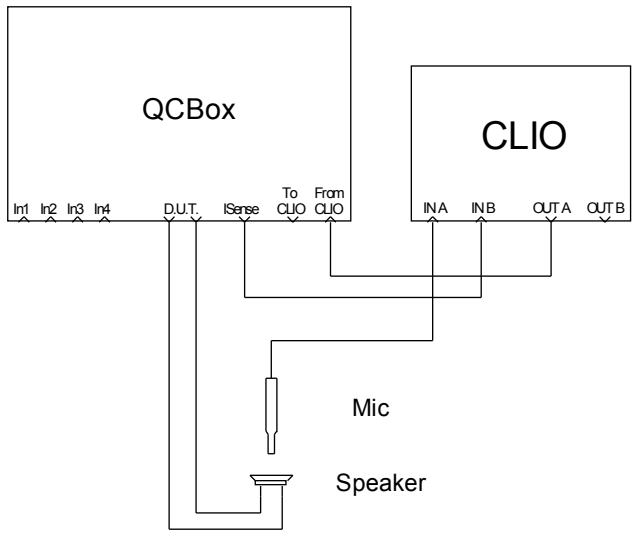
11.3 HOW TO MEASURE A SIMULTANEOUS FREQUENCY AND IMPEDANCE RESPONSE OF A LOUDSPEAKER



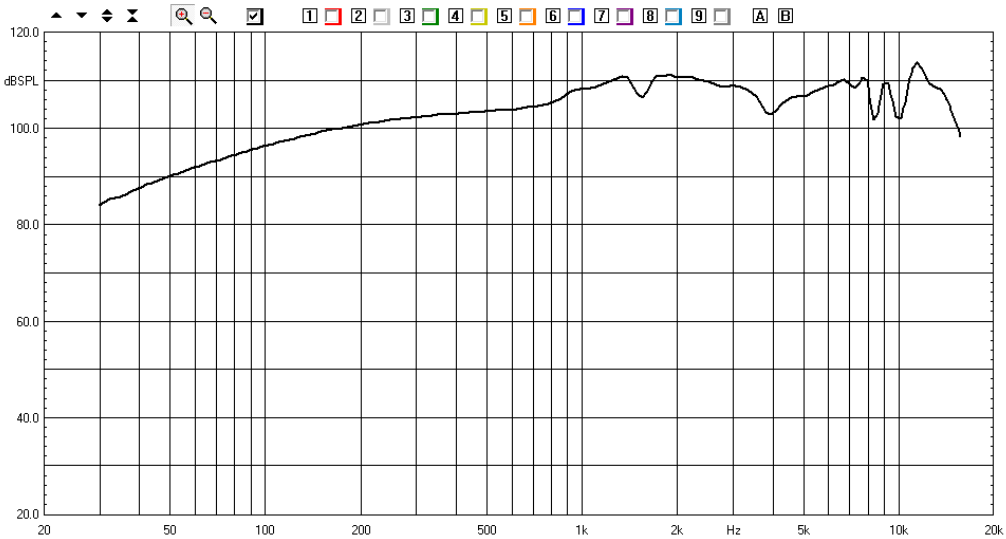
Using the ISense current sensing output of a QCBox it is possible to simultaneously measure frequency response and impedance of a loudspeaker; this tutorial will guide you through the steps nedeed while setting up this test.

11.3.1 SETTING UP THE FREQUENCY RESPONSE

Open the sinusoidal menu. Let's start with the acoustic frequency response; open the settings dialog to set up the required sweep. The main parameters affecting sweep are: frequency range, here chosen from 30Hz to 15kHz, resolution of 1/12 of octave, supposed to be fine, and speed that is set to "Normal".

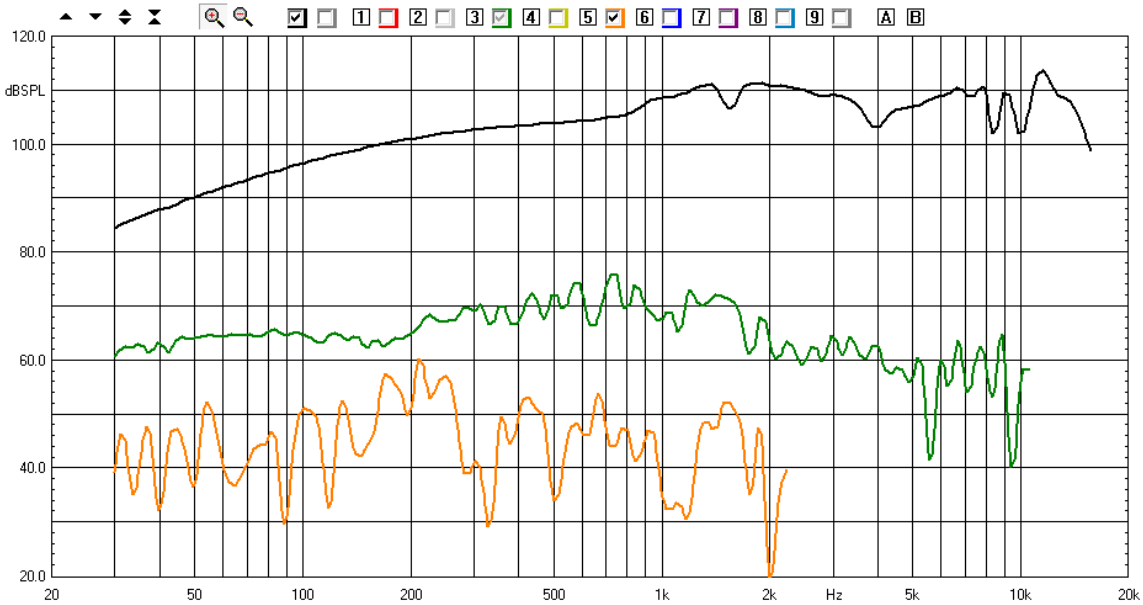
Before taking the first measurement you still need to set the proper output level (here chosen 1V at speaker terminals) as indicated by DUT specifications and accordingly set input sensitivity of CLIO input A; as the final measurement will be stereo operate separately the two input channel controls releasing the Link Input Controls button in the hardware toolbar; initial input A sensitivity is -10dBV (channel B is left to 0dBV).

Now choose CHA input channel selection and dBSPL as Y scale unit. Press go. The first measurement gives you the following result



one important parameter now clear is the sweep time that is shown in the sinusoidal menu status bar: with these settings we have 1.05 seconds sweep time. Consider it fine. Save the result to "response.sin" file.

The test should now be tuned up to take into account the acoustic environment and completed with missing settings. Open the sinusoidal settings dialog; proper delay should be set to compensate for microphone distance to loudspeaker, this may be evaluated by the two common ways CLIO gives you i.e. taking a trial sinusoidal measurement with auto delay active or taking a parallel MLS&LogChirp measurement and inspecting the impulse response; in our case we found a 0.2ms delay to be compensated, due to a quasi near field measurement with a microphone to DUT distance, in the acoustic fixture, of circa 7cm. Final settings you may require are about distortion curves; we may activate THD calculations clicking on "THD Enabled", the Rise parameter is set to 0dB as we are going to accommodate all displayed curves inside one single 100dB Y scale graph. Execute the measurement with final frequency response settings.



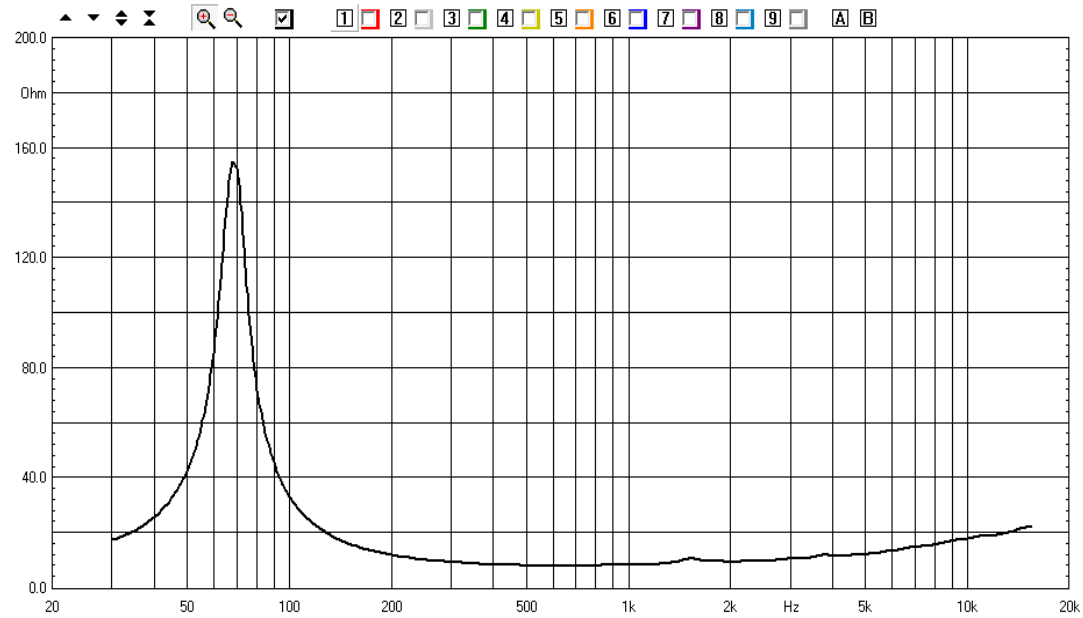
After the measurement is done we may inspect THD and 10th harmonic pressing the THD button and selecting the proper harmonic with the drop-down, in figure they are shown as overlays (green THD, orange 10th harmonic). Repeat the measurement until fully confident with the results obtained, eventually refine the settings as needed.

11.3.2 SETTING UP THE IMPEDANCE RESPONSE

We put now our attention to the impedance response of our loudspeaker.

We choose CHB with the input channel selector and Ohm as Y Scale unit; inside the sinusoidal settings dialog leave all previous settings unchanged as they will accompany us to the final reference measurement; only change the impedance settings to "QCBox Select" to reflect QCBox operation.

As the output level has already been set for the acoustic test we only have to deal with input sensitivity for channel B; a settings of -30dBV or -40dBV is usually correct for ISense impedance tests. The measurement looks as follow.



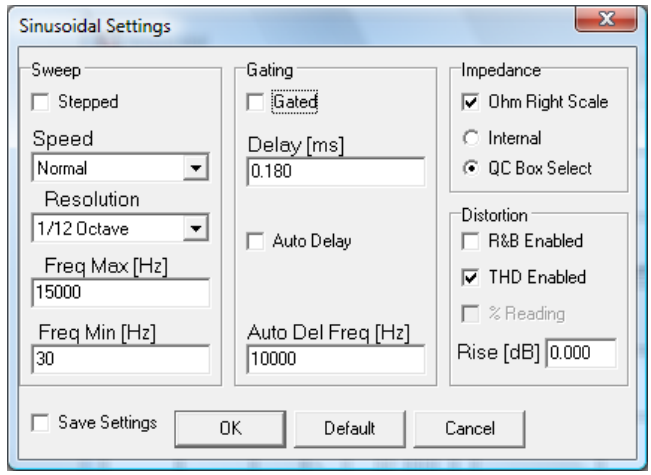
Save the result to "impedance.sin" file.

11.3.3 INTEGRATING THE TWO-CHANNELS MEASUREMENT

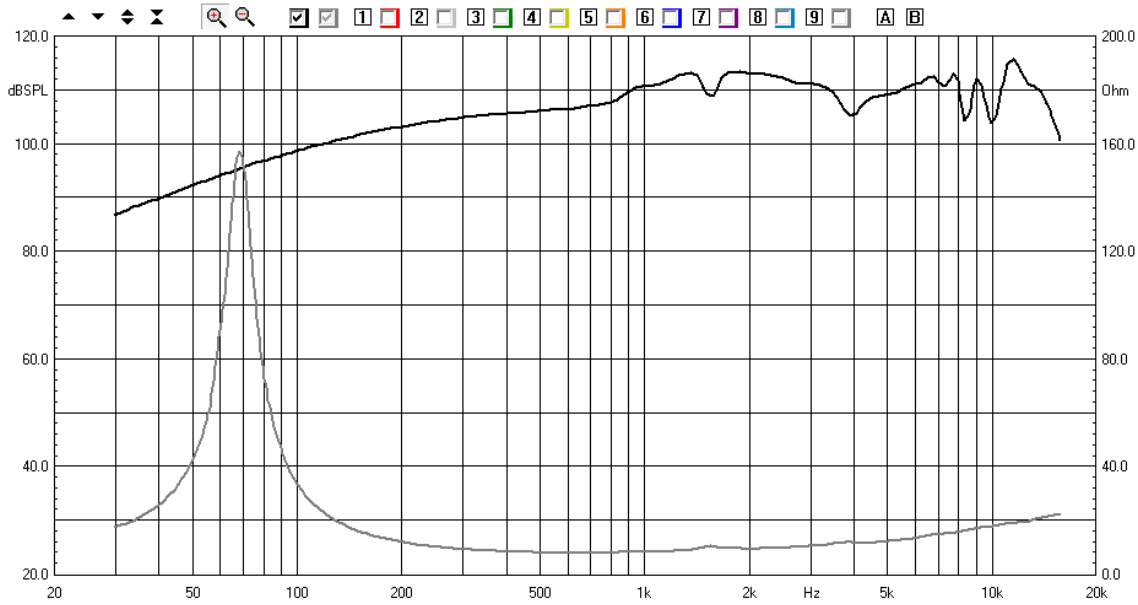
Starting from the actual situation, i.e. having just measured impedance relying on settings that accumulated from the previous frequency response measurement, we are now ready to integrate all of our work to realize a single stereo sinusoidal measurement.

Have the impedance measurement loaded in memory; select CHA&B with the input selector, change the Y Scale unit to dBSPL; CLIO is now ready to take a two channels measurement with main unit set to dBSPL; as the measured unit for channel B needs to be Ohm we must open the sinusoidal settings dialog and select "Ohm Right Scale": **in this way channel B will measure impedance using the right scale to identify it**.

The final sinusoidal settings are:



Press Go; the graph obtained has frequency response measured from channel A and refers to left scale while impedance response comes from channel B referring to right scale. Note that the two curves displayed are measured and controlled by dedicated checkboxes, no overlays are active.



The measuremenet can be saved as “response_impedance.sin”. To properly set scales it is useful to directly input values at their extremes; refer to 6.2 and 6.4 for details about this.

Read carefully 6.2.1 about the stereo measurement display features.