter the **Speaker Locations** stage.


Now, instead of selecting the **My speakers are in their practical locations and I am unable to determine their ideal locations** radio button, select the **My speakers are in their practical locations and I can determine their ideal locations** radio button, and click on the **Next: Practical >** link in the bottom navigation pane to enter the **Practical** stage.

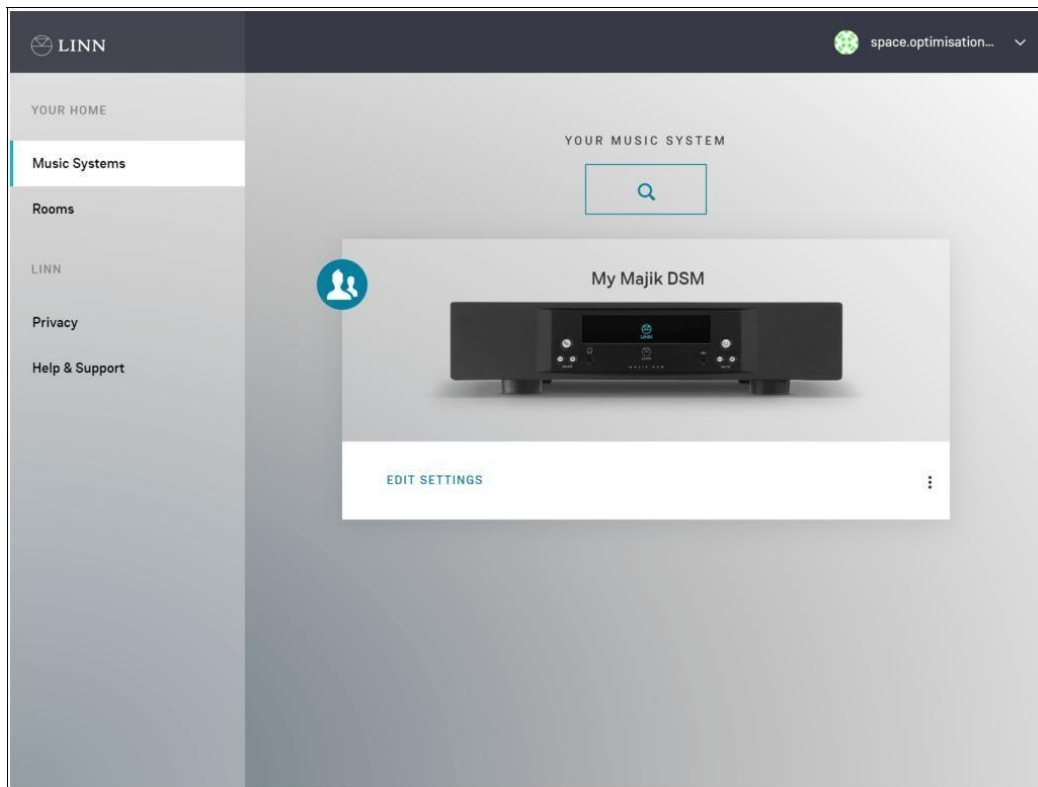
Define your speakers' practical locations as outlined in §2.3.2, then click on the **Next: Ideal >** link in the bottom navigation pane to enter the **Ideal** stage. You can now adjust the ideal speaker locations to reflect any changes you would make if you were physically moving your speakers; once you have chosen an ideal location, click on the blue **Finish** button in the bottom navigation pane to calculate the optimisation. You should repeat this process using a Tune Dem method to establish the virtual ideal speaker locations.

3.5 Account Sharing

Sometimes it may be useful to share music systems, rooms and optimisations between Linn accounts; this may be of particular use to Linn retailers and their customers. The following sections outline the procedures for such sharing.

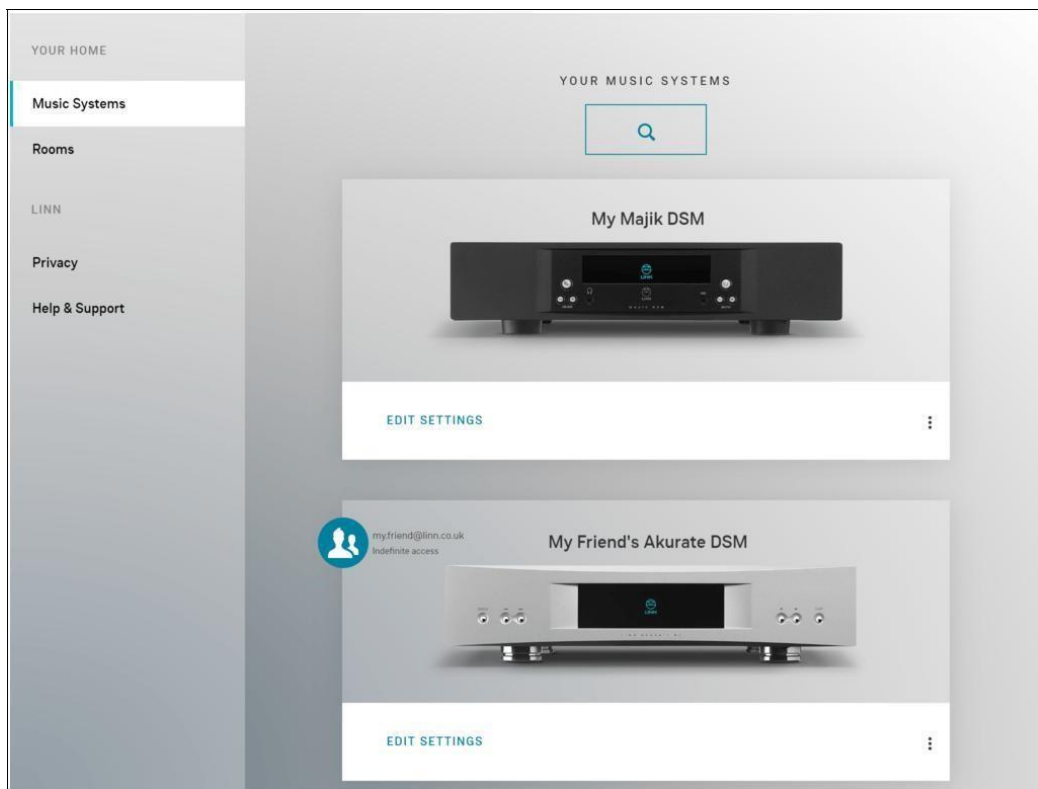
3.5.1 Sharing your music system

You may now share your music system with a third-party Linn account; this gives the third-party access to your music system, enabling them to configure all of your music system's settings, including Space Optimisation. To share a music system with a third-party Linn account, navigate to the **Music Systems** page, click on the  drop-down menu under the music system you wish to share, and click on **Share Control**; a dialog prompting you to provide the email address linked to the third-party Linn account and to specify the duration of the shared control will appear, as shown below. Enter the email address linked to the third-party Linn account, specify the duration of the shared control, and click on the **Share** button; note that the user interface does not check that the email address provided is linked with a Linn account, for security reasons.



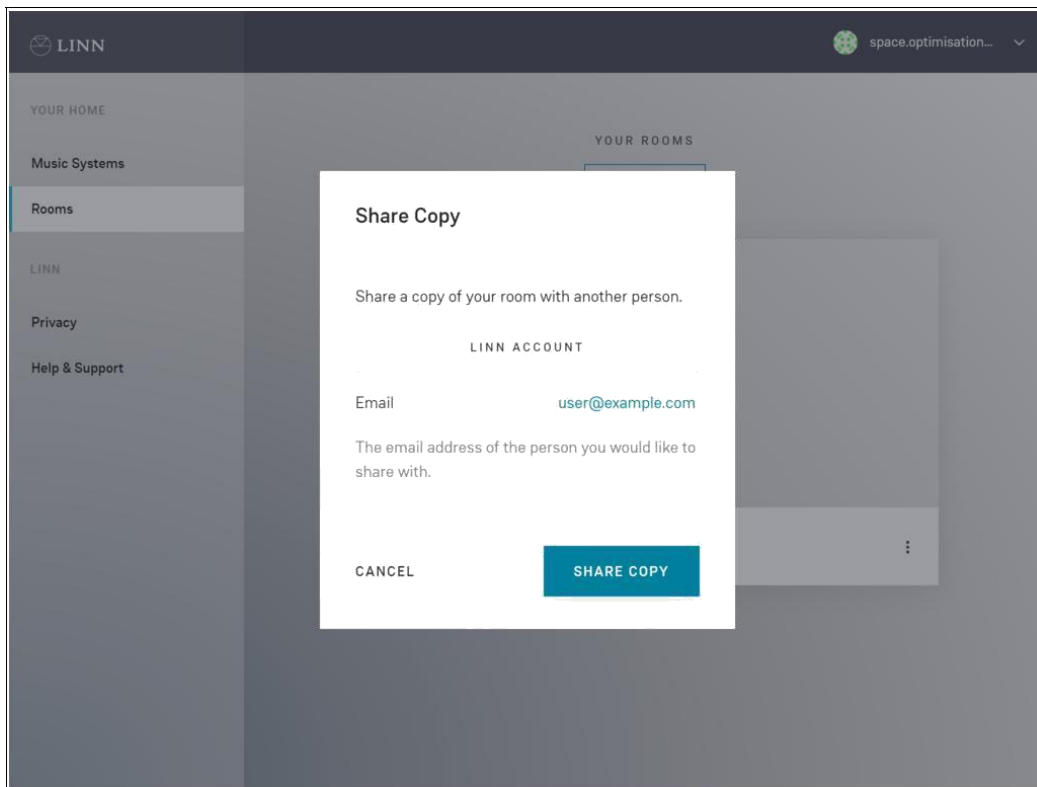
Once your music system has been shared, a sharing icon will appear next to your music system to notify you that it is currently being shared with a third-party, as shown below. You may share a music system with multiple third-party Linn accounts using the procedure outlined above and revoke shared control at any time by clicking on the **⋮** drop-down menu under the music system, clicking on **Manage Access**, and clicking on **Revoke** next to the email address linked to the third-party Linn account.

Once your music system has been shared, the third-party will receive an email from **sharedDeviceNotifier@linn.co.uk**, notifying them that you have shared your music system with them; note that this email will contain the email address linked to your Linn account. Your music system will then be listed on the **Mu-sic Systems** page of the third-party Linn account, with a sharing icon, the email address linked to your Linn account, and the duration of the shared control, as shown below. The thirdparty may then configure all your music system's settings, including Space Optimisation; however, note that any rooms or optimisations created by the third-party will remain in their Linn account, and will not appear in your Linn account. The third-party may end their shared control at any time by clicking on the **⋮** drop-down menu under the music system and clicking on **End Access**. Note that the third-party cannot share the music system with other third-party Linn accounts.

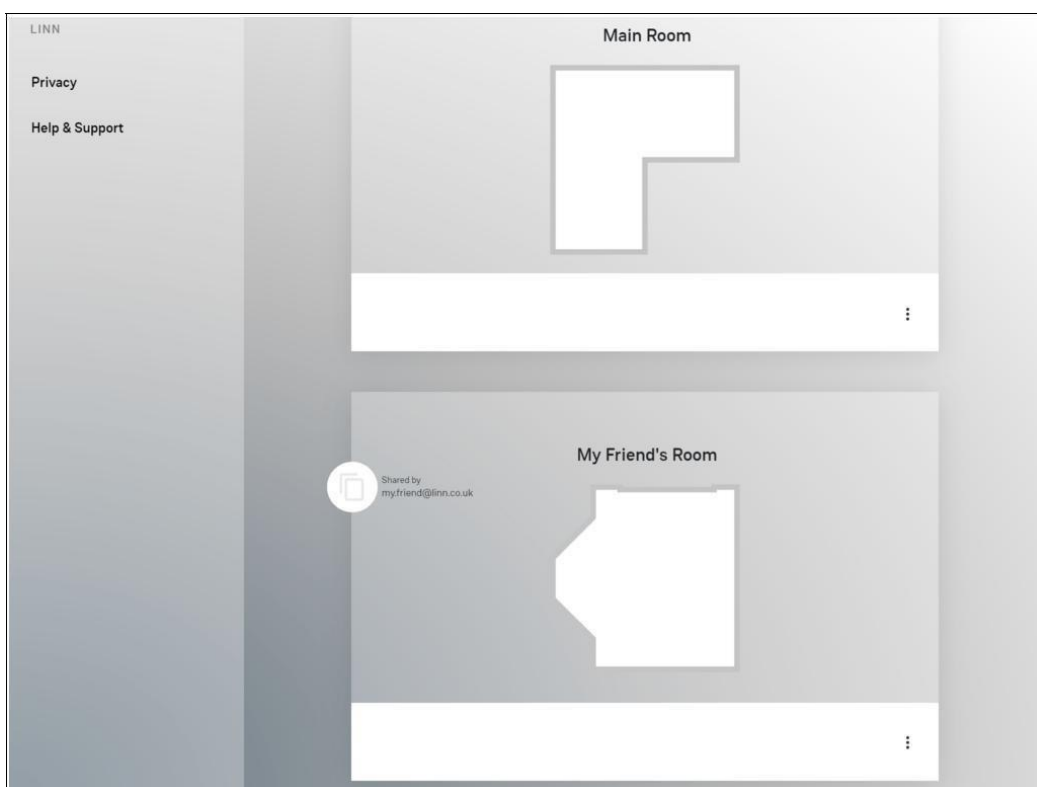


3.5.2 Sharing your room

You may now share your room with a third-party Linn account; this gives the third-party a copy of the room. To share a room with a third-party Linn account, navigate to the **Rooms** page, click on the **⋮** dropdown menu under the room you wish to share, and click on **Share Copy**; a dialog prompting you to provide the email address linked to the third-party Linn account will appear, as shown below. Enter the email address linked to the third-party Linn account and click on the **Share Copy** button.

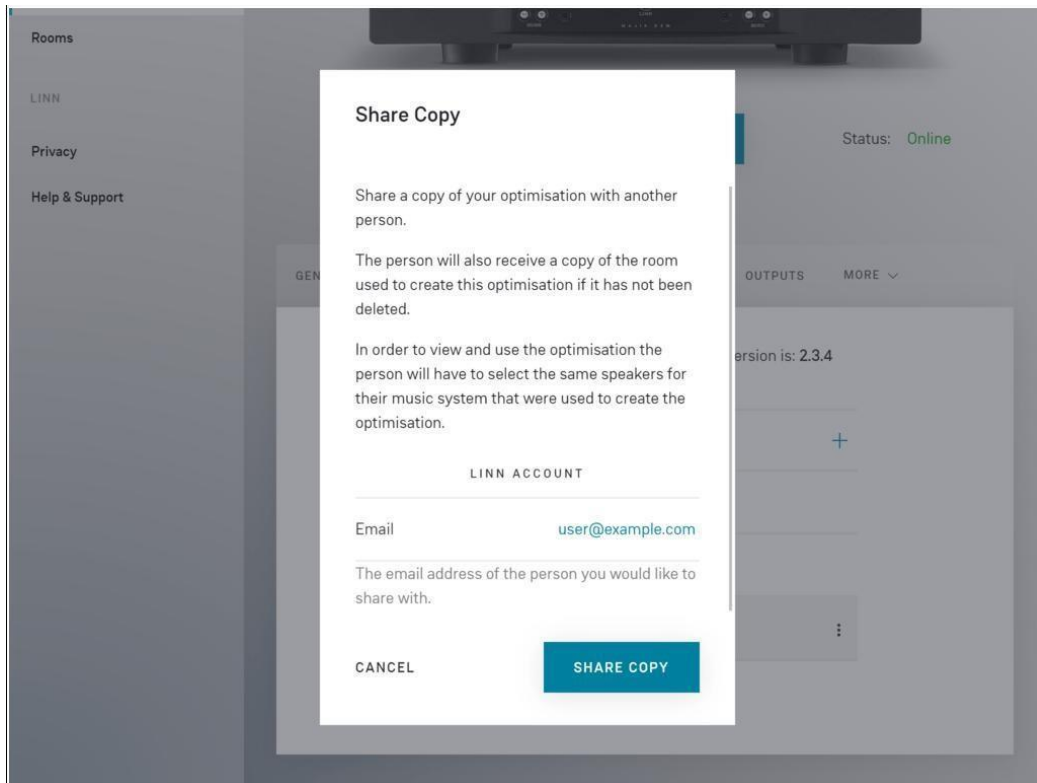


Once your room has been shared, the third-party will receive an email from **sharedRoomNotifier@linn.co.uk**, notifying them that you have shared your room with them. Your room will then be listed on the **Rooms** page of the third-party Linn account, with a copy icon and the email address linked to your Linn account, as shown below. The third-party may then use your room for Space Optimisation; note that any changes made by the third-party will only affect the room in their Linn account, and will not affect the room in your Linn account. Note that the third-party may also share the room with other third-party Linn accounts.





3.5.3 Sharing your optimisation

You may now share your optimisation with a third-party Linn account; this gives the third-party a copy of the optimisation, along with a copy of the room used to create the optimisation provided it has not been deleted. To share an optimisation with a third-party Linn account, navigate to the **Space** tab on the settings page for your music system, click on the **:** drop-down menu next to the optimisation you wish to share, and click on **Share Copy**; a dialog prompting you to provide the email address linked to the thirdparty Linn account will appear, as shown below. Enter the email address linked to the third-party Linn account and click on the **Share Copy** button.



Once your optimisation has been shared, the third-party will receive an email from **sharedOptimisationNotifier@linn.co.uk**, notifying them that you have shared your optimisation with them. Your optimisation will then be listed under the **Optimisations** heading in the **Space** tab on the setting page of any music system of the third-party Linn account, provided that the optimisation is compatible with their music system and speakers, and will be flagged as being shared, as shown below. The third-party may then apply your optimisation to their music system; note that any changes made by the third-party will only affect the optimisation in their Linn account, and will not affect the optimisation in your Linn account. Note that the third-party may also share the optimisation with other third-party Linn accounts.

3.5.4 Filtering Optimisations List

The optimisation list may be narrowed down by various categories by pressing the filter button  above the optimisations list. Optimisations may be filtered by various categories at once. **Clear All** will clear all applied filters. Filtering applies both to compatible and incompatible optimisations. The filter symbol will appear yellow  when a filter is currently applied.

Filter Optimisations

Room	Main Room ▾
Shared By	None ▾
Tag	None ▾

CLEAR ALL

CANCEL APPLY

3.5.5 Optimisation Tags

Optimisations may be assigned some labels to help group various optimisations together. For example, if an account has multiple systems with the same speaker setup, but optimisations that are particular to only one of the systems, optimisations for that system could be tagged with the system room name to see only those optimisations for the system.

Optimisation tags can be managed from within the optimisation details view.

Main Optimisation

Glass - Single Glazed	0%
Wood	0%
Island	0%
Material	0%
Drywall	0%

OPTIMISATION PREFERENCE

Flat Frequency Response	Short Decay Time
80%	20%

TAGS

Add custom tags to enhance optimisation filtering.

[Add Tag +](#)

CLOSE

To add a new tag, press the **Add Tag** button and enter some text and press the Enter/Confirm key. Multiple tags can be added.

TAGS

Main Room ×

Add Tag +

CLOSE

To delete tags, press the delete × button on the tag item.

Tags can be used to filter down optimisations list in the **Filter** view described above.