DEQX Pre-8 Beta v1.38 - Getting Started Guide

Introduction

In this guide we're going to be showing you how to prepare your Pre-8, amplifiers and speakers for use, then show you how to measure your speakers, create a crossover, then create a speaker "System" to utilise the speaker calibration, time/phase alignment and then room correction that you have performed to deliver the best sound possible from your system.

Preparations

Inputs

The DEQX Pre-8 has the following inputs for your source devices to connect to:

- in1 - Stereo Balanced XLR Connectors, +22dBu (9.76V RMS)
- in2/phono - RCA phono input. This is the connection point for a moving magnet or high output moving coil turntable. (This input can also be converted to an unbalanced line level input by means of a jumper within the unit.)
- in3 - Stereo RCA line input +16dBu (4.89V RMS)
- in4 - USB Audio. This input allows the Pre-8 to appear in your Windows PC or Apple Mac computer as a Class Compliant USB audio output.
- in5 and in6 - TOSLINK stereo digital inputs
- in7 - 75ohm S/PDIF coax stereo digital input
- in8 - AES/EBU balanced stereo digital input

- calibration microphone - 48V phantom powered balanced microphone input for calibration.

Outputs

There DEQX Pre-8 has the following line to amp and amp to speaker connections:

- All the DEQX Pre-8 outputs are active at all times. This allows you to use any combination of RCA, XLR or digital outputs depending on your amplifiers' requirements. i.e. you may wish to supply your tweeter amplifier from the RCA outputs, your mid-range amplifier from the XLR outputs and your subwoofer's amplifier from the digital outputs.
- RCA Outputs
  - Subwoofer (sub-bass)
  - Main (bass)
  - mid
  - high
- XLR Outputs
  - sub-bass
  - bass
  - mid
  - high
- 75Ohm Coax S/PDIF Digital Outputs
  - sub-bass
  - bass
  - mid
  - high

Power

- The DEQX Pre-8 has its power supplied via a standard 10A IEC power connector.
- The usable voltage range is 100V to 250V AC, 50Hz or 60Hz.
- There are no plans to support any DC power supply options at this stage.

Network

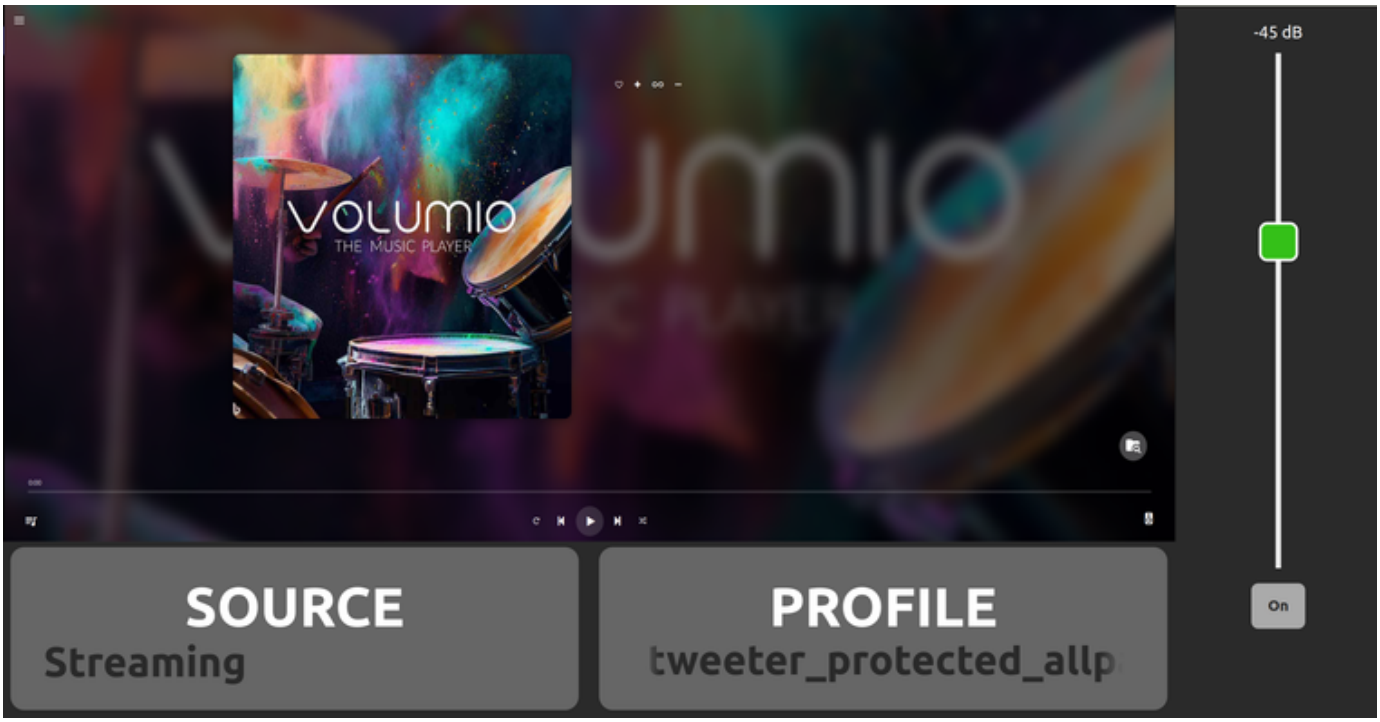
- The Pre-8 requires an internet connection at all times to startup and control remotely. Please connect an Ethernet cable to the rear Ethernet socket and then connect the other end to your internet router.
- If you cannot provide an Ethernet connection to the Pre-8, you can use the supplied Vonets WiFi to Ethernet bridge device supplied (if you chose to have this supplied when you ordered). Follow this guide to set up the device: Wi-Fi to Ethernet Device Setup Guide

Initial Startup

There is a first-run process for the Volumio streaming platform integrated into the Pre-8 that needs to be performed when the system is first installed, that we will be taking care of for you all before shipping so you don't need to perform this process. You can however go into the Volumio settings and add your Tidal or Qobus credentials so that you can access your libraries directly from the Volumio control page.

HOME

Once the Pre-8 has completed its power-up cycle (This process currently takes around 2 minutes), you should see this on the front panel screen:



If you open a web browser to this address - http://deqxy3.local/ . You should then be greeted with this screen:

Clicking on the boxes in your browser, or touching them on the front panel screen, will navigate to different windows where you can access various controls for the unit.

The slider on the right-hand side controls the output level of the device with the number above indicating the attenuation of the output signal in dB.

The button labelled “Unmuted” shows the output muting status.

SOURCE

Select the SOURCE tab on the main startup screen. You should see something like this:

Clicking on these squares select the audio source that will play on the Pre-8. The selected item will be highlighted in light grey, as the Streaming (Volumio) square is in this screenshot. Clicking the HOME icon (small house) in the top left corner of this screen returns you to the HOME screen.

Selecting any source other than STREAMING and then exiting to the HOME screen by selecting the HOME icon in the top left-hand corner, will return a screen that looks like this on the front panel of the Pre-8:

In the example above, the RCA input source was selected and is indicated in the lower left-hand corner of the SOURCE button. Whichever source you have selected will be visible here.

When Streaming is selected as the source, you can then interact with the Volumio streaming system built into the Pre-8.

For more information on the operation of the Volumio software platform, you can visit the Volumio website at this link: https://help.volumio.com/help/volumio-3-software

If you would prefer a larger interface that is dedicated to the Volumio control, you can also point your browser to this link: http://deqx-gen-4.local/playback

PROFILE

This selection takes you through to where you select any system profiles you have created in the SETUP process. However, when you first setup your unit, you will only see the default **headphones** and **tweeter_protected_allpass** filters.

- The **headphones** filter is automatically engaged when headphones are plugged into the front panel of the Pre-8 and the filter selection will return to the selected filter before the headphones were connected.
- The **tweeter_protected_allpass** filter is a default four-way crossover with the tweeter cross over filter set to 1k and no speaker or room calibration applied. You can consider this to be something like a bypass filter for getting the system passing audio without any calibration performed.

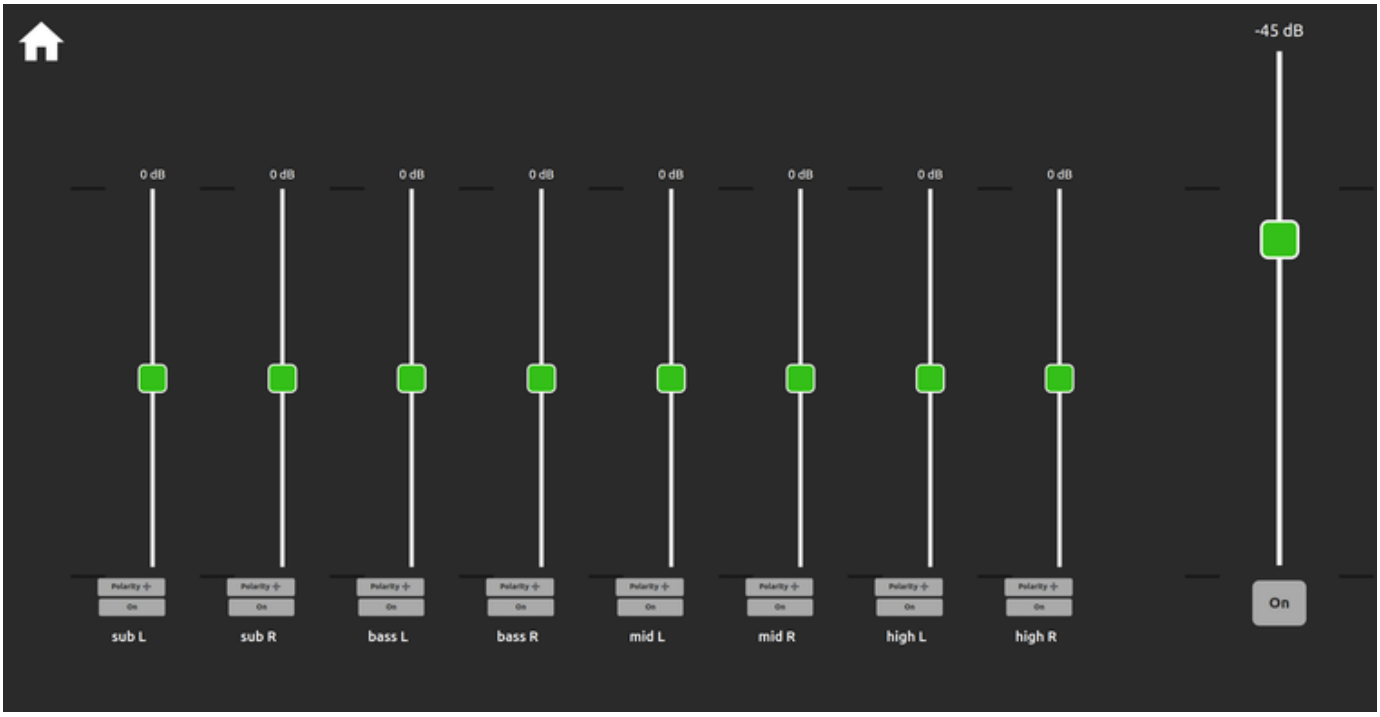
Once you have performed one or more calibrations, the created filters will appear in this profile list, and you can choose between them.

- Click on the filter to select it and it will change to a light grey colour.
- Click on the right-hand side of the filter will bypasses it and gives you an uncorrected output with the crossover settings from the filter you have selected. In the bypassed state, only the speaker Time of Flight (TOF) and room correction settings are bypassed.

LEVELS

Selecting this box brings you to a page where for each of the eight output channels in the Pre-8 you can:

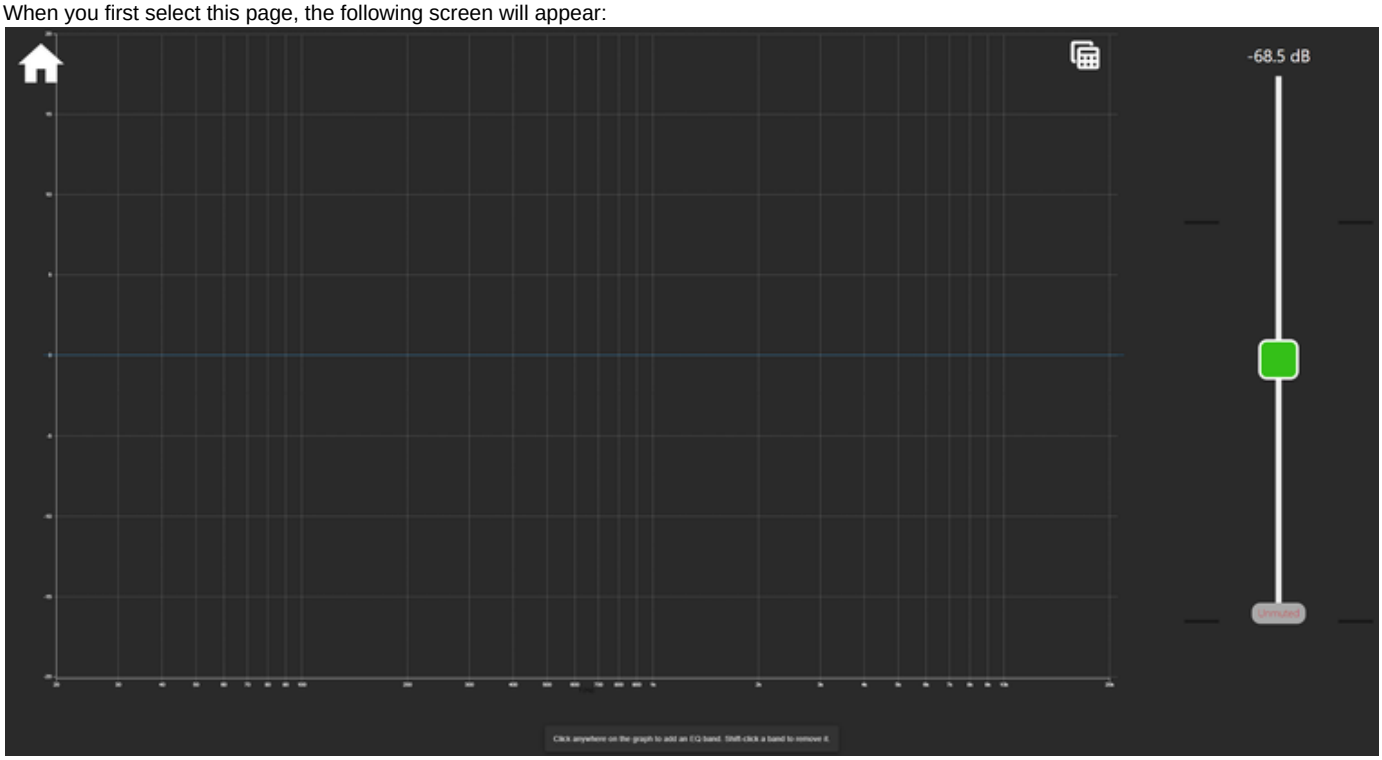
- Adjust the level.
- Mute and unmute.
- Flip the polarity.



PARA EQ

This page allows the addition of parametric equalization for each profile.

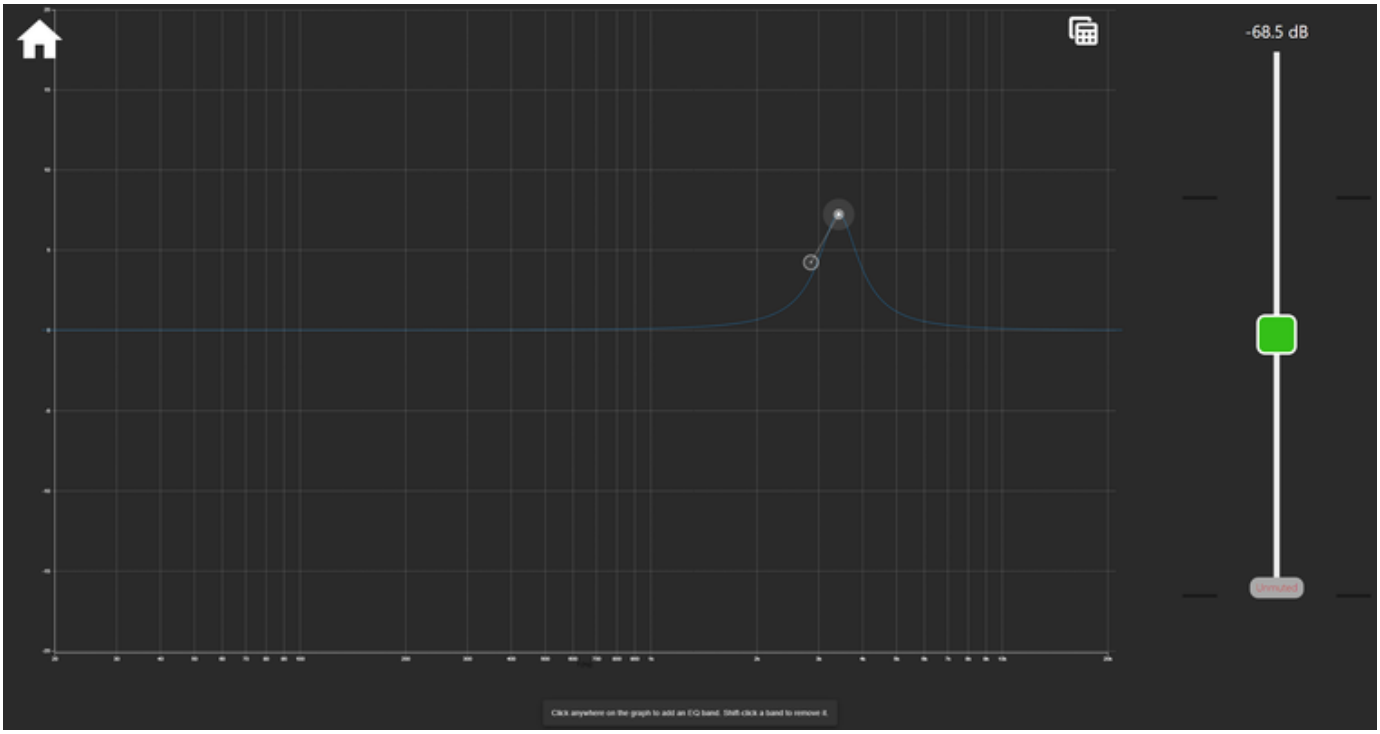
When you first select this page, the following screen will appear:



To add a PEQ band:

- Click on an empty part of the graph.

This will automatically add an PEQ band to the system and will look like the following image:



Here you can see that a PEQ band has been added with +5dB of gain @ 4kHz. The band can be manipulated with the following actions:

- Click and drag the peak circle.

This will change the frequency and gain of the PEQ band.

- Click and drag the Q handle circle.

This will increase or decrease the Q value for the band.

- Shift and click the peak circle.

This will delete the PEQ band.

The changes will be visible on the graph, with larger Q values increasing the width of the peak.

To view the precise values for the PEQ parameters:

- Click on the table icon at the top right of the screen.

This will change the view to a table showing all PEQ values as seen in the following image:

The values can be download to your computer by:

- Clicking on the JSON or CSV buttons.

Click on the graph icon in the top right to return to the graph view.

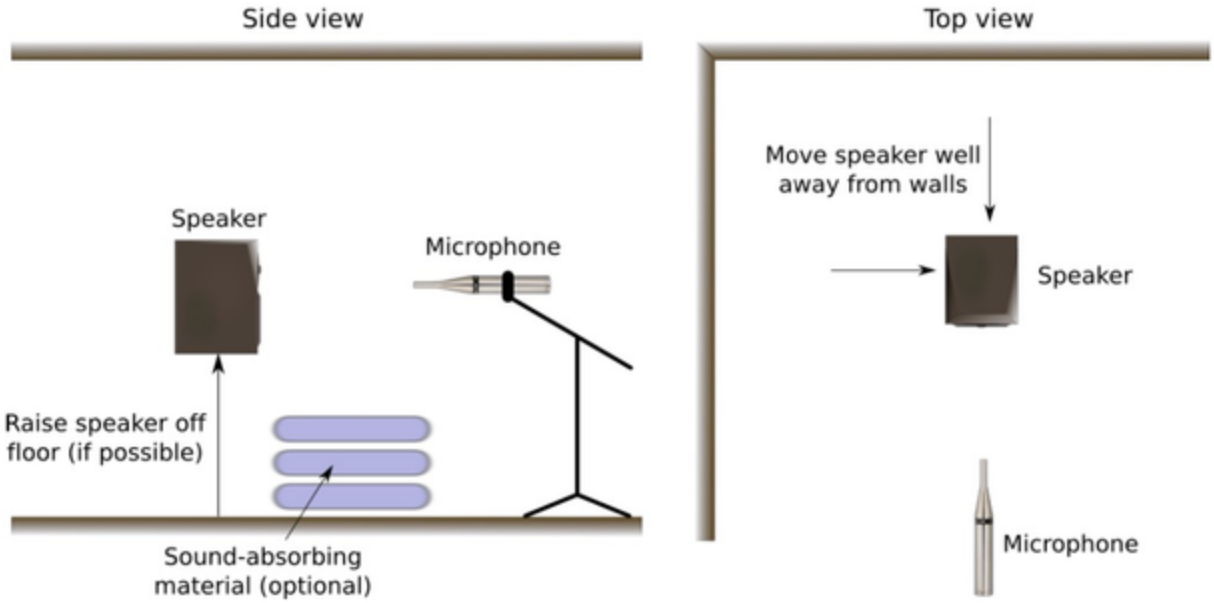
SETUP

This is the page where the speaker calibration, time/phase alignment, crossover and room correction process all take place.

Calibration

One of the vexing issues in speaker measurement is the presence of the room – it is difficult to measure *only* the properties of a speaker, because reflections from any other object (including furniture, floor, ceiling and walls) all conspire to corrupt the measurement. DEQX-Cal is able to remove these reflections from the measurement (therefore stopping them from corrupting your measurements) when doing a speaker calibration (described in the next chapter).

While the reflections can be removed with software, a longer time delay before the first reflection arrives at the microphone is still beneficial, because it enables more correction to be applied to lower frequencies. The diagram below and the description that follows describe how to accomplish this in a typical listening room. Measuring in an anechoic chamber or outdoors on a raised platform is the ideal solution and will provide a longer reflection-free time window, but excellent results can still be obtained using the method described here.



- Move the speaker well away from the walls or other large objects such as furniture. (They should be at least as far from the walls as the tweeter is from the floor, otherwise those reflections will reduce the reflection-free time window.)
- If possible, raise the speaker so the tweeter is about halfway between the floor and ceiling. This ensures that reflections from the floor and ceiling are as delayed as possible.
- If it is not possible to obtain a sufficiently long reflection-free time window, place thick absorbing material (e.g. cushions and pillows) on the floor between the speaker and microphone to reduce the level of the floor reflection.
- Position the microphone 150 mm (half a foot) away from the speaker. Speakers wired in parallel (or through passive crossovers) may need the microphone positioned further away so the drivers integrate properly for the measurement. (Moving the microphone further away will reduce the length of the reflection-free time window.)
- Position the microphone at a height midway between the centres of the driver(s) under measurement.
- While the microphone is typically positioned horizontally on the speaker's axis, in some cases a better measurement can be obtained if the microphone is slightly off the horizontal axis (such as inline with the edge of the speaker cabinet).

Deqxcal 2 speaker calibration startup video

At this point you may find it helpful to watch the Deqx Calibration 2 - software startup video below to understand how to navigate to the Deqx software, start the setup and login.
https://youtu.be/6Nt6zbESB7E?si=frmD7GHmQ6SdTy0R

Entering Setup

After you've selected the **SETUP** menu item in the **HOME** menu, you will see a page that displays "Your connection is not private".

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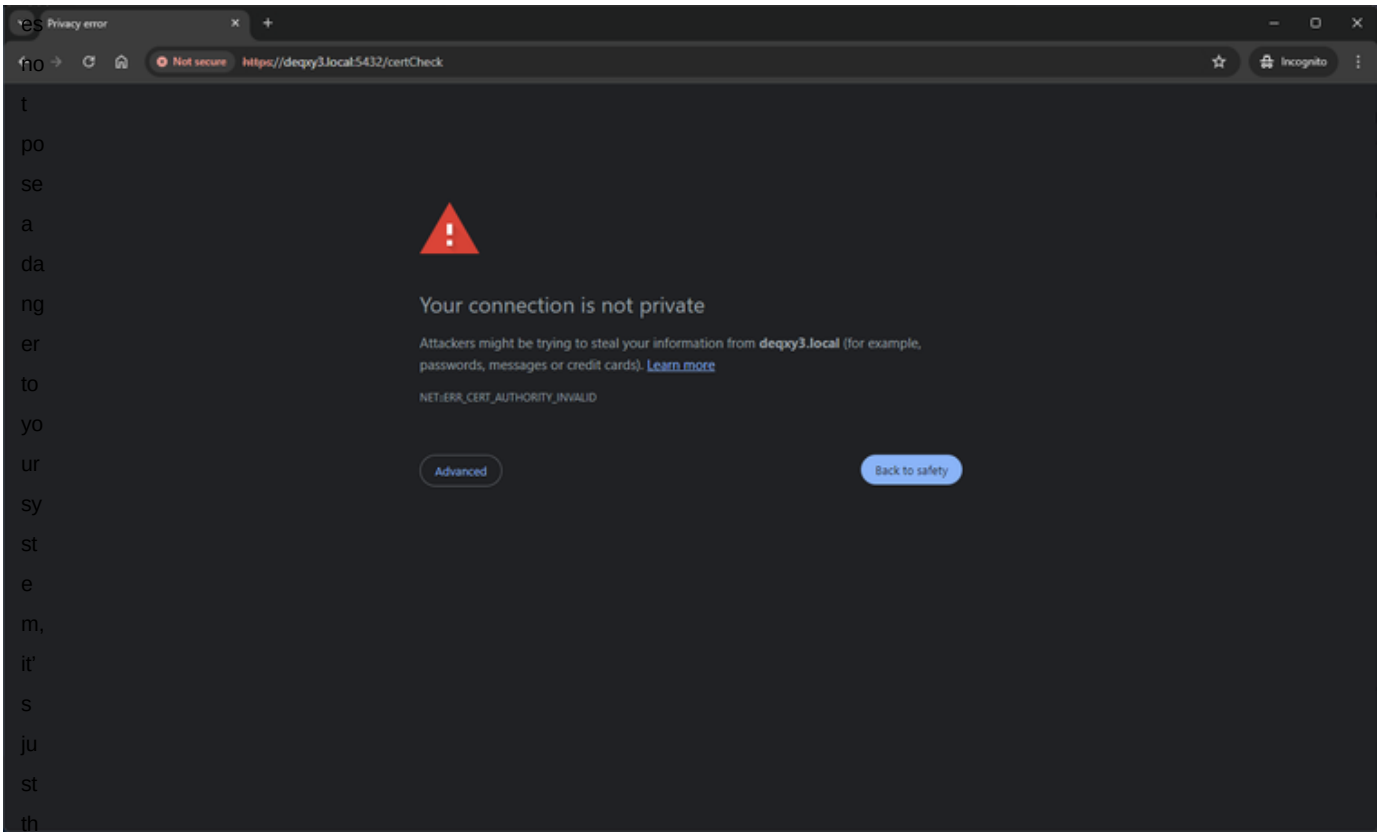
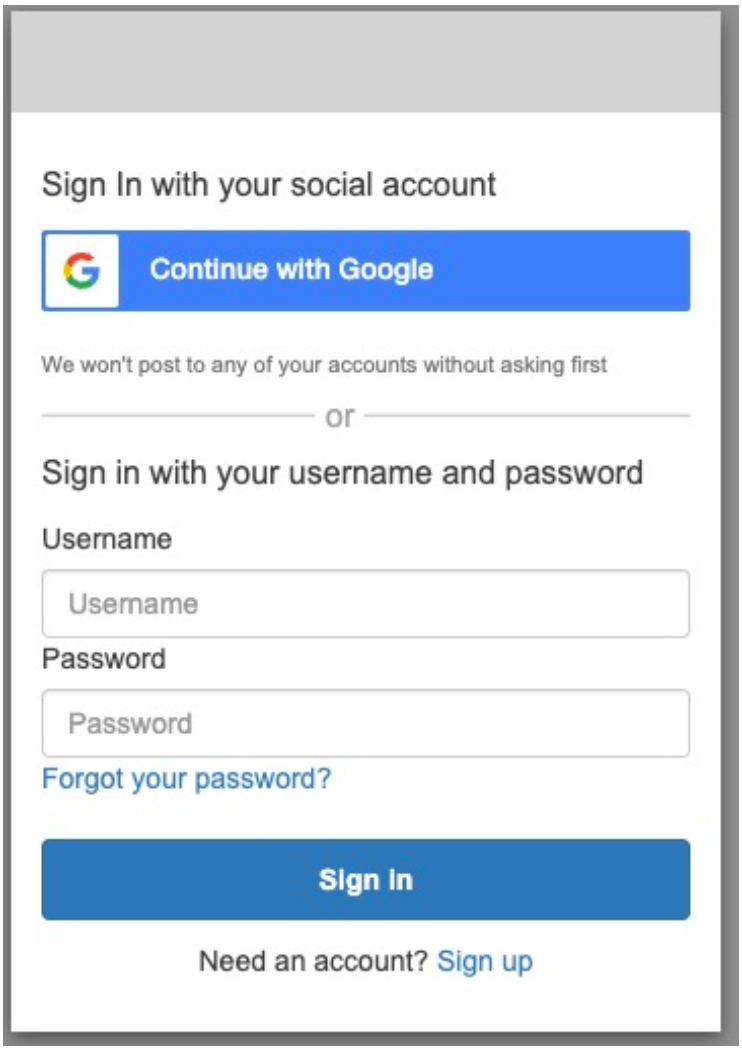


To get to the setup log in page do the following:

- Click on **Advanced**
- Click on **Proceed to deqxy3.local (unsafe)**
- Wait for a few seconds for the pages to finish refreshing.
- You should then see a **LOGIN** button.

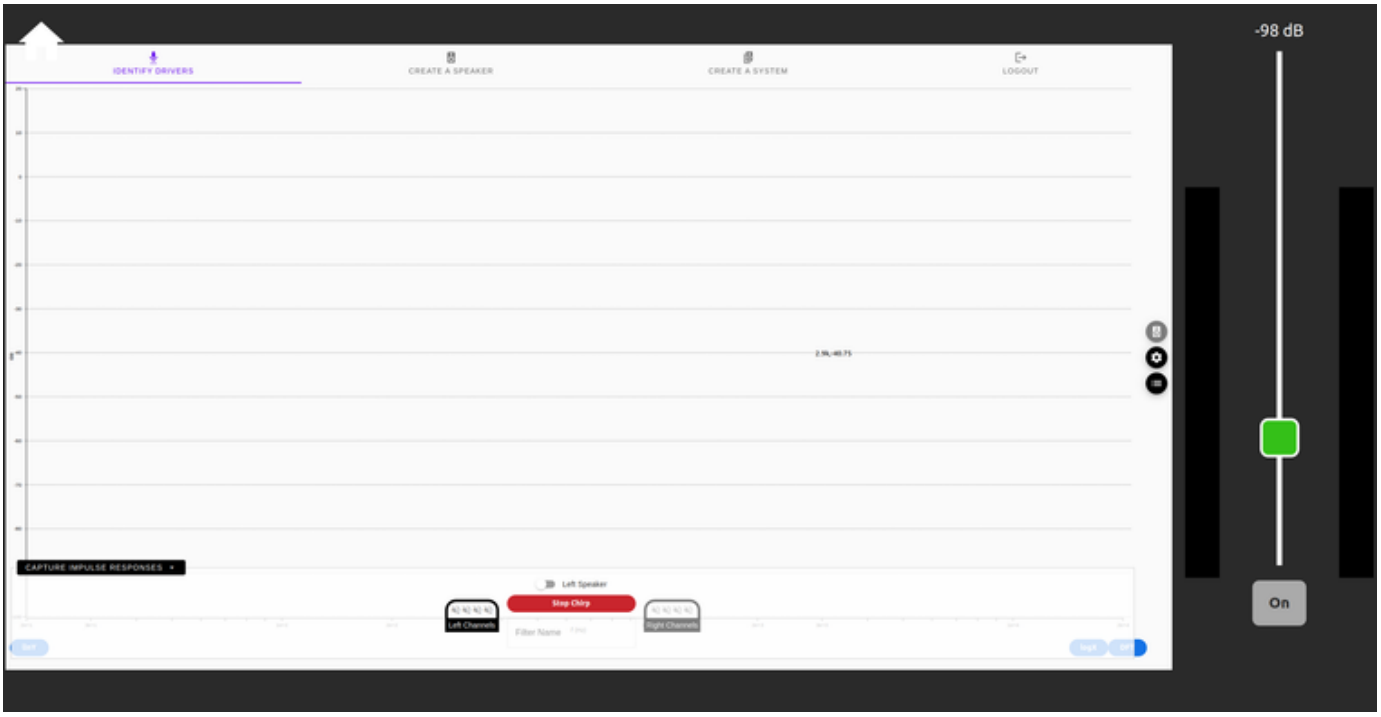
Login

Click the **LOGIN** button. This will take you to an authentication window where you can use a Google account to authenticate on the DEQX Cloud Server. This will act as your secure log-in to your settings, filters, crossovers, etc.



Identify Drivers

Once you've logged in, you'll be presented with a series of tabs and a frequency response graph like this:



System Sound Level Adjustment

You may find it helpful to watch the Deqxcal 2 sound level adjustment video at this point.
https://youtu.be/LfCGZh7DN_w

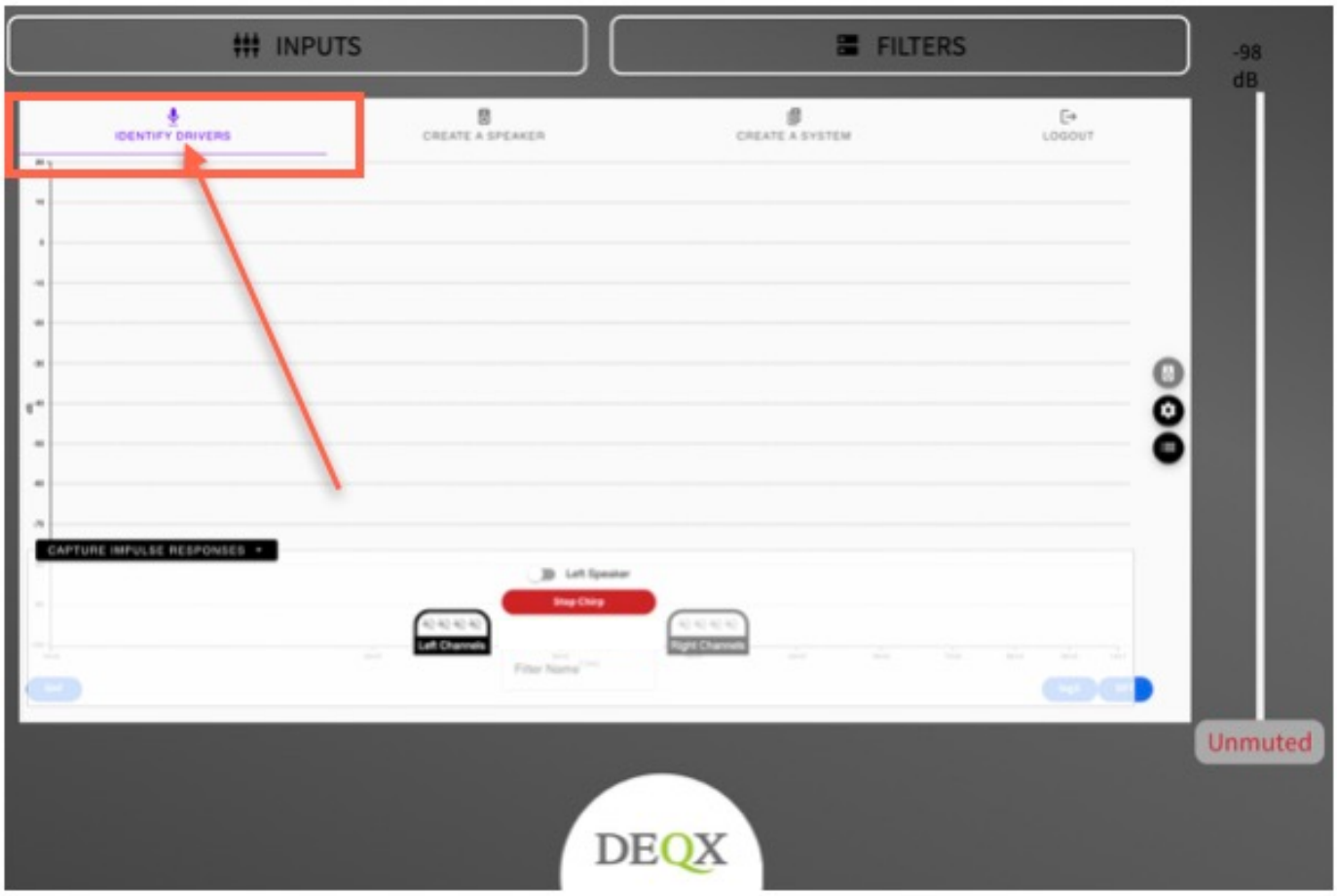
Speaker Driver Sensitivity Equalisation

You may find it helpful to watch the Deqxcal 2 speaker sensitivity equalisation video to understand how to set attenuations to equalise amplifier and speaker sensitivity differences.
https://youtu.be/e1BIugjJPNU?si=Zwbf0NblkBeSFqD6

In this section you will learn how to adjust individual hardware gains to equalise for speaker driver sensitivity and power amplifier gain differences. You will begin by setting the master level and then capturing speaker driver responses to see if the responses differ by more than a few dB.

Measuring the driver levels

If not selected already, click on “IDENTIFY DRIVERS” tab.



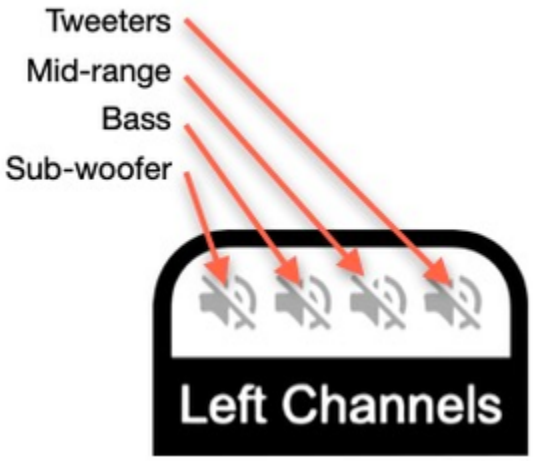
Now is a good time to set a level for the calibration chirp. We recommend starting at around -65dB. Although it's a very low level, and it may not provide enough signal to get a good measurement, it can be a safe place to start (for people with extremely powerful amplifiers, you may want to start at an even lower volume).

- Slide the large slider on the right of the screen until the level is at -65dB.

We will take a look at what result we get after we chirp all the speakers, and in this example, we will need to make an adjustment after that.

Look at the block labelled Left Channels near the bottom of the page.

The four audio channels in the selector are arranged from left to right as Sub, Bass, Mid and Tweeter:



In our example we are using an active three-way system. It comprises a two-way bookshelf speaker and a powered front-facing woofer. We are connecting the tweeter to the amplifier that is connected to the HIGH outputs, the mid-range driver is connected to the amp connected to the MID output and the bass powered speakers are connected directly to the BASS outputs.

We'll perform a measurement of the tweeters first:

- Click on the fourth speaker icon in the "Left Channels" window and it should turn blue, as shown in the following image.

- Ensure your calibration microphone is positioned as per the instructions above.
- Click in the middle of the blue target (or circle) to start the chirp.

- While the chirp is in progress, you can adjust the level slider until the sweep of frequencies coming out of the tweeters are at a volume level that could be compared to that of a loud conversation.

- Once you're comfortable with the level you are ready to perform the measurement chirp.

- Click in the middle of the blue target (or circle) to start the chirp.

Once the chirp is complete, the system will perform some calculations, and return a result in the form of a frequency response curve on the screen. The result on the screen in your web-browser interface should look something like this:

Now we'll do the MID driver.

- To capture the MID driver, click on the greyed-out speaker icon to the left of the blue tweeter icon, this will enable the MID driver.
- Again, position the microphone to have the same distance from the mid driver (as you had for the tweeter driver).
- Click on the centre of the target (or circle) to initiate the capture.

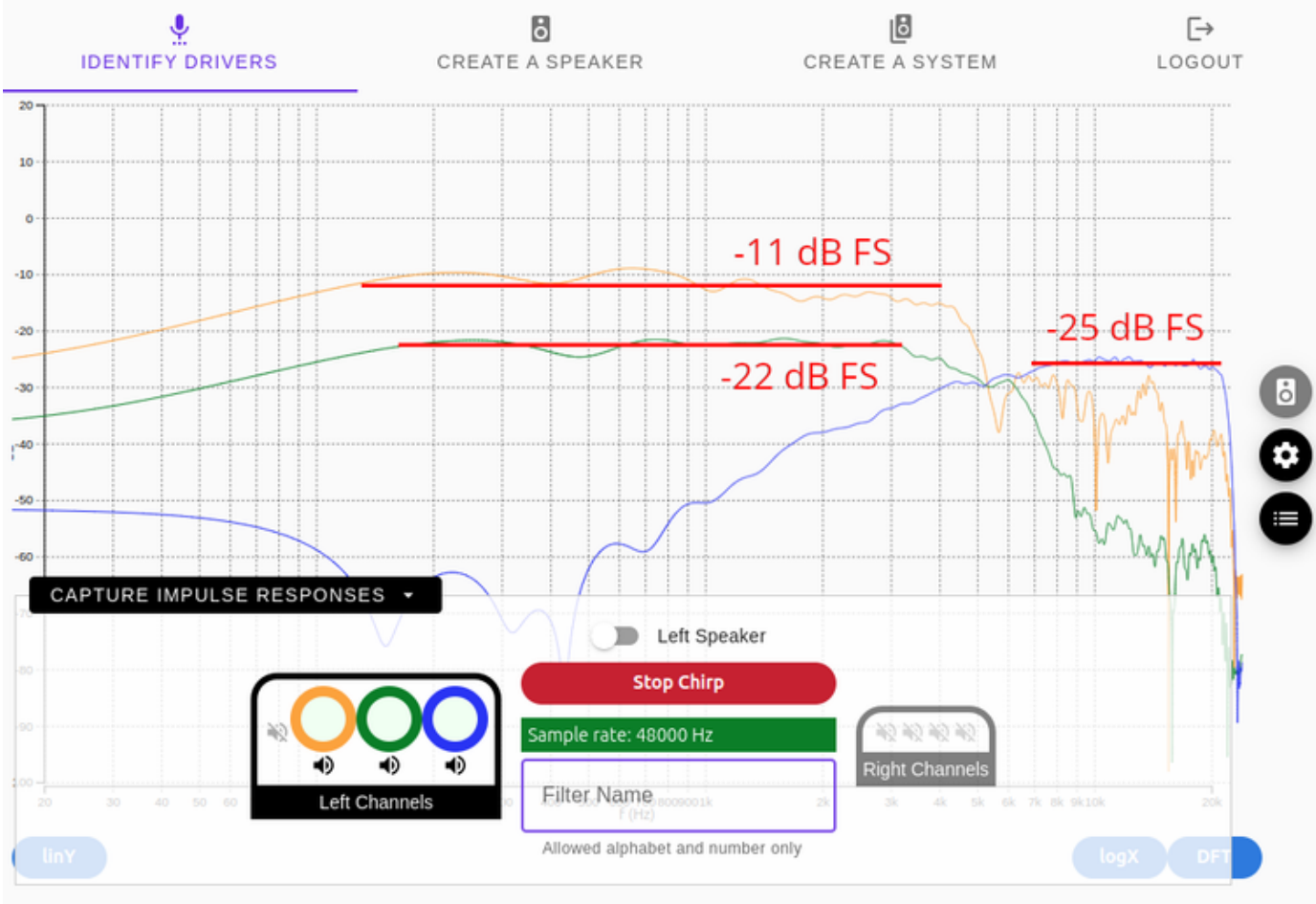
Once complete the web-browser interface should look like this:

Now we'll do the BASS driver.

- To capture the BASS driver, click on the greyed-out speaker icon to the left of the green mid icon, this will enable the BASS driver.
- Again, position the microphone to have the same distance from the bass driver (as you had for the mid driver).
- Click on the centre of the target (or circle) to initiate the capture.

Once complete the web-browser interface should look like this:

In the above image, the orange BASS frequency response magnitude is around 12 dB above the MID and TWEETER drivers.



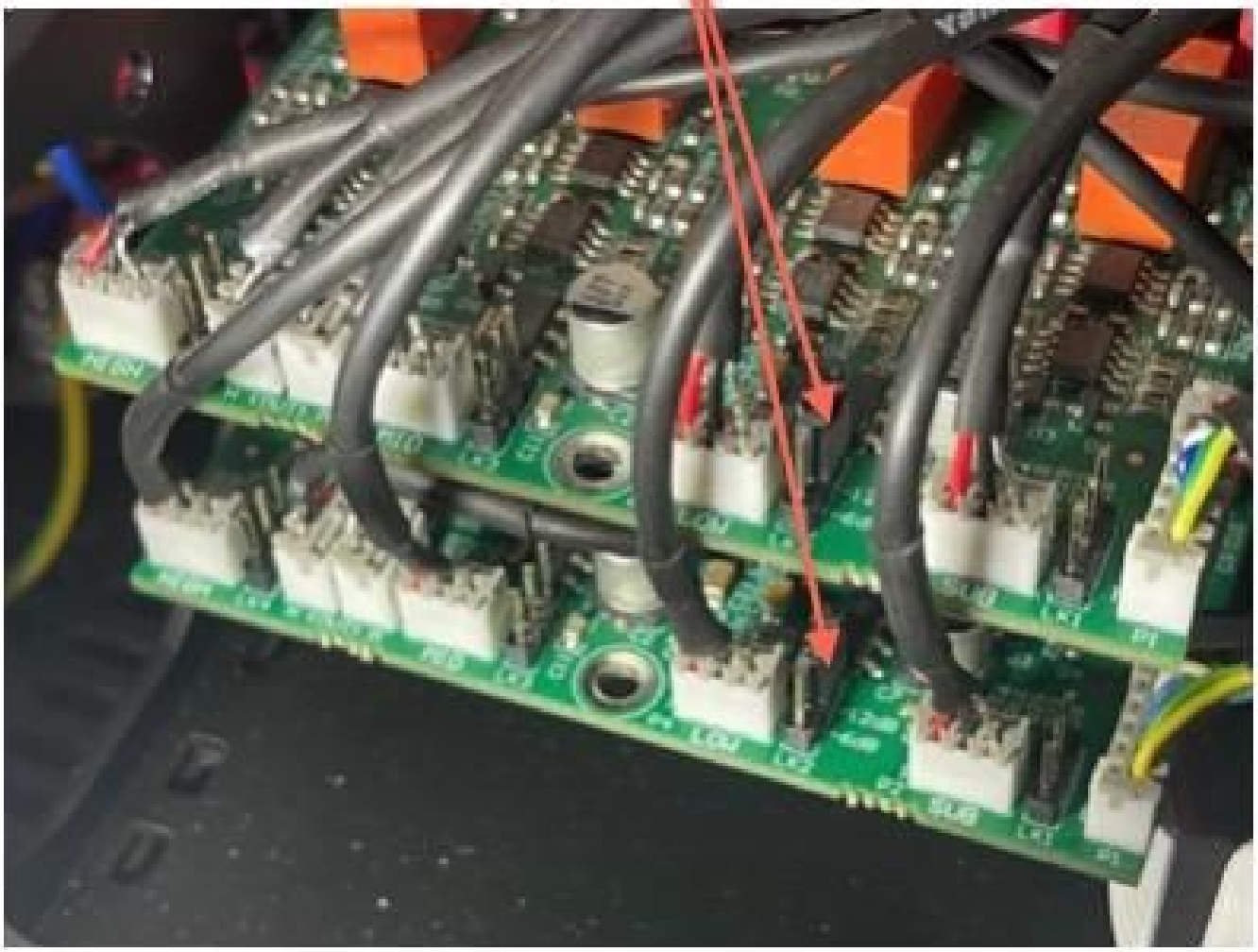
The TWEETER (blue) and the MID (GREEN) driver's average plateau levels are a few dB apart (-25 dB and -22 dB FS respectively). The TWEETER and MID driver levels are similar enough for the calibration process to equalise, so no analog gain adjustment is required.

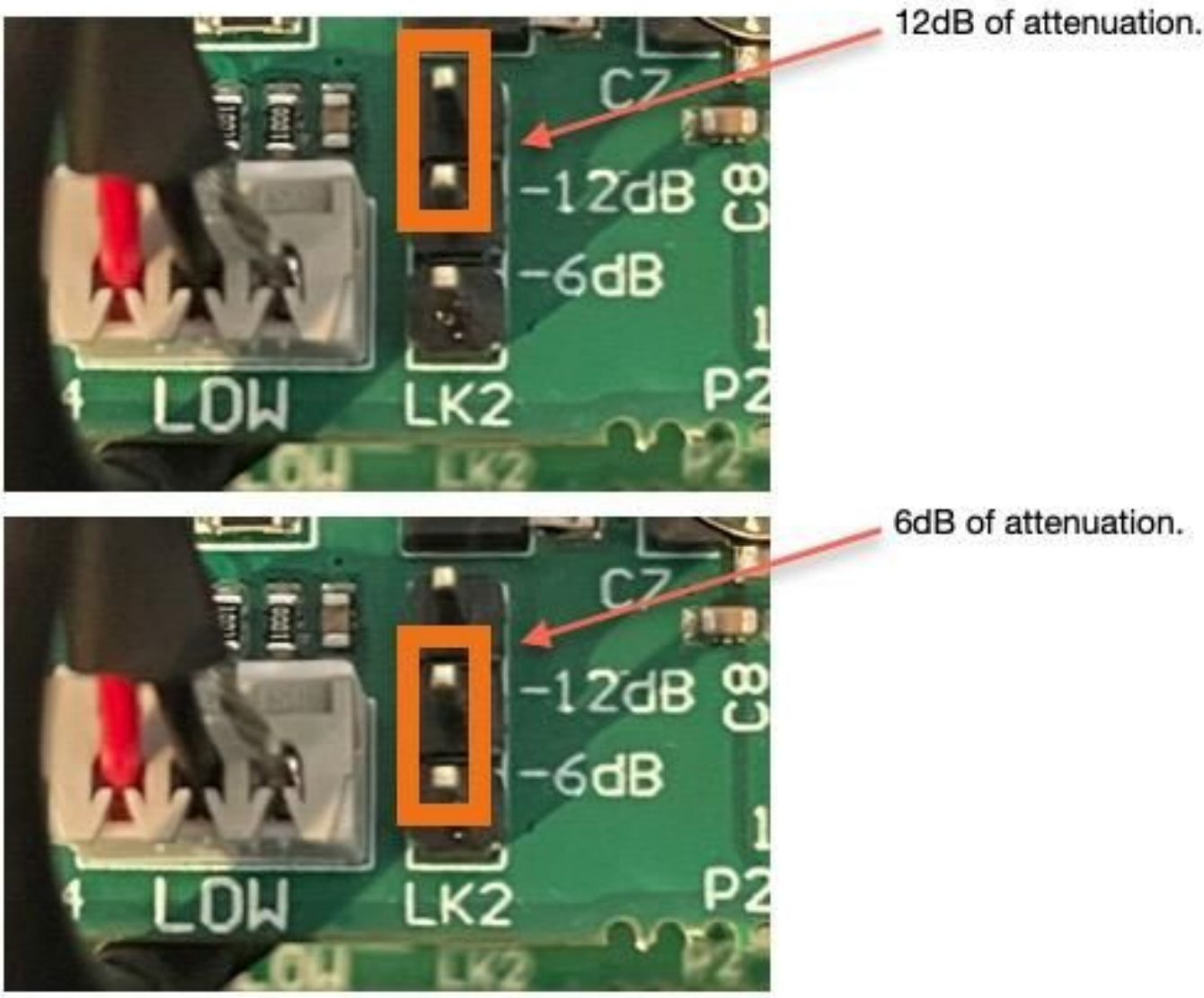
As the BASS (orange) and MID (green) are close to 12 dB apart, the attenuation of the BASS driver by 12 dB will lay their average plateau levels at roughly the same level.

To achieve this, we will need to adjust the DEQX hardware channel gain to attenuate the BASS driver by 12 dB:

- Turn off your DEQX.
- Remove the power cable.
- Remove the two rear screws securing the lid of the unit at the top rear of the chassis.
- Carefully remove the lid.
- Being careful not to damage the surrounding electronics, insert the jumpers on the pins marked "-12db" or "-6 dB" for each output you need to attenuate.

To add 12dB of attenuation to the LOW outputs, insert jumpers on these two link points, on the -12dB position.





After reducing the BASS driver level by 12 dB:

- Power on the DEQX Pre-8
- Wait for the unit to boot.
- Refresh your browser, this will return you to the home page.
- Enter Setup mode by clicking on SETUP.
- Wait for the screen to return to the IDENTIFY DRIVERS page.
- Capture the responses for each of the drivers as per the previous instructions.

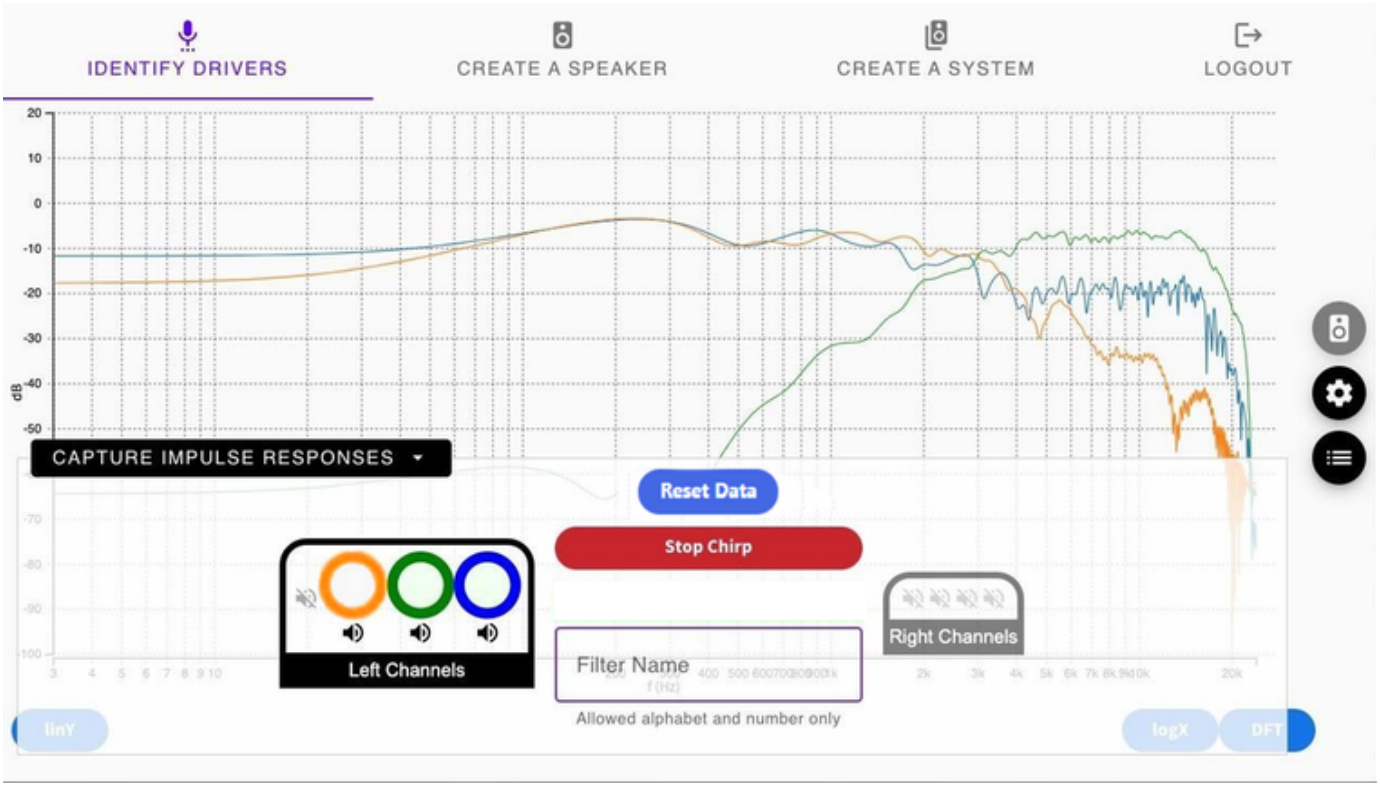
Now that the BASS driver has been attenuated in the unit, the driver gains are now well matched with the BASS and MID at very similar levels and the TWEETER a few dB below them, as shown in the following image:

The speaker drivers are now reasonably well matched and are ready for capturing their responses.

IDENTIFY DRIVERS

In this section you will measure the responses of your speaker drivers. At this point you may find it helpful to watch the following video to understand how to identify drivers.
https://youtu.be/zzQkmSmwG6o

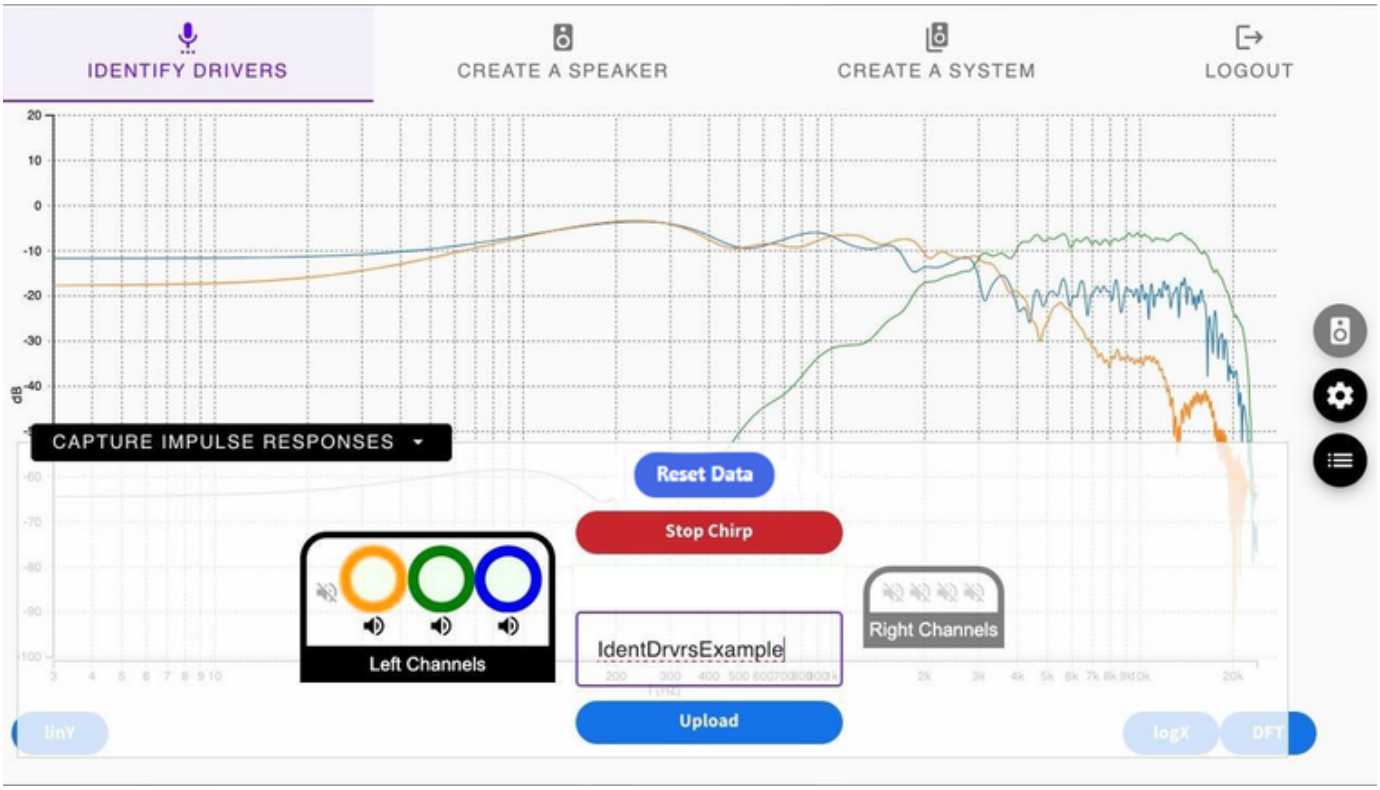
In the previous step we ended with measurements for the left speaker. Here we continue on from that point or you can remeasure each driver if you wish to.



Once this driver identification process is complete, and you see all the driver responses that you have captured, you can:

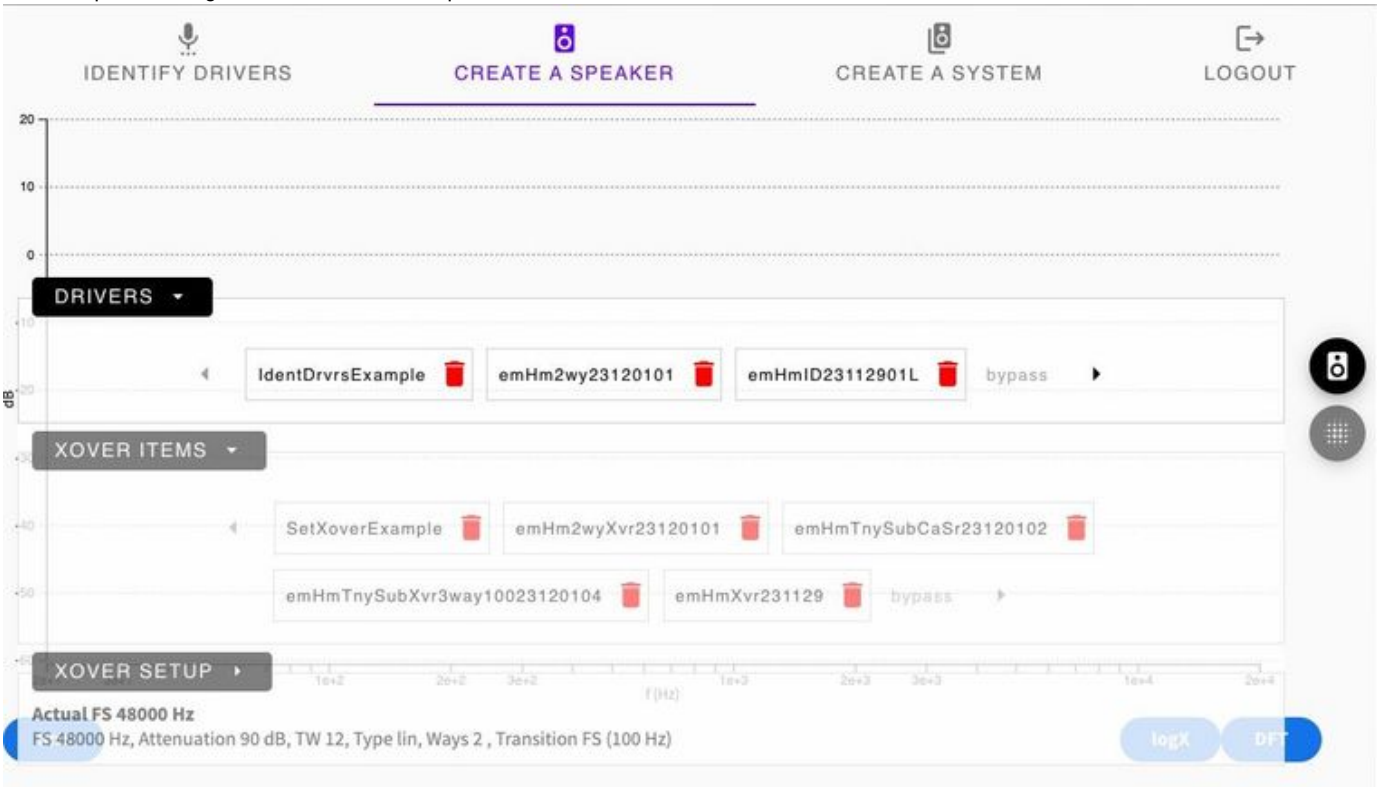
- Name the Filter by clicking in the **Filter Name** box and typing the name.

Use alphanumeric characters only at this stage, and name it something meaningful. In our example we will name the measurement, “IdentDrvrsExample”.



- Upload the measurements to the cloud by clicking on the Upload button.

Once the results are uploaded, you should be presented with a screen that looks something like the image below. At this point you are ready to create a speaker using the measured driver responses.



Trading off between bass power and reverberation power

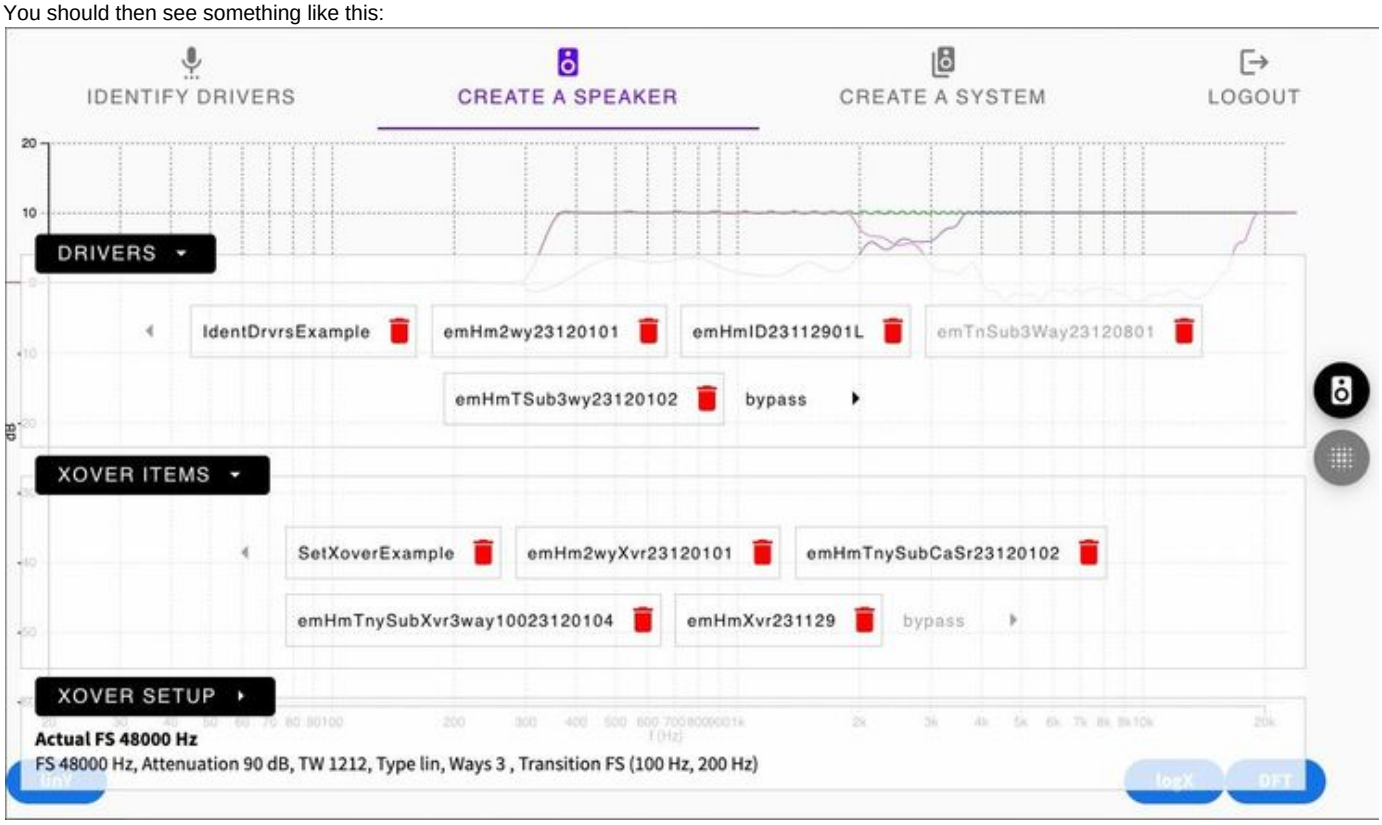
At this point you may find it helpful to watch the following video to understand how to trade-off between bass signal power and reverberation signal power.
https://youtu.be/LfCGZh7DN_w

CREATE A SPEAKER

At this point you may find it helpful to watch the video Deqx Calibration 2 - Generating crossovers and calibration filter sets for a speaker to understand and see a demonstration of the **CREATE A SPEAKER** tab for generating crossovers and measuring the speaker.

- Select the filter you just created to proceed.

You should then see something like this:



The plot shows the individual driver correction filters. In this process we will be designing our crossover and capturing information on speaker driver positions relative to each other.

The output of the **CREATE A SPEAKER** process will be a set of calibration filters for the speaker.

X-Over Setup

At this point you may find it helpful to watch the video on creating a crossover:
https://youtu.be/wen7zeF3quw

Here are the steps to set up the Crossover, refer to the image below:

- Select the XOVER SETUP tab.
- Slide the Transition Frequencies circles left and right to choose the crossover frequencies.

The circle on the left will set the crossover frequency between the lowest frequency driver and the next driver up. The next circle to the right again selects the crossover frequency between that driver and the next driver up.

The two **Transition width** options allow you to enter different crossover slopes for each band. In this example, the crossover between the bass and mid drivers is set to 100Hz and 60dB/octave and the crossover point between the mid drivers and tweeters is set at 1.6kHz and 86db/octave.

Once you're happy with the settings you've made for the crossover:

- Type in a name in the Xover Name box on the right.
- Click the Process button to send the settings to the cloud for processing.

The system normally automatically then chooses this last crossover you've created, but to be certain it has, ensure the XOVER SETUP tab is closed and see if the one you've just created is visible and greyed out in the list.

If you cannot see it on the screen, click on the arrows to the left or right of the items in the XOVER ITEMS list to re-populate it with items from the cloud to find it, and ensure it is selected (greyed out).

- Close the XOVER SETUP tab.

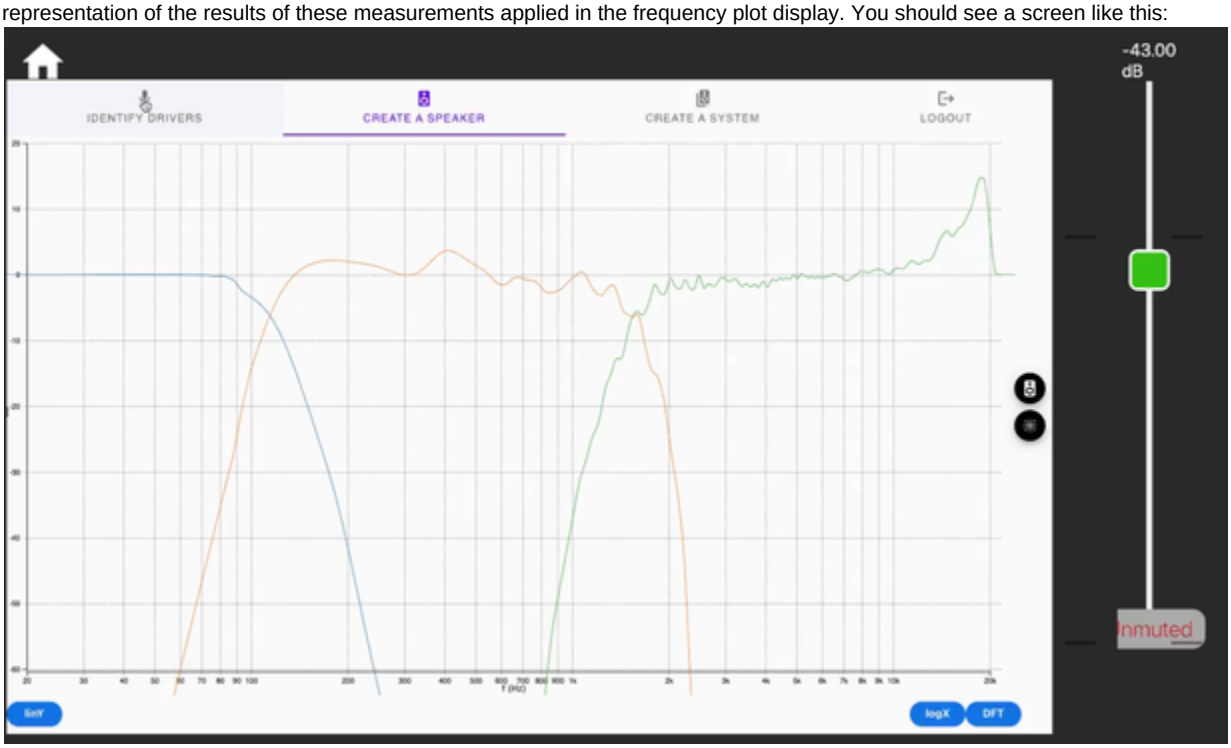
Now we're ready to perform a measurement.

Speaker Measurement

At this point you may like to view a video demonstration of creating a speaker:
https://youtu.be/6pFvMOeOqIw

- Confirm that the drivers you selected in the **DRIVERS** tab (at the top on this tab's page) are selected (greyed out).
- Confirm that the crossover setup you created in **XOVER SETUP** is also selected (greyed out).

With the **DRIVERS** measurement and **XOVER ITEMS** crossover setup selected, and the **XOVER SETUP** tab closed, you should then see a representation of the results of these measurements applied in the frequency plot display. You should see a screen like this:

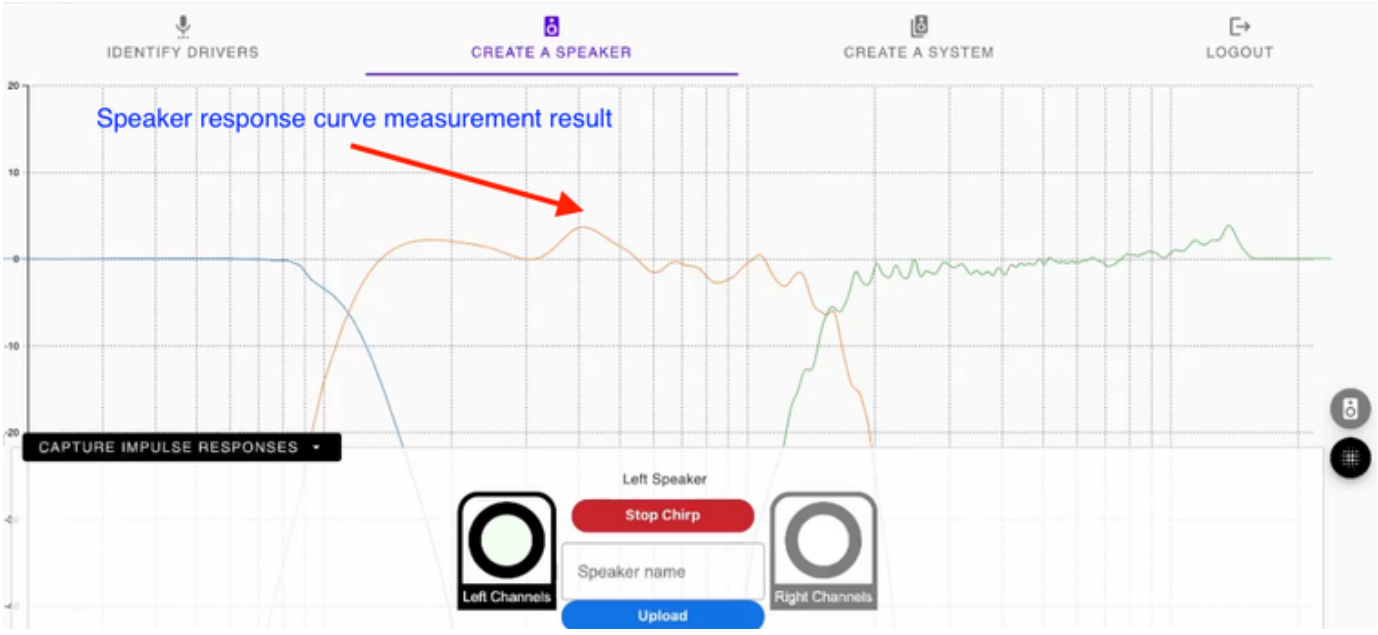


Now it's time to perform a measurement of this configuration:

- Position the calibration microphone half-way between the listening position and the speakers with it angled so it's pointing at the centre of all the drivers.

- Click the Speaker icon on the right of the graph plot screen to bring up the chirp controls.
- Click in the centre of the circle to begin the measurement.

When the sweep is complete, then you should see a window like the following image:



The bottom left of this window shows you the resulting relative delays from each speaker driver to the microphone. The closest speaker driver will have a 0 m distance and the other distances are relative to this driver.

For our example above, the tweeter is closest and the mid is around 6 cm (0.06 m) further away from the microphone than the tweeter. The woofer is a little more than 43 cm (0.43 m) from the microphone then the tweeter.

- Enter a name for this measurement in the **Speaker name** box (it can be the same name as you used in the **IDENTIFY DRIVERS** tab earlier).
- Click **Upload** to upload this measurement to the cloud.

Once the system has uploaded the measurement to the cloud, some more calculations are performed, and it's time for a final measurement of the overall system.

You should see a display something like the image below in the **CREATE A SYSTEM** section.

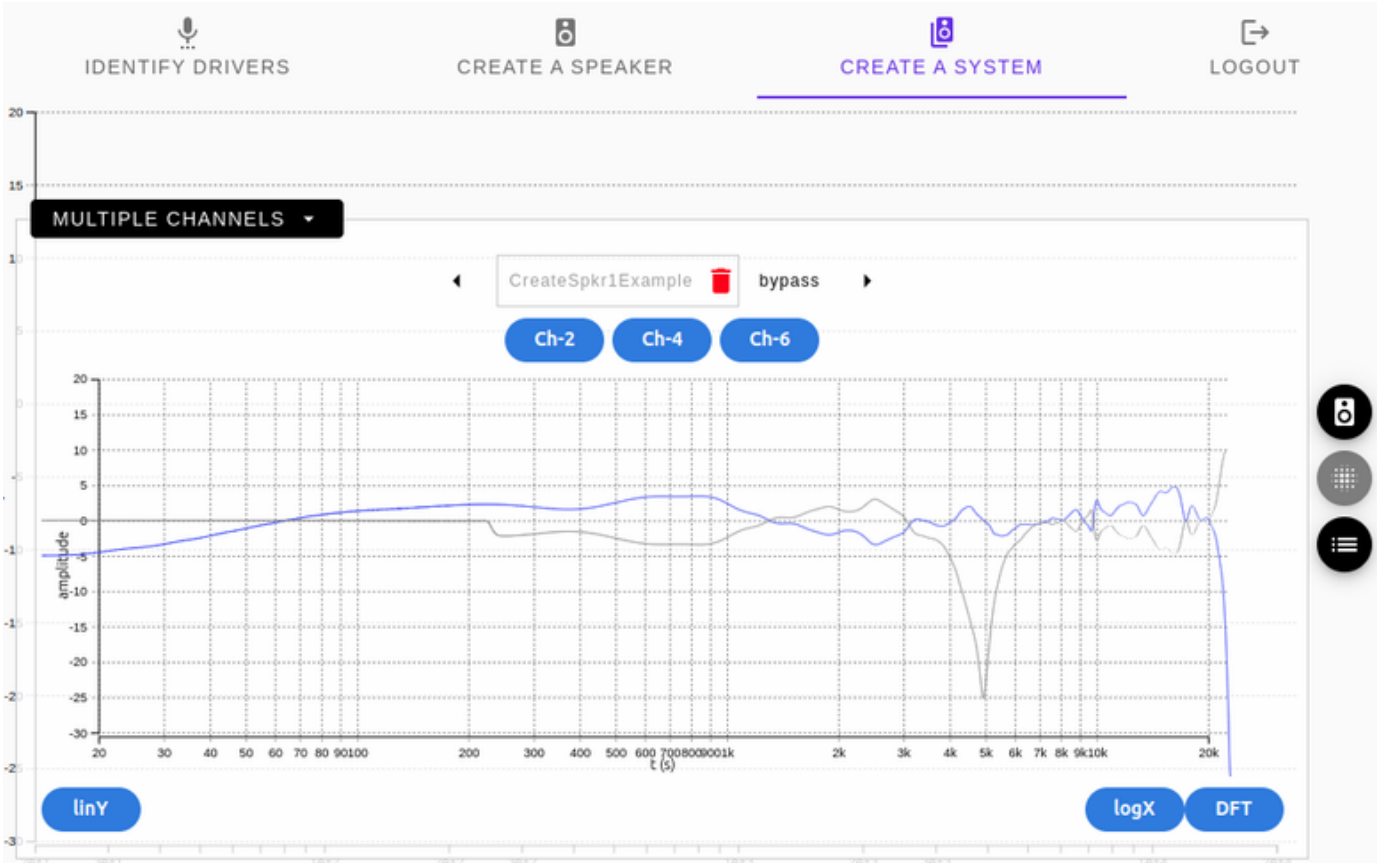
CREATE A SYSTEM

The create a system tab allows you to create mono or stereo speaker systems.

At this point you may like to view a video demonstration of creating a system:
https://youtu.be/JTagbnTMsgc

Uploading a speaker from the previous step will automatically take to to the **CREATE A SYSTEM** tab. Or you can return to this page at any time by clicking on the **CREATE A SYSTEM** tab at the top of the page, and then click on the grid icon on the right side of the user interface to show the previously recorded speaker items.

The following image demonstrates loading the "CreateSpkr1Example" speaker.

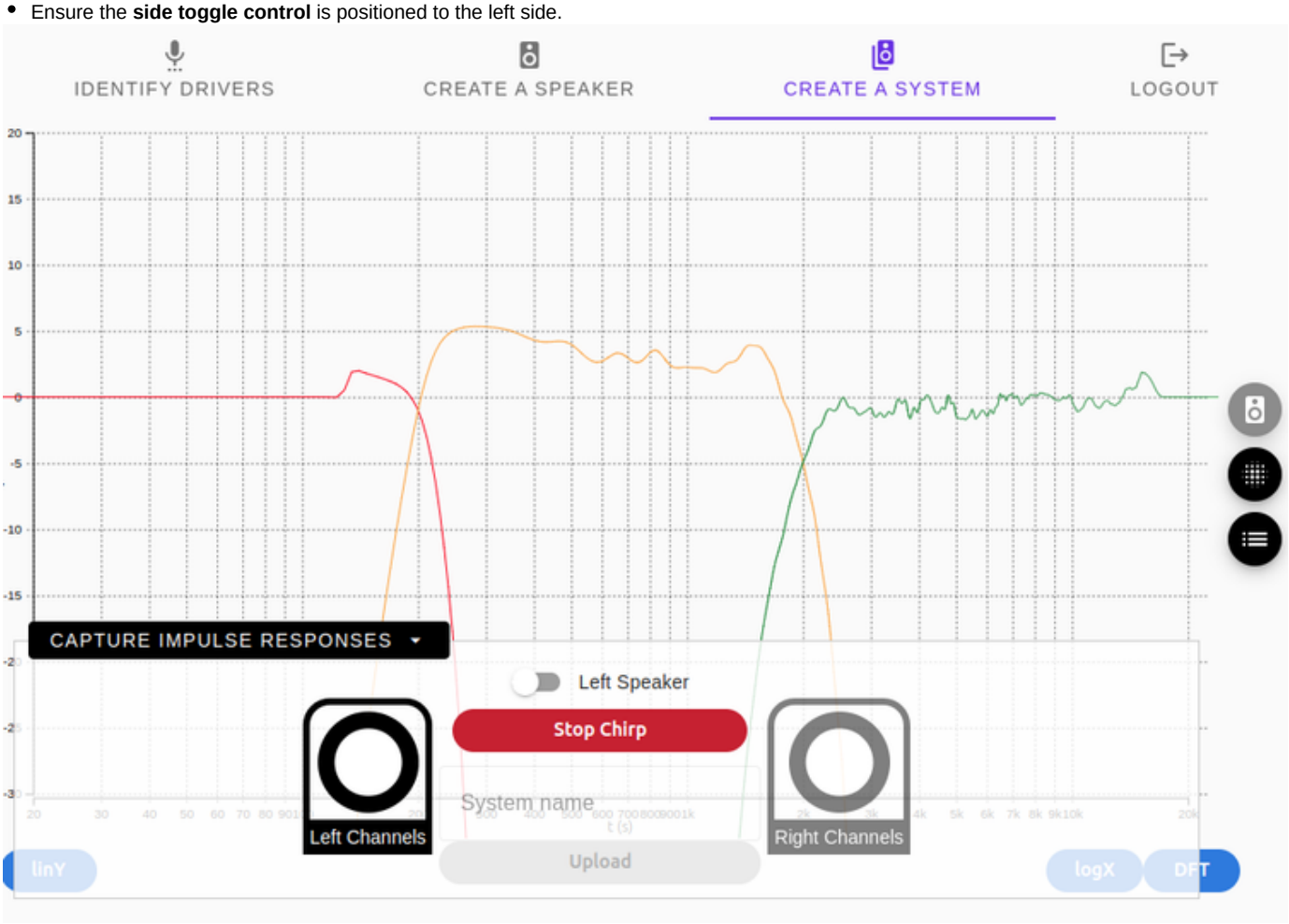


The next step is to choose whether to arm the left or right side of the system for capture.

- Click the speaker icon on the right side of the page.

This brings up the chirp control user interface.

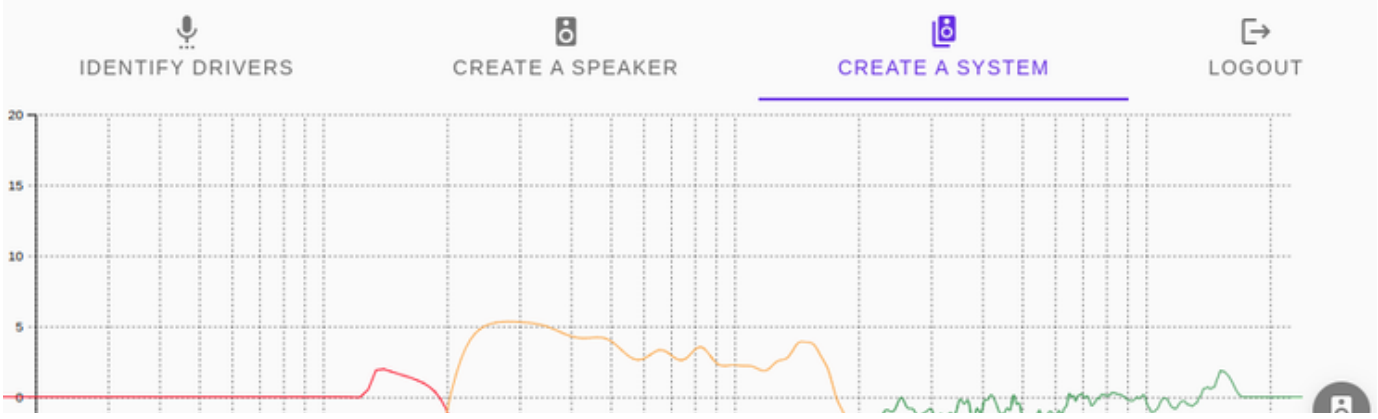
- Ensure the **side toggle control** is positioned to the left side.

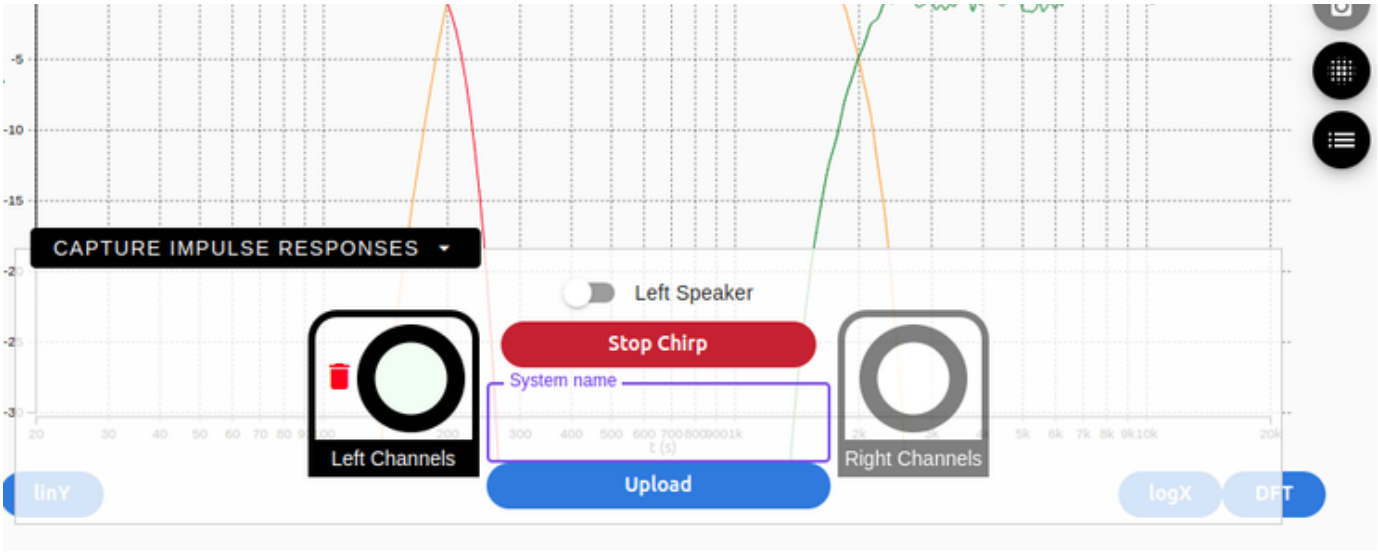


Now the left side of the system is armed with the previously selected CreateSpkr1Example speaker.

- Position the microphone to a similar position previously used in the CREATE A SPEAKER page.
- Click in the center of the Left Channels circle to start the capture of the left side of the system.

Once chirped and computed, the page will look similar to the following image:

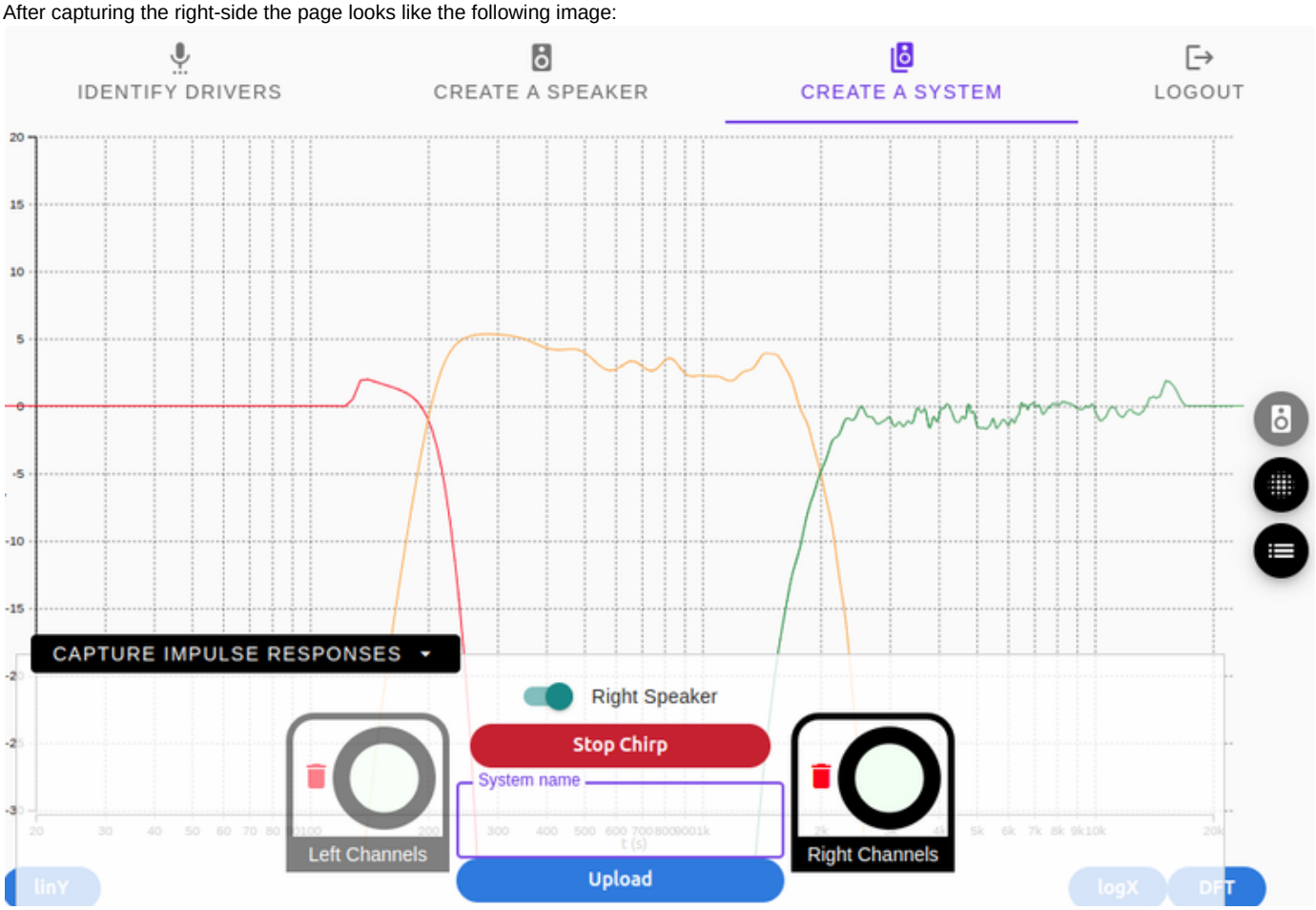




The red rubbish bin icon is now showing next to the “left channels” target is indicates that it has been captured (and can be deleted if necessary).

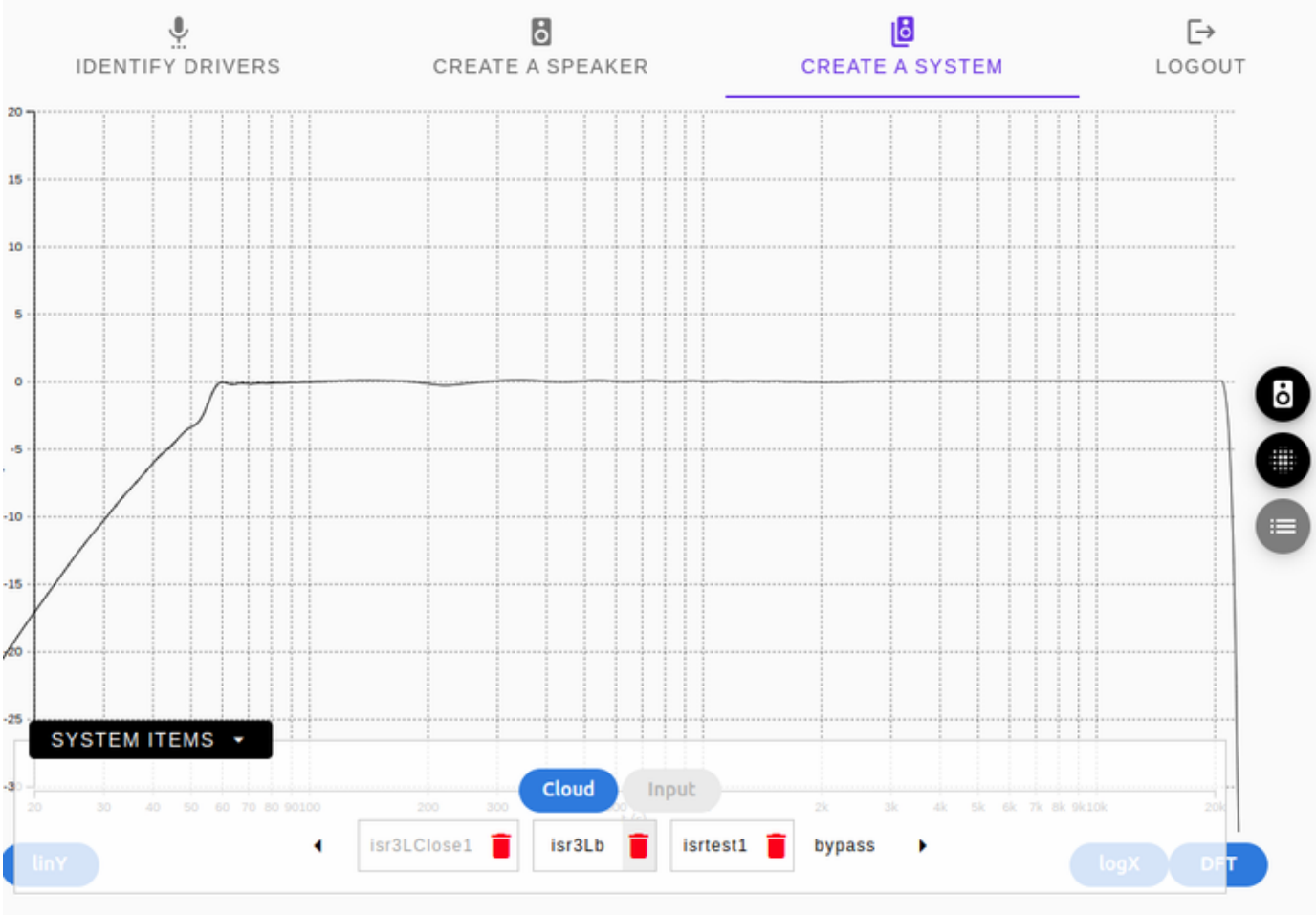
- Click on the **side toggle control** is so it switches to the right side.
- Ensure the microphone has not been moved from the previous measurement.
- Click in the center of the Right Channels circle to start the capture of the right side of the system.

After capturing the right-side the page looks like the following image:



- Enter a name for the system in the **System name** box.
- Click on **Upload** to upload it to the cloud for computation.

Once the system has been uploaded to the cloud, the page changes to look like the following image:



Transferring System Correction Filters from the Cloud to the Hardware

At this point you may find it instructive to look at the demonstration video:
https://youtu.be/5kG9SnICmuw

The system correction filters are managed with the list icon on the right side of the page.

- Click the list icon to see the previously created systems.

The user interface should look similar to the following image:

The previously created systems are shown in the **SYSTEM ITEMS** tab at the bottom of the page. To transfer any of these systems to the hardware:

- Click on the item.

Once clicked, the system will download from the cloud and appear on the graph. Once the graph has changed, the systems have also been synchronised with the DEQX hardware and should be ready to use.

Selecting Correction Filters for listening

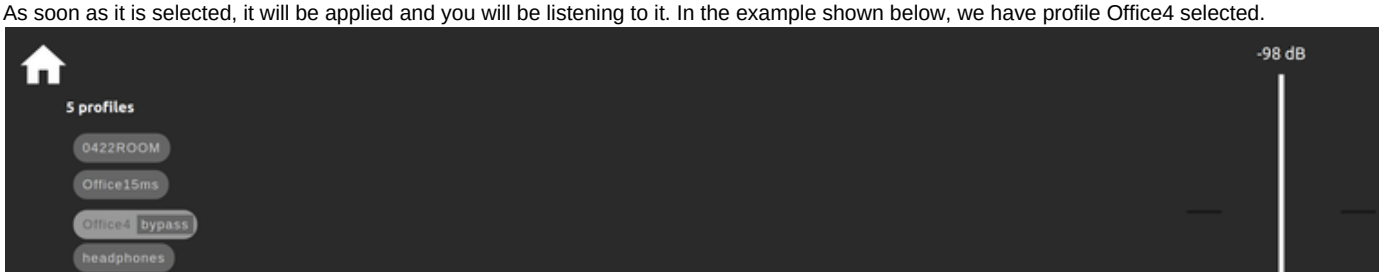
To find and load/enable the system correction filters on the hardware:

- Click on the **HOME** button (top left of the screen).
- Click on the **SOURCE** button.
- Select an input to listen to.
- Click on the **HOME** button.
- Click on the **PROFILE** button.
- Refresh the browser (either click on the reload icon in your browser or reenter the deqxy3.local URL and press ENTER).

When the browser refreshes you will see a list of the profiles you can select.

- Click on the desired profile to select it.

As soon as it is selected, it will be applied and you will be listening to it. In the example shown below, we have profile Office4 selected.



At this point we can also listen to the audio in **bypass mode** which means playing through the crossover filters alone without the correction filters being applied.

- Click on the **bypass** button to bypass the filter.

The bypassed profile can be identified as the profile with **bypassed** displayed in red.

To re-enable the profile:

- Click on the profile button.

Note, this process is under development and will change in future and this document will be updated.