Dirac Live®
Training Guide,
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Dirac Live® Training Guide

Disclaimer

Dirac Research AB cannot be held responsible for the improper use of configuration of the Dirac Live® software, or for any damage that might occur as a result of this improper use or configuration. This manual is intended to provide a guide for proper use of the software, but possibilities for use are such that no manual can be considered exhaustive for every scenario. **Therefore, in addition to reading and understanding the material contained in this guide, we encourage you to utilize caution when using the Dirac Live® software, as misconfiguration, especially with regard to output gains or boost, can produce signals that may damage your audio system or hearing.**

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The Dirac Live® Product

Dirac Live® is a room acoustic solution that enables users to measure and optimize their sound systems to their preferences and reduces sound colorations introduced by the room. Dirac Live® has two features: room correction, included with every software package, and bass control, an add-on feature available as separate purchase. This training guide will walk you through setup and use of the bundled room correction feature.

Why room correction?

Your listening space impacts sound. Walls, floors, windows and furniture all affect how sound waves travel, maximizing certain frequencies while weakening others. Furthermore, speakers might not be placed optimally. For instance, they may not be placed symmetrically, meaning the left and the right channels arrive at the listener at different times. This leads to distorted stereo imaging. Speakers can interfere with each other as well, cancelling out at certain frequencies.

Without addressing these acoustic challenges, your audio system at home sounds worse than intended, regardless of price. Muddy sound, distorted soundstage and flabby bass are extremely common sound quality issues, even in the most expensive setup. Click here to dive deeper into the four types of distortions good digital room correction system should address.

Dirac Live® room correction

Dirac Live® provides world-class room correction with its patented mixed-phase technology and time domain correction that other solutions are missing. Dirac Live® is proven to deliver unparalleled room correction performance, minimizing the room's impact on sound.
Loaded with sophisticated algorithms, Dirac Live® is at the same time extremely easy to use, with an intuitive user interface and step-by-step guidance that allows for easy setup and precise personalization of the target sound curves.

End user benefits

- **Enhanced clarity**: Enjoy the transparent and uncluttered sound you've probably never experienced with your current sound system.
- **More accurate imaging and staging**: Hear how vocals and different instruments fill a wider space, as if you were experiencing the song being performed live.
- **Larger sweet spot**: Enhanced overall sound experience in an expanded space, free of resonance throughout the entire listening area.
- **Deeper, tighter bass**: Hear beats more accurately as each note starts and ends as quickly as it's supposed to.
- **Richer details**: More fine details emerge where you have never heard them before. Listen to your favorite song with new ears.

What makes Dirac Live® unique?

- **Industry leading solution**: Dirac Live® provides a perfect combination of leading performance and easy-to-use interface. There's simply no other solution on the market that can achieve the same performance while maintaining ease of use.
- **Solves problems other solutions fails to address:** Dirac Live®'s room correction feature solves crucial room acoustic problems that other solutions fail to address. Only Dirac Live® delivers phase alignment, speaker driver alignment, room resonance reduction, and early reflection reduction. All in one. Click here to learn more
- **A well-respected brand:** Dirac Live® has been licensed to more than 20 Hi-Fi and home theater OEMs. Our solution has more than 200,000 delighted users worldwide. Used in professional mixing studios, control rooms and commercial cinemas, Dirac Live® is endorsed by world-renowned musicians such as Axwell and Rami Yacoub.
- **Patented impulse response correction technology**: The key technology utilized for Dirac Live®'s room correction feature has been widely adopted in automotive audio, one of world's most challenging acoustic environments since 2006. Today, the technology has helped premium auto brands such as Bentley, BMW, Rolls Royce and Volvo to lift their sound systems to next level.

Initial Setup

System requirements

Dirac Live® requires a Windows or macOS computer with the following minimum specification

Windows

1. Microsoft Windows 10
2. Intel i3 or equivalent
3. 2GB RAM

Mac

1. macOS 10.14 Mojave, 10.15 Catalina, or newer
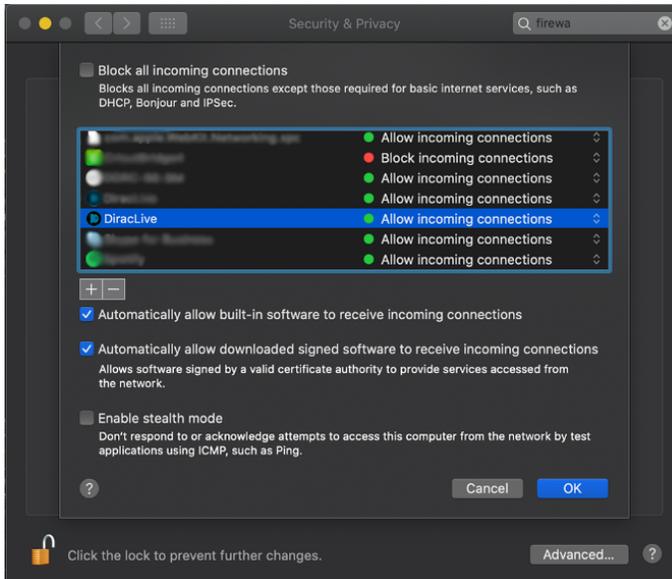2. Intel i3 or equivalent
3. 2GB RAM

Network settings

Both the Dirac Live® application and the Dirac Live®-supported hardware need to be connected to the same network to facilitate communication. The Dirac Live® application also requires access to the internet for two reasons. First, the application needs access to the license server. Second, part of the filter design is calculated on a cloud server. Therefore, it is important to make sure that the firewall doesn't block the connection from the application.
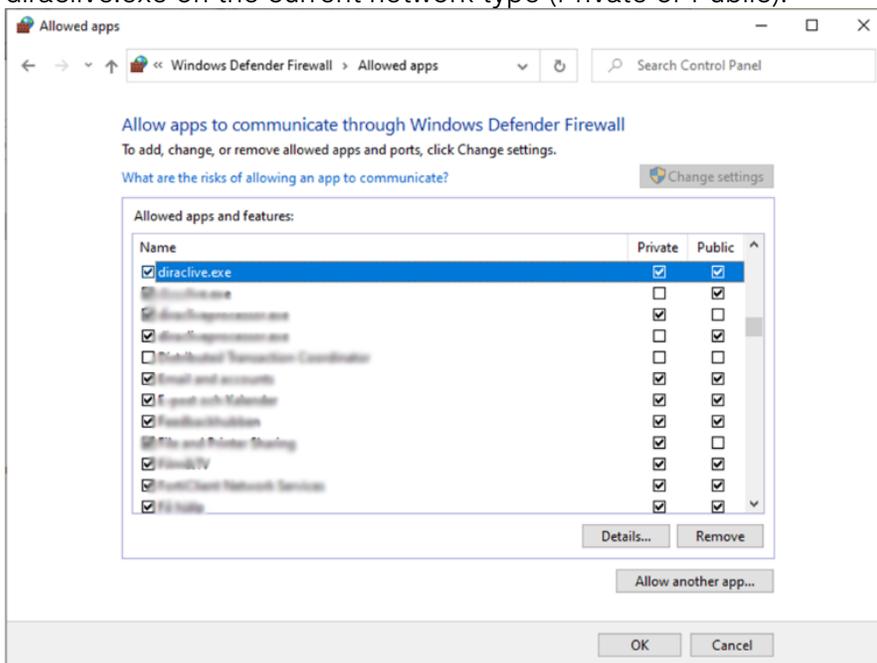
Firewall

Configure your firewall to allow connections from the Dirac Live® application.

1. macOS: In "System Preferences" → "Security & Privacy," make sure that "Allow incoming connections" is set for Dirac Live®.

2. Windows 10: In "Windows Defender Firewall" → "Allowed apps," enable access for diraclive.exe on the current network type (Private or Public).

If you are using Kaspersky, please see the following guide: https://confluence.dirac.services/x/JbGDC

DIRAC

Initial Microphone & Speaker Setup

Before starting with the room calibration, you must have a calibration microphone and ensure your speakers are configured properly.

Microphone

Dirac Live® requires an omnidirectional calibration microphone with an associated calibration file. We suggest the miniDSP UMIK-1 microphone due to its ease of use and universal drivers. However, there are many other options available, given these follow some general microphone guidelines (below). **Please note** that the measurement microphone is not included in the Dirac Live® Room Correction software purchase.
Here is a short list of validated mics, with links to purchase on Amazon.

- miniDSP UMIK-1 USB Measurement Calibrated Microphone
- Dayton Audio EMM-6 Electret Measurement Microphone,Silver
- Beyerdynamic MM-1 Electret Condenser Omnidirectional Measurement Microphone with Linear Frequency Response
- AudioControl SA-4100i Omni-directional Audio Test and Measurement Microphone for Apple / iOS Devices
- Earthworks M30 Measurement Microphone
- ADC-SA-4140I

What is an omnidirectional microphone?

An omnidirectional microphone is equally sensitive to sound from every angle. An omnidirectional microphone's polar pattern is a circle, indicating that gain is equal for any inclining angle relative to the microphone. In contrast to a bi-directional microphone, the omnidirectional microphone has only one side open to the sound pressure.

Why can't I use my cardioid or bi-directional microphone?

The Dirac Live® application requires that sound pressure from the room's reflections and the speakers' lines-of-sight are measured with equal gain. A cardioid or bi-directional microphone will measure the sound with different gain depending on sound waves' inclining angles to the microphone. Measuring a surround system with a cardioid microphone pointing at the front speaker will measure lower gains for the speakers behind the microphone, preventing the system calibration from being robust.

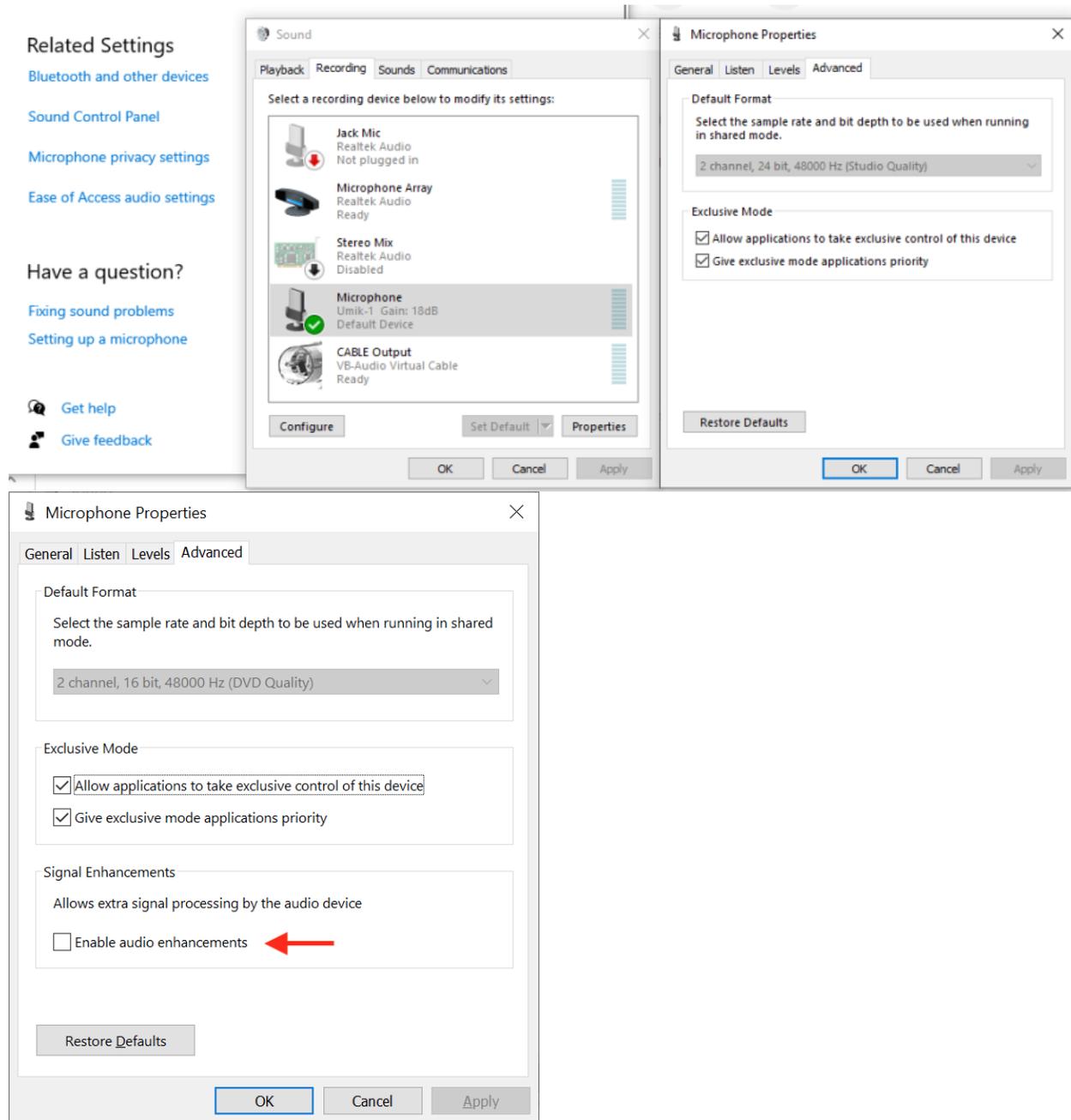### Where should I connect the microphone?

If the Dirac Live®-enabled device **comes with** a calibration microphone, we recommend connecting the included calibration microphone to the device and not the computer, as the calibration file is fetched from the device. The included microphone, or an approved third-party microphone, can also be connected to the computer if the Hi-Fi device is placed far away from the listening area—but in this case it becomes crucial to use the associated calibration file for the microphone.

Microphone Access

If the calibration microphone is connected to the computer, the Dirac Live® application needs to access the microphone to do the measurement.

Windows

1. Go to "Sound Settings."
2. Under "Related Settings," select "Sound Control Panel."
3. Select the microphone you want to use for the calibration.
4. Click "Properties" and then choose the Advanced tab.
5. Make sure that both checkboxes under "Exclusive Mode" are selected.
6. If visible, uncheck the box under "Enable audio enhancements."
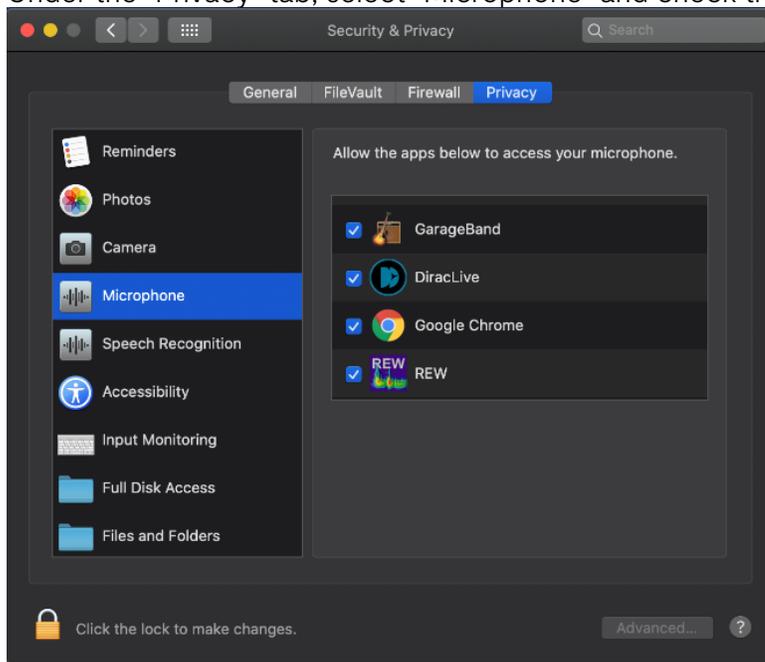
Ensure the checkbox for "Enable audio enhancements" is unchecked.

Mac

1. Go "System Preferences" → "Security and Privacy."

2. Under the "Privacy" tab, select "Microphone" and check the box next to Dirac Live®.

Microphone & Speaker Placement

Dirac Live® uses measurements made in your listening room to calculate correction filters for all speakers and the subwoofer. The Dirac Live® app will guide you through the measurement and filter design procedure, where you will take between 9 and 17 measurements at different locations in your listening room.

Loudspeaker placement

Before you begin calibration of your system, it is important to ensure that your speakers themselves are in a suitable arrangement and position. Below are a few guidelines to follow when determining the physical arrangement of your setup.

1. Check your speaker manufacturer's recommendations for setup and follow these first. They might suggest steps that conflict with our guidance below and are to be followed first and foremost.
2. Maximize distance between your speakers and the wall, if possible. This will reduce the interference of high energy wall reflections, which often affect lower frequencies. Dirac Live® will be able to correct for this distortion in many cases, but sometimes the loss of energy is too high and the speakers need to be moved further away from the wall.
3. Do not place objects in front of the speakers.
4. If possible, position the normal listening spot in the middle of the room.
5. Consider adding dampening in the room. This reduces the impact of room modes or flutter echo.
6. Place your speakers at the same height as your ears.

Microphone Placement

The basic principle of microphone placement is that any additional measurement improves the correction. More points = more accurate filters. However, depending on your room's acoustics

and equipment, the benefit from more measurements may diminish faster. We recommend that you complete every measurement point in your chosen arrangement.

- The measurement points should have a distance of at least 30 cm (12 in) between one other.
- Avoid making measurements in too small a space. Even for the "Tightly focused" listening environment, it is important to spread out the microphone positions in a sphere of at least 1 meter in diameter. Too small space will result in over-compensation, which sounds sounds very dry and dull.
- Measure some points outside the listening area. E.g. for a sofa, it is recommended to do a few of the measurements outside the couch by 20-30 cm in any direction.
- Remember that you are measuring a three-dimensional *volume* rather than a two-dimensional *plane*, so be certain to take measurements in different vertical positions instead of in a single horizontal line. Consider depth as well.
- Point the microphone toward the ceiling (90°) when measuring to ensure that the microphone's coloration is similar for both the wall reflections and the direct wave from the speaker. A 90° microphone calibration file is needed in this case.
- The positions specified in the "Select Arrangement" view the act as a guide. You may deviate from them as needed in order to emphasize or deemphasize particular spaces.

Dirac Live® Calibration Guide

Installing the software

Download the latest version of Dirac Live® 3.x.x from https://live.dirac.com/download/ and save it to a suitable location.

Double-click on "DiracLive v3.x.x Setup Windows.exe" on Windows or unzip the "DiracLive-v3.x.x-Setup-Darwin.zip" on Mac and follow the steps in the installer.

After installation, make sure your device is connected to the same local network as your computer. Your computer also needs to be connected to the internet for licensing purposes.

Dirac Live® account

On the first screen that shows up after launching Dirac Live®, you will enter your account details. Depending on the manufacturer, your Dirac Live®-enabled device may or may not include feature license(s) by default. If you bought a feature from our web-store, you will need to enter your account details in the application to use it.
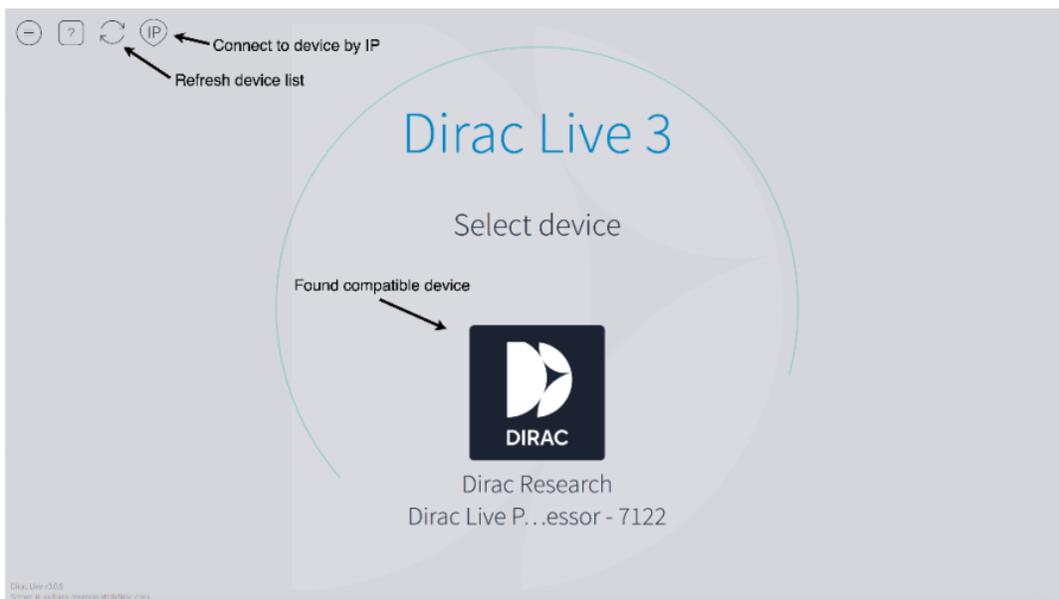
If you don't have an account, you may create one by clicking "Create or manage your account" on the login screen.

If you haven't bought any licenses and do not wish to log in, you can press the "Proceed without logging in" button.

Select Device

Next, the Dirac Live® application will scan your network for all compatible devices. Make certain your device and the computer are connected to the same network and have full network access. All found devices will be listed as an option that can be clicked on.

If you have trouble with device discovery, see: Troubleshooting: No Devices Found

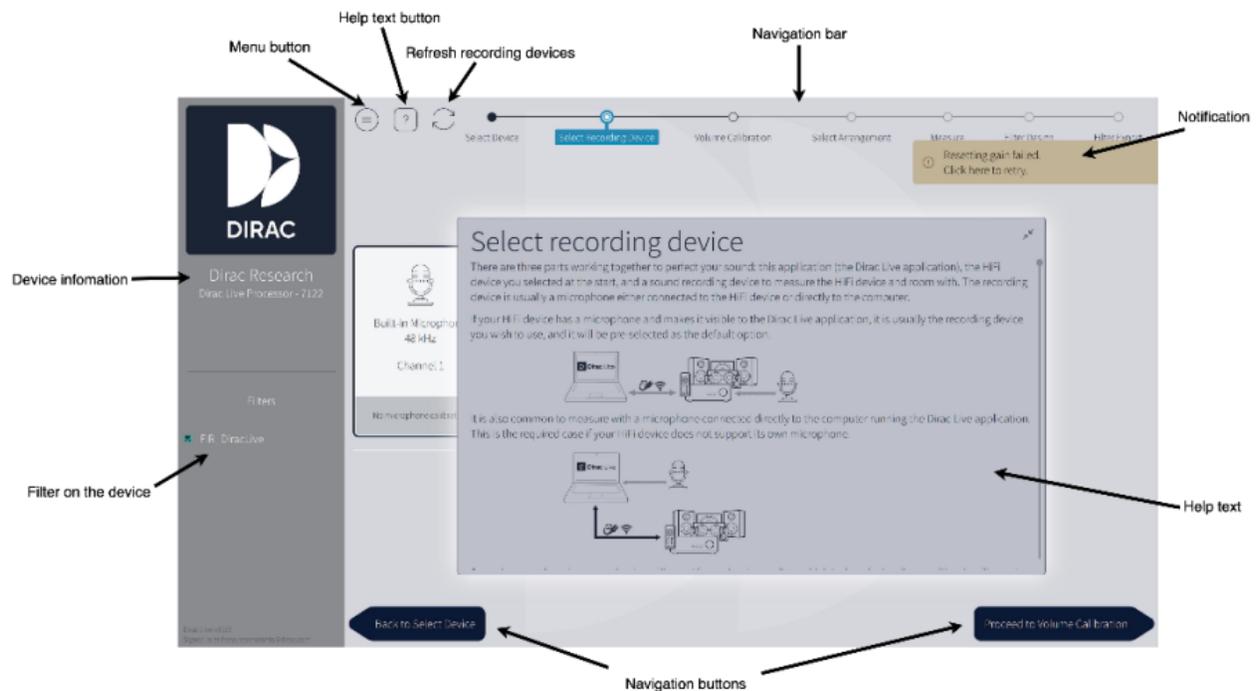You can also try using the "connect via IP" by pressing [IP] at the top of the application and enter the IP-address of the device. If the device still doesn't appear, ensure that there is no firewall blocking the connectivity between the device and Dirac Live® application. Kaspersky on Windows can be particularly problematic. Here's our guide to fixing it: Windows: Problems with Kaspersky

Common user interface items

Once you've selected a device, you will enter the Select recording device page, which starts the calibration procedure. This section describes the function of the common user interface items available during the whole calibration process.

Menu button

The menu is found by pressing the **Menu button** in the left upper corner. The menu includes some standard user features such as saving and loading projects, application themes, languages, etc.

Auto-save

After each measurement is taken, the project is auto-saved.
The auto-saved project can be found in:

Windows

%userprofile%\Dirac\projects\autosave

Mac

<User>/Dirac/projects/autosave

Help text

If you get stuck and don't know what to do during the application, you can always press the **help button** [?]. Pressing the **help button** will give you the necessary information on how to proceed with your calibration. For example, the help text for the Select recording device page can be seen below:

Notifications

Dirac Live® uses different types of notifications to keep the user updated about changes or errors.
Yellow indicates an error. Green indicates that a procedure was successful. Black and blue are general notifications.

Sidebar

The sidebar presents general information about the connected device, such as manufacturer, logo, model, and system name. The filter available on the unit can be seen under "Filters." The sidebar can be minimized by pressing the section between the sidebar and the rest of the page described with a blue line in the figure below.

Note: Depending on your device, changing the configuration may clear the filter list or switch to a configuration-specific filter list. You should never change device configuration while performing a room correction.

Navigation bar & buttons

At the bottom of the page, you will find two buttons for navigating forward or backward in the application.

The navigation bar at the top of the page shows where you are in the application. You may also navigate directly to a page you have visited previously by pressing one of the black circles.

Select the recording device

After you've selected a device, you will need to select a microphone to record the stimulus, or test tones, played by your device. All microphones connected to your computer and your device will be listed on the "Select Recording Device" page.
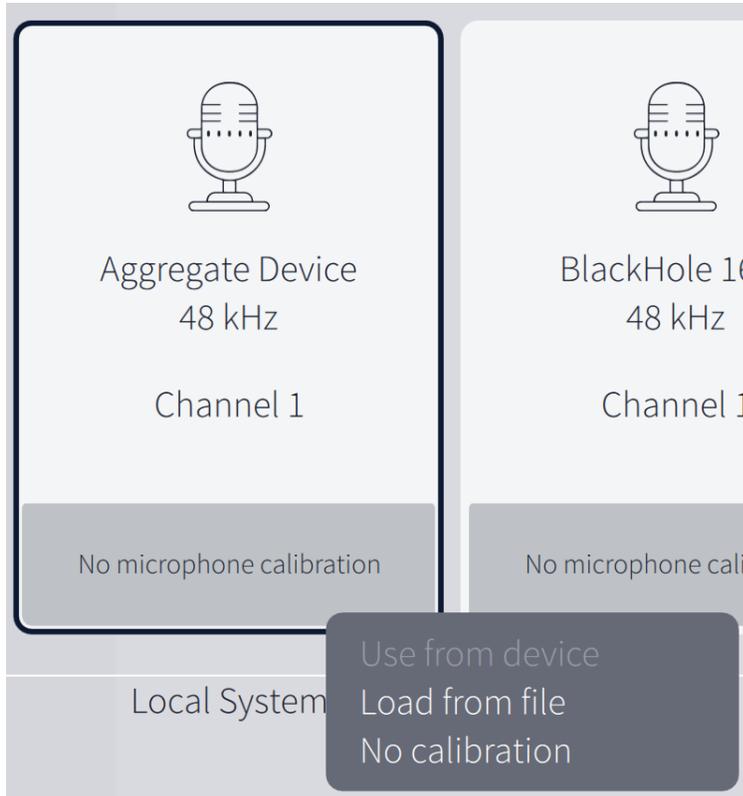
- The microphones over the "Local System" section will show all microphones connected to your computer.
- The microphone connected to your device will be shown over the device logo.
- A selected microphone will have a thin border surrounding it.

Select the microphone that you wish to use for measurements—usually the one you connected during setup. Click the bottom of the microphone's box to load the relevant calibration file. Selecting "No calibration" after clicking the context menu bypasses any compensations to the

raw input stream and is not recommended.
Make sure that the microphone calibration file is created for 90-degree measurements.

After choosing the calibration microphone and loading a calibration file, you want to proceed to the "Volume Calibration" page by pressing the navigation button in the lower right corner.
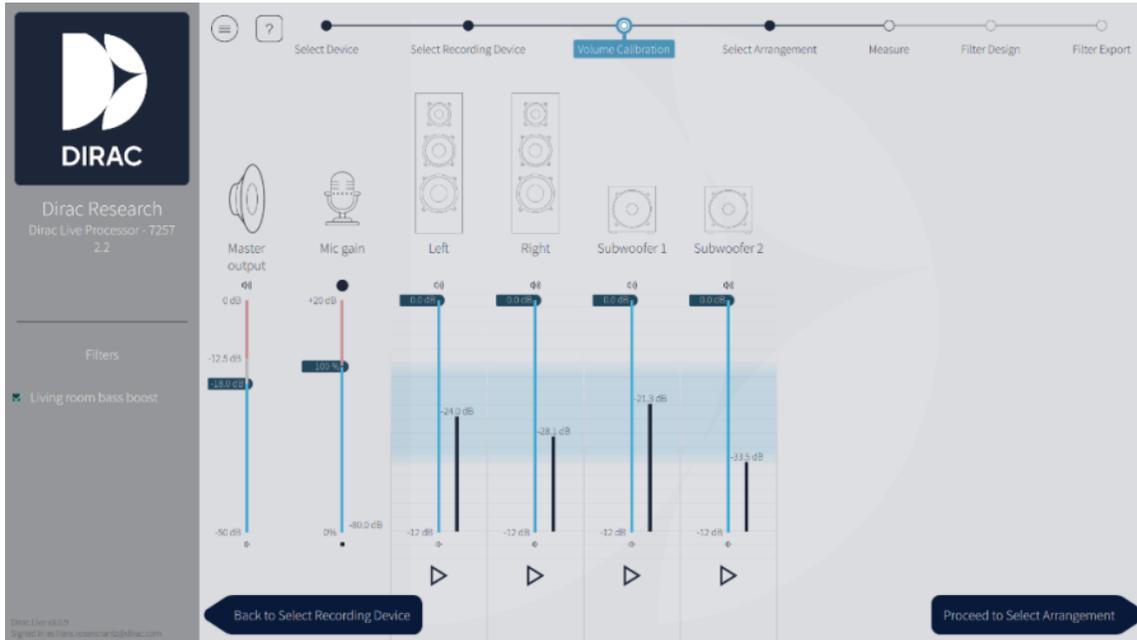
Volume calibration

Since the filter design algorithm requires that the speakers are measured with
a moderate sound pressure level and a noise level as low as possible, it is crucial to do a level calibration of the system before measurement. The microphone should first be positioned in the center of the listening area. This is the "sweet spot."

1. Set the Mic gain to 100%, which is the point between the red and blue areas.
2. The "Master output" level must be set to a low volume in order to avoid damage to your ears or speakers. If it's not already set to a low volume, drag the magnitude indicator to the lower part of the slider.
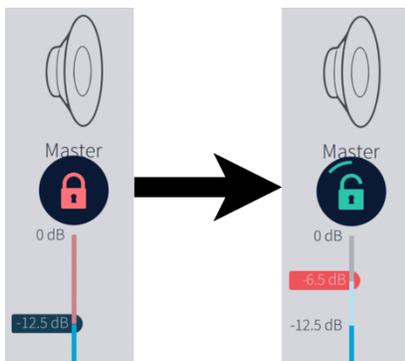
3. Press the play button ▷ beneath the speaker located furthest to the left. The speaker should now play a stimulus in the form of a pink noise or, if the speaker is a subwoofer, short sine sweeps. If you can't hear the stimulus, slowly raise the "Master output" level until you hear it.
4. Repeat this procedure for all speakers. If there is no noise playing from one or more speakers, make sure that your device is configured to the correct speaker configuration and that your speakers are connected to the device. Ensure that the device's firmware is also properly recognizing each speaker.

5. After you've confirmed that all speakers play stimulus, then play the stimulus from the furthest left speaker again. Raise the "Master Output" level until the sound pressure indicator reaches the blue zone. Reaching only the lower bound is usually fine.
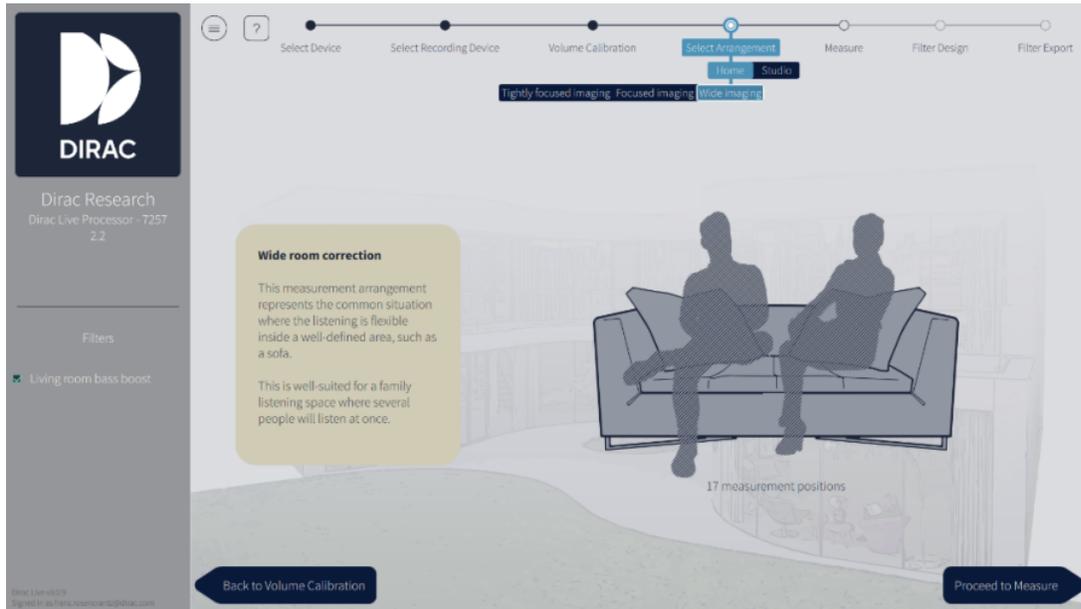

Remember that volume of the stimulus should never hurt your ears. There is a lock on the Master output slider for safety reasons. However, if you need to raise the volume into the red zone and are positive that your system can handle it, press the red lock that appears above the slider. You should now be able to drag the slider into the red area.

Select arrangement

In the "Select Arrangement" view, select the arrangement that best matches the arrangement to be measured. The variations we offer act as a guide to positioning the microphone. The core difference between the arrangements is the number of measurement points that are allowed. The first measurement should always be taken in the center of the listening region, in the desired sweet spot, as this will be used for aligning levels and delay between loudspeakers.

An arrangement can be chosen from the arrangement menu. In the arrangement menu, the home section has three different arrangements, Wide Imaging, Focused imaging, and Tightly Focused imaging, which provide 9, 13, and 17 measurement points, respectively.
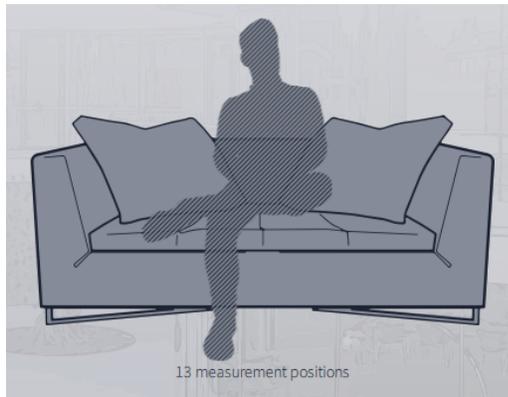

Tightly focused imaging

This measurement arrangement represents a well-defined listening area from which the listener rarely moves.
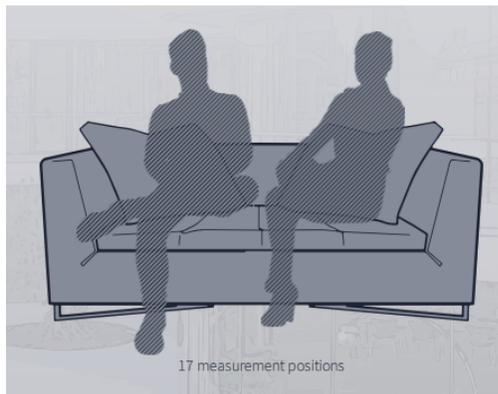**Note:** The tighter the measurements are placed, the more extreme the correction.

Focused imaging

The measurement arrangement represents a listening area with one well-defined listening position that should still accommodate a degree of flexibility. Select this arrangement if the listening area is a two or three-seat sofa.

13 measurement positions

Wide imaging

This measurement arrangement represents a larger listening area for multiple listeners. This setting works for both corner sofas and for listening areas that are distributed across two or more sofas.

17 measurement positions

Tip: It is recommended to spread out measurement points evenly across the whole listening area. However, for the "Wide" and "Focused" listening arrangements, measurements can be taken more densely at a specific position to more strongly emphasize it.
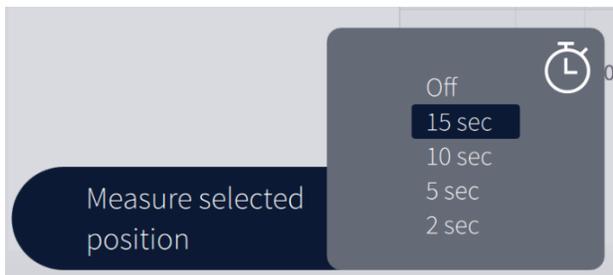
Measurement procedure

Ensure there is a clear line-of-sight between the microphone and speakers, no background noise (TV, air conditioning, construction work, etc.) while doing the measurements, and remember to keep the microphone perfectly still, using a stand or similar. A sweep will be played through each speaker, and a final sweep will be played through the first speaker again.

1. The first measurement should always be taken in the center of the listening region, in the commonest listening position or "sweet spot," as this will align levels and delays between loudspeakers.
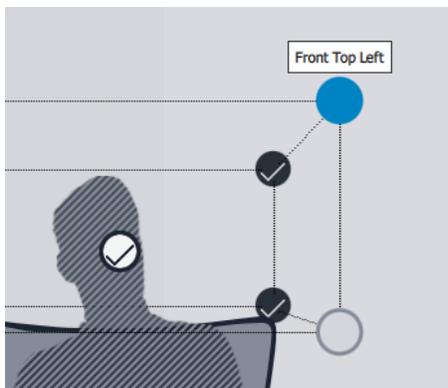
2. Press the measure button to collect a set of measurements. This will play a sweep in each loudspeaker and one final sweep in the first loudspeaker again.
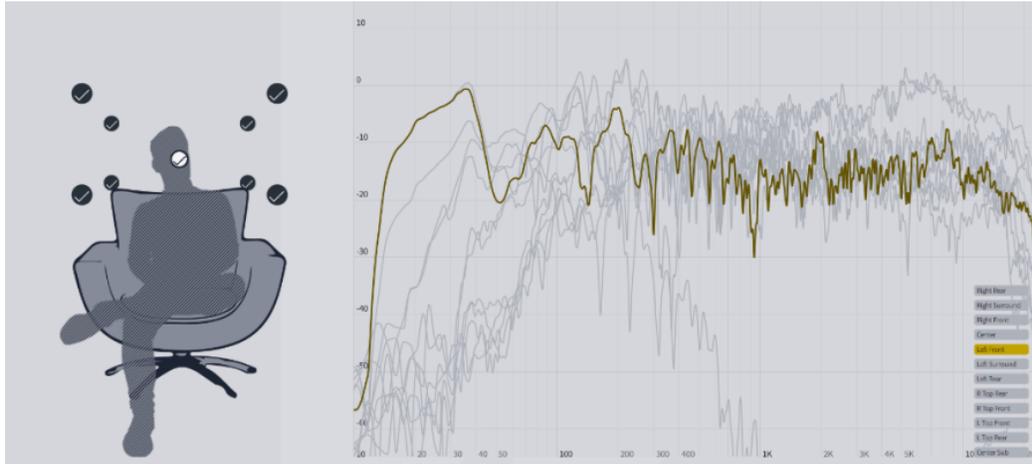

3. Press the timer to select a delay between 2–15 seconds before the measurement start. This will give you time to get out of the listening area, or to lower your laptop lid if it interferes with line-of-sight.

4. Move the microphone to the next indicated position and press "Measure." Repeat this procedure for all measurement points or until you have spanned the whole seating area. **Tip:** Hover over a measurement point to get a help text on where the point should be positioned.

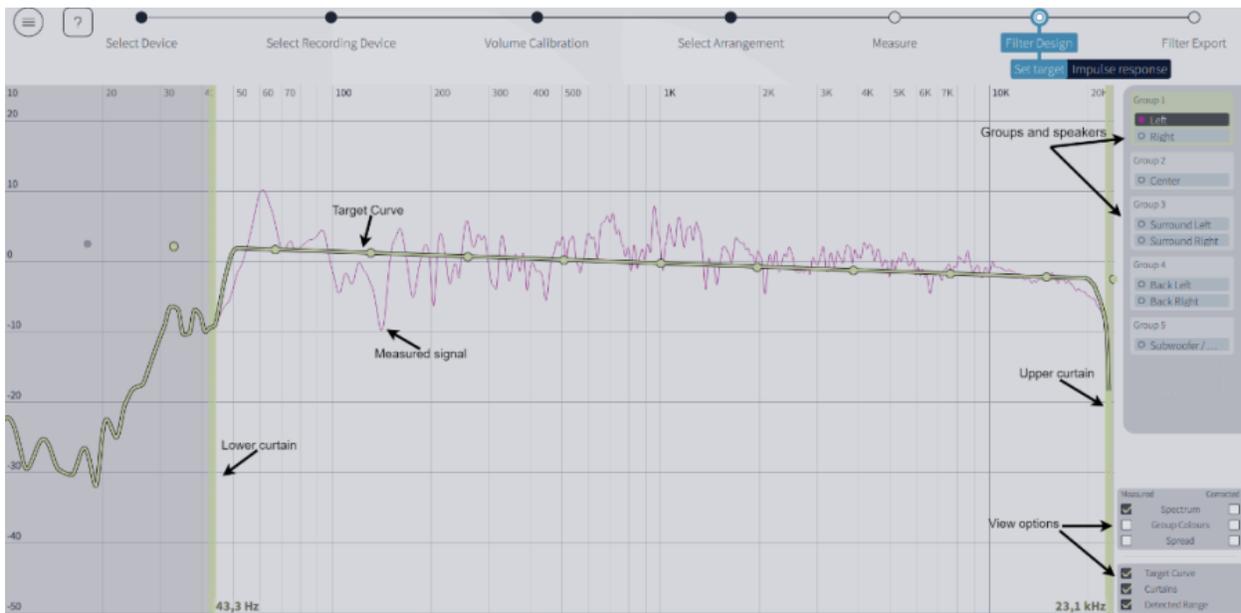5. Proceed to the filter design page after all recommended positions have been measured.

6. Your project will now be auto-saved

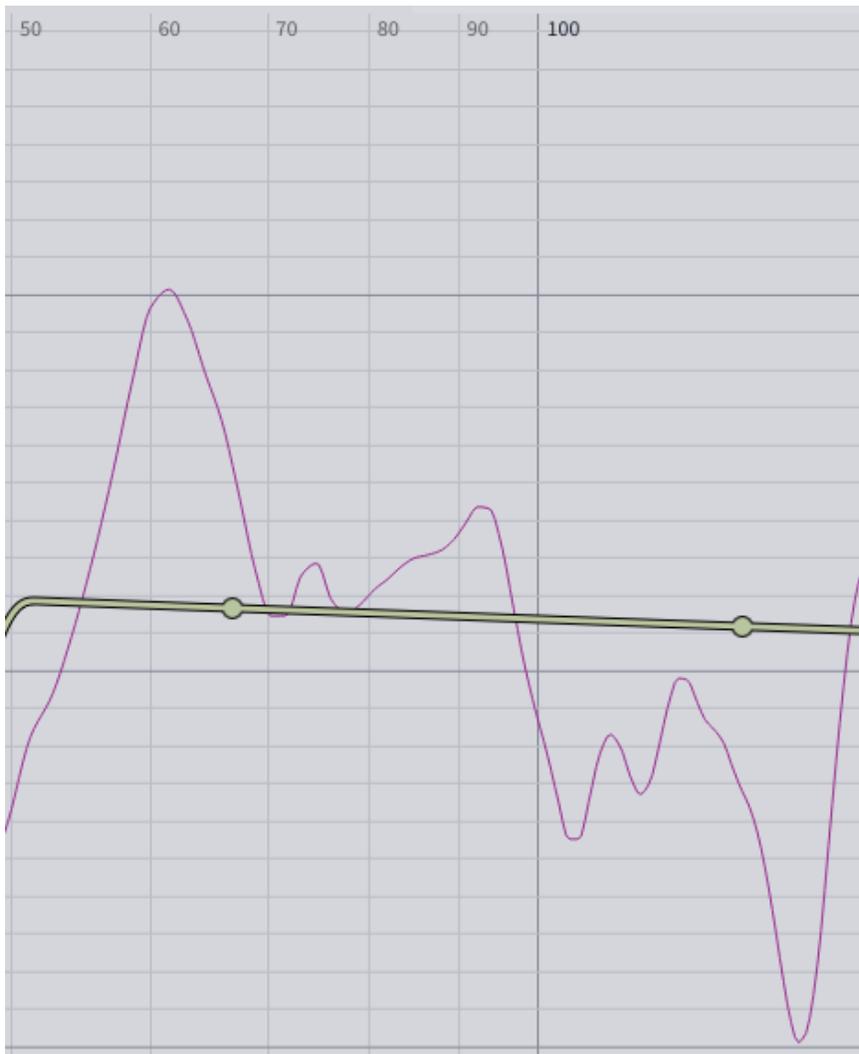**Potential problems and workarounds during measurement:**

- Clipping: If the level is too high during measurement, the signal will clip, and the measurement will be terminated. Return to Volume Calibration to reduce the gain of the corresponding speaker or master volume of the system.
- Low SNR (signal-to-noise ratio): If the level is too low during measurement, it is difficult for the application to discern signal and background noise. Return to Volume Calibration to increase the gain of the corresponding speaker or master volume of the system. See more here: Troubleshooting: Low Signal-to-Noise Ratio (SNR)

Filter Design

With the measurement done, we have all the information to correct for any distortion in the system. The filter design page shows each speaker's averages frequency response before & after Dirac Live® has been applied. The frequency response itself shows how much energy the speaker can produce for a certain frequency. For example, in the figure below, the room resonance has caused a 10 dB energy boost at 60 Hz and 5-10 dB attenuation above 100 Hz. A
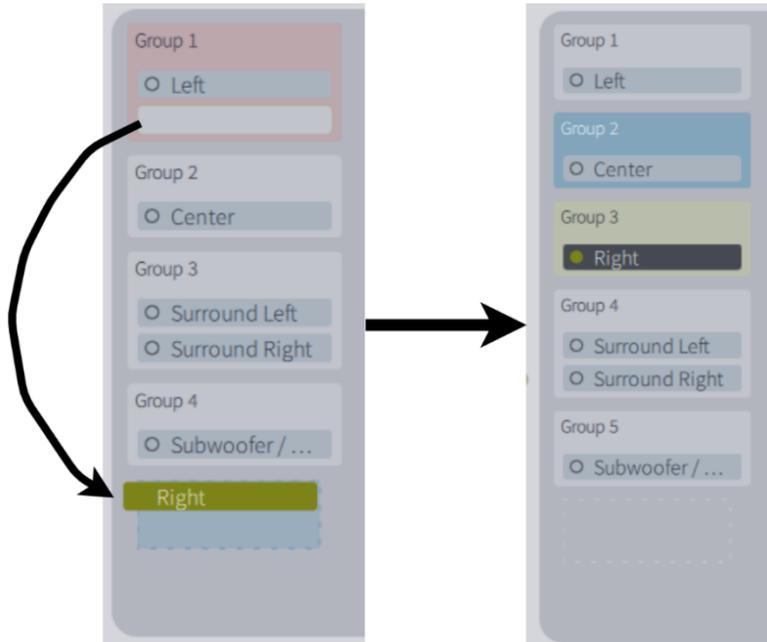
sharp peak like this at 60 Hz will amplify some bass notes more than others making the bass reproduction of the system uneven. The valley above 100 Hz will reduce the feeling of warmth of the system. These are distortions that Dirac Live® will correct.

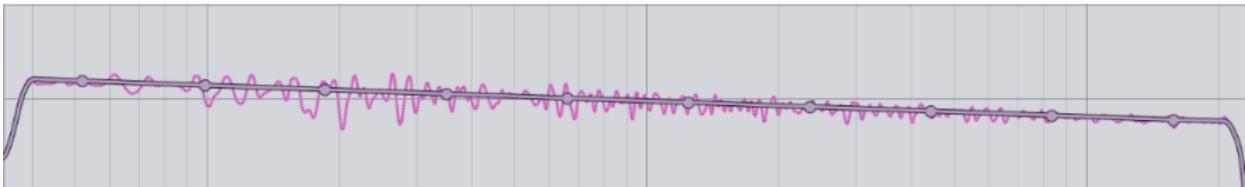**Tip:** You can zoom in and out by using the wheel on the mouse.

Speaker groups

Speakers with similar physical attributes are automatically grouped. Speakers within a group will have the same target curve and, in turn, also have a similar frequency response. If you want individual target curves for the speakers within a group, you can separate the speakers by dragging a speaker within a group to the empty area shown in the figure below.
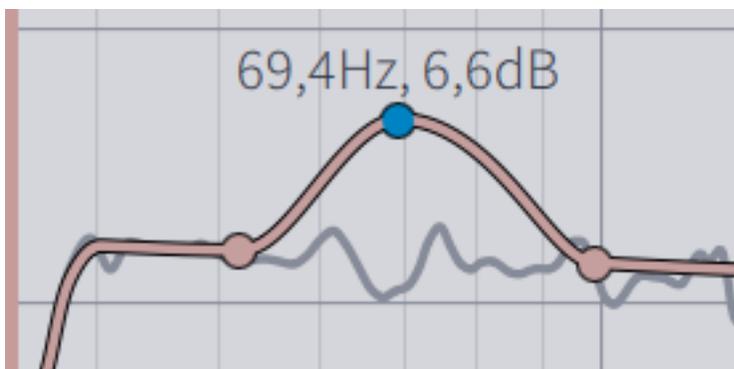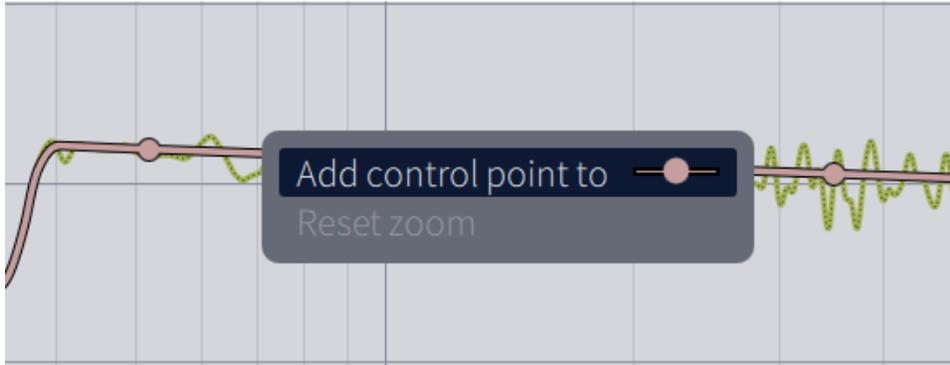
Target curve

The target curve is a tool to edit the frequency response of a speaker or a group of speakers. Dirac Live® will construct a mixed-phase filter to make the systems frequency response mirror the target curve. Dirac Live® will automatically generate suggested target curve(s) and resulting filters intended to make the sound image in your room as even as possible. These curves can be adjusted to your preferences.
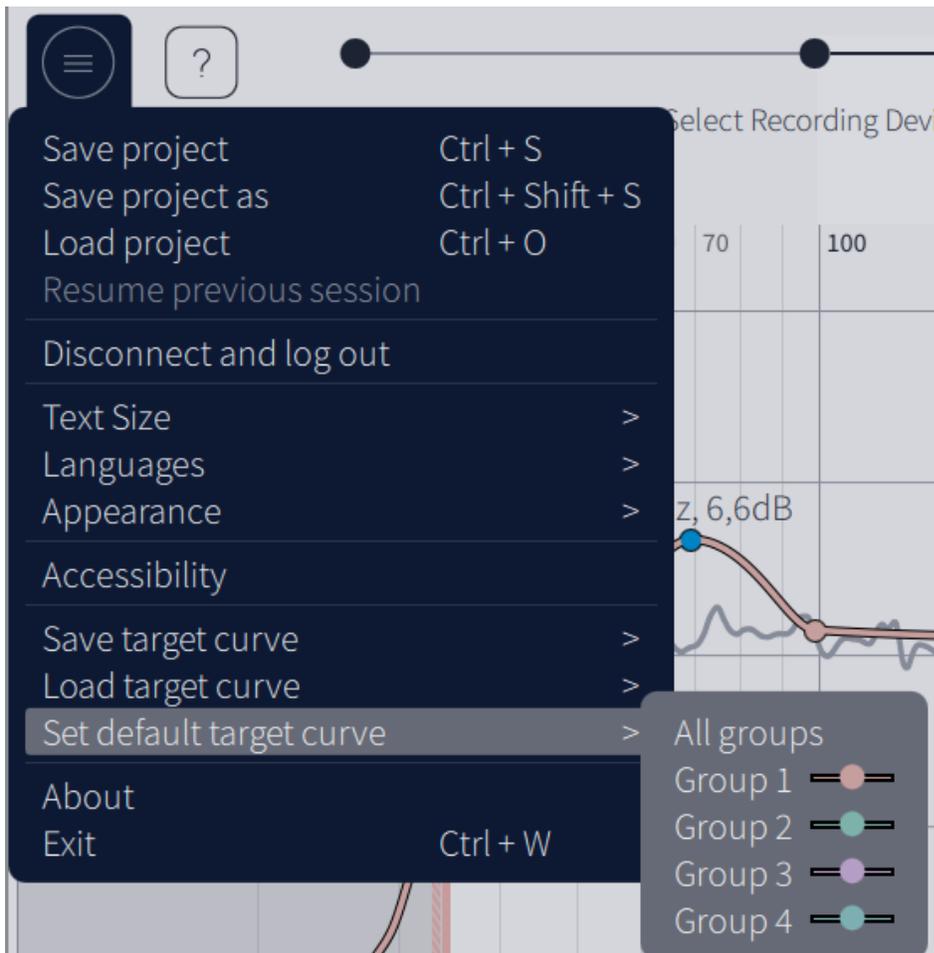

The target curve can be modified (and emphasis on a particular frequency increased or decreased) by dragging the control point.

69,4Hz, 6,6dB

Control points can be added by right-clicking on the target curve and select "Add control point." A control point can also be deleted by right-clicking on it and pressing "Delete control point."
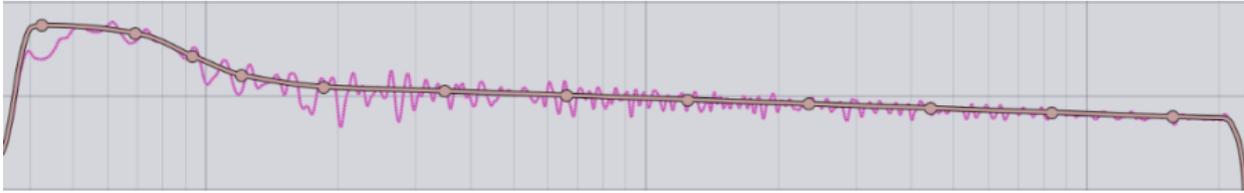
At any time, you can load the default or custom target curve from the menu in the upper left corner. Choose between loading the target curve to a specific group or all groups.
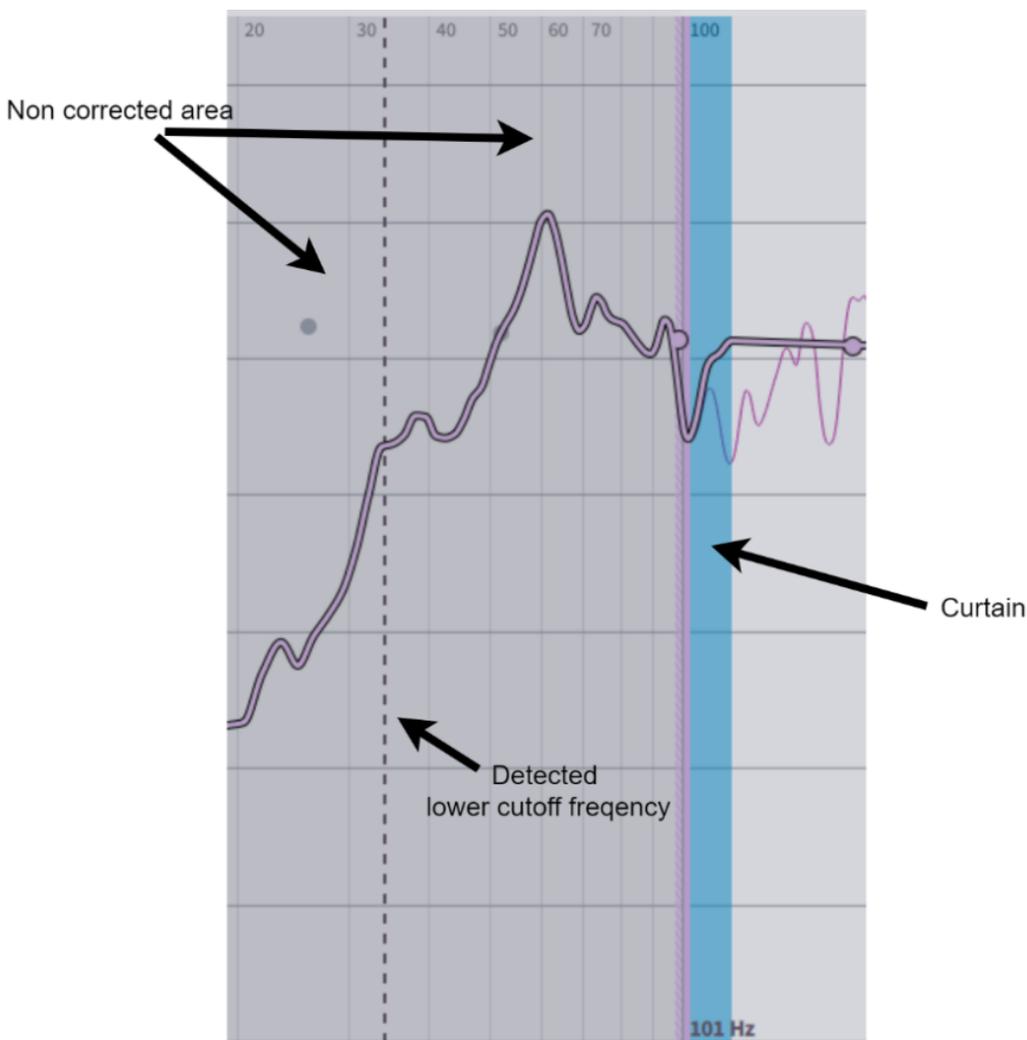

Tip: A small change to the target curve can dramatically change the perceived sound quality. It is therefore recommended to edit the target curve with care and awareness.
You can play around with some different target curves by exporting different filters to your device and finding the one you prefer. Save your project often to give yourself the latitude to make adjustments without committing to any potential negative side-effects.
If you experience phase issues from an exported filter, you may have measured too few measurement points or measured in too small an area. You can always go back to the Measure page and re-measure points or measure more.
The default target curve often attenuates the bass response of the room. Many users prefer to

amplify the bass region to mirror the room's natural response. This can be done by adding a 6 dB bump under 100 Hz, as shown below.
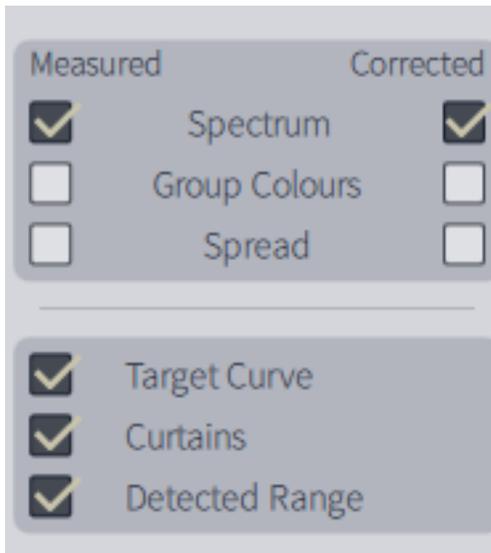

Curtains

Curtains can be used to restrict the area that is going to be corrected. The light grey area on the curtain's right is going to be corrected in contrast to the dark grey area left of the curtain, which will not be corrected. Hovering over the curtain will highlight it in light blue. The curtain can be dragged by pressing the left mouse button over the curtain. The dashed line is the detected lower cutoff frequency for the speaker. It is not recommended to drag the curtain below this point since the speaker is not designed to produce energy at these low frequencies.
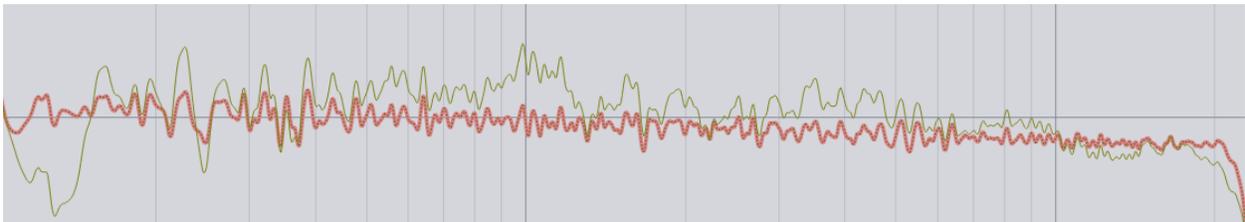

View options

The Dirac Live® application offers several view options, making it easier to study the characteristics of your system. System measurements without Dirac Live® applied can be seen to the left, while the corrected system with Dirac Live® applied can be seen to the right.
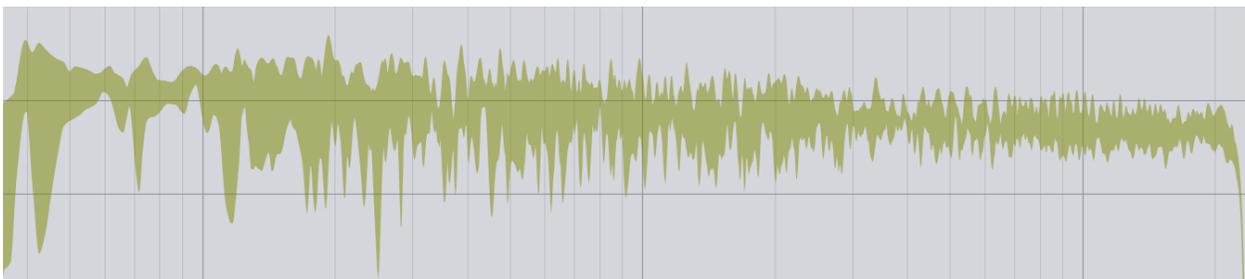

Spectrum

The averages frequency response of all measurements for a speaker can be seen if this box is checked.
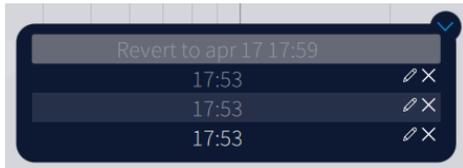

Spread

Shows the spread of the frequency response for a speaker. For a specific frequency, the highest and the lowest measured energy is shown.
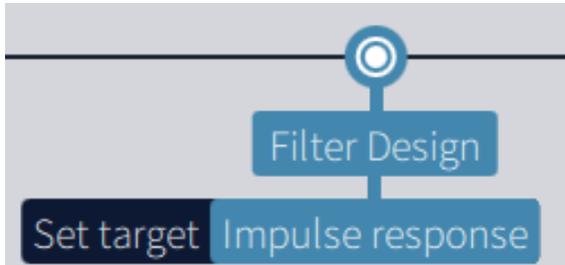

Snapshot

Take snapshot function will create a snapshot of the current state – if a change is made to a target curve, it is possible to switch between snapshots without saving/load projects.
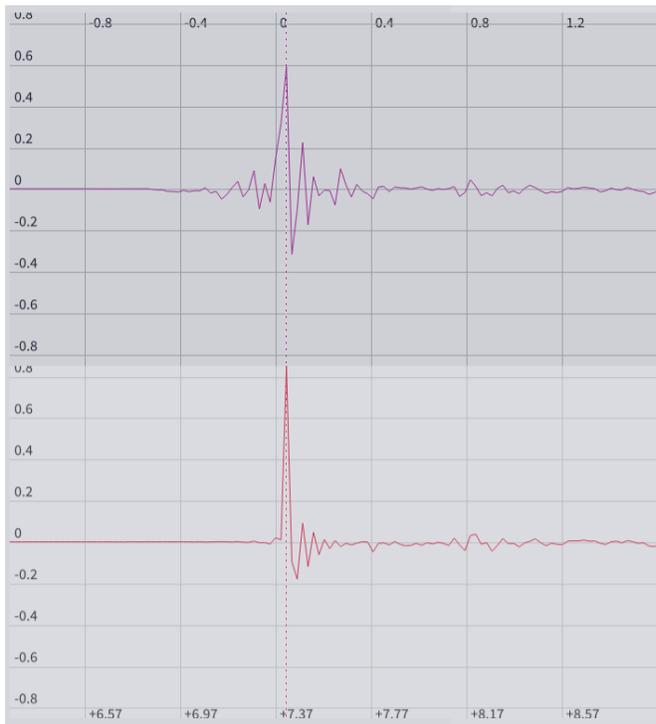
Impulse response view

The impulse response illustrates the precision and distinctness of the sound before and after Dirac Live® compensation. Each speaker's impulse response can be seen by pressing the "Impulse response" tab in the upper left corner.
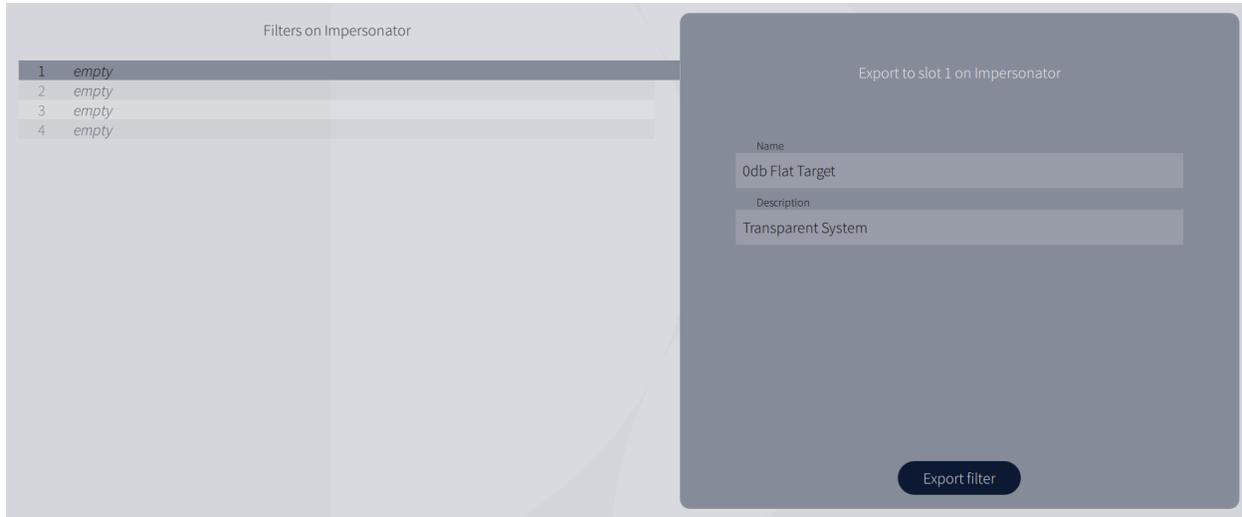

Pressing "separate curves" in the view options under Impulse response will split the impulse view horizontally. The corrected impulse is then seen below, with the measured impulse on the top. The measured impulse's detected peak is positioned at 0 ms and the corrected impulse peak is positioned a few milliseconds later—typically around 7 ms. This is the true latency of the filter introduced to the system and is needed to correct for the mixed-phase behavior of any speaker.

In the figure below, we can study the drivers' misalignment in the speaker, where the energy is spread out over time. After Dirac Live® correction, the impulse response's energy is well defined over a small time period, making the sound sharper and more detailed.

![Dirac logo]

Filter export

The last step of the process is exporting the filter generated by Dirac Live® for a live listening test. Select a slot and save under the desired name (there may be an auto-generated name, which can be replaced). When the export is complete, the application will return to the Filter Design view. Do not forget to save your project before closing the application.

Filters on Impersonator

1	empty
2	empty
3	empty
4	empty

Export to slot 1 on Impersonator

Name

0db Flat Target

Description

Transparent System

Export filter

Final remarks

Thank you for reading through this guide. We hope that it provides all the answers you need for getting a Dirac Live®-calibrated system up and running. However, if you experience trouble with anything not mentioned in this guide, please feel free to contact our support team at:

helpdesk@dirac.com

or

https://helpdesk.dirac.se