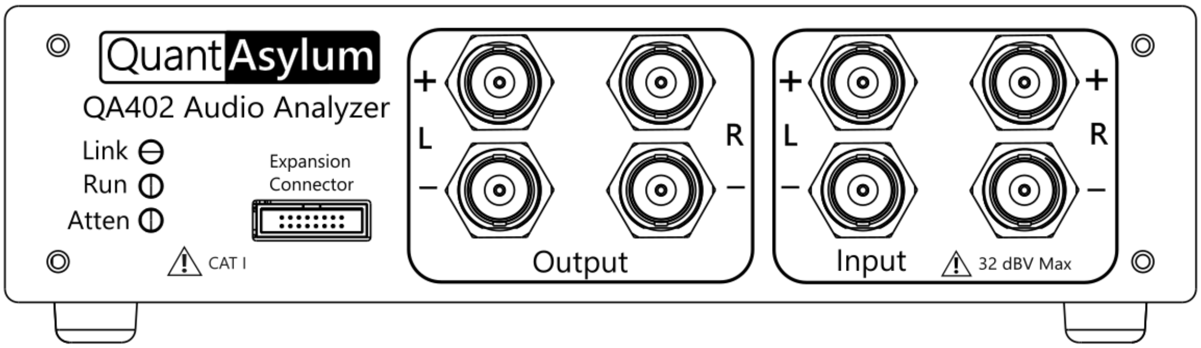
QA402 24-bit/192 KSPS Audio Analyzer



Introduction

The QA402 is our third-generation audio analyzer. The QA402 extends the functionality of the QA401 by increasing both the input- and output-ranges. The increased output range (up to +18 dBV = 8Vrms single ended) ensures that low-gain, high-power amps can be driven with plenty of headroom. And the increased input range (+32 dBV = 40Vrms single-ended) makes measurements on higher-powered amps (400W into 4Ω without an attenuator.

Fast Boot

The QA400 and QA401 used an internal FPGA to handle the USB interface. On the QA402, we have moved to an advanced microcontroller. The upshot is that you can plug-in and go: There is no waiting for the hardware to configure.

No-Cal Design

The QA402 comes with a factory calibration in its flash ensuring great unit-to-unit performance. On the manufacturing line you can swap QA402s and be confident what you read on one unit will be very similar on the next unit. The software install is driverless and very lightweight, making it easy to keep your entire audio debugging solution on a thumb-drive as you move from your bench to your factory.

Measurements

Making basic measurements is quick and easy. In a few clicks you will understand the frequency response, THD, gain and SNR of your device-under test.

Lots of Dynamic Range

The QA402 offers 8 gain ranges on the input (0 to +42 dBV in 6 steps), and 4 gain ranges on the output (-12 to +18 dBV in 10 dB steps). This ensures consistent performance over very wide ranges of input and output levels.

Easy Programmability

The QA402 supports a REST interface, making it easy to automate measurements in just about any language you could imagine. From Python to C++ to Visual Basic—if you know how to load a web page in your favorite language, you can control the QA402 remotely. Measurements are fast and responsive, with several commands being processed per second.

Isolated and USB Powered

The QA402 is isolated from the PC, meaning you are measuring your DUT and not chasing some phantom ground loop. The QA402 is USB powered, like nearly all our instruments. If you are setting up remotely, throw a powered hub in your bag and your entire test setup can be running with a minimum of cables.

Goodbye Soundcard, Hello QA402

Tired of trying to make a soundcard work? The calibration nightmare? The lack of gain stages? The limited drive? Are you tired of dealing with the fixed input ranges? The worry that you might destroy it with too much DC or AC? Tired of the ground loops? Say hello to the QA402.

Easy Returns

We know getting comfortable with a new analyzer is an investment. That is why we offer a 15-day no-questions-asked return policy. Try it. And if you don't find the QA402 helpful in your workflow, just send us an email and we'll arrange a return.

Ready?

Contact us at **Sales@QuantAsylum** if you have questions.

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Specifications

Mechanical

Dimensions	177W x 44H x 97D
Weight	435 grams
Case Material	Powder-coating Aluminum (2mm thick front panel, 1.6mm thick top/bottom)

Electrical ADC

Inputs	Differential, BNC x 2 for LEFT and BNC x 2 for RIGHT
Input Z	100KΩ AC-coupled (appears as "open" for DC reading)
Input Coupling	AC, F_c < 1 Hz
Input Max DC	±40V. |AC + DC| must not exceed $56V_{PK}$
Input Full Scale (Atten OFF)	+18 dBV = $8V_{RMS}$
Input Full Scale (Atten ON)	+42 dBV, but input is clipped by software to +32 dBV = $40V_{RMS.}$
Input Overload Protection	With attenuator off, momentary application of +32 dBV = $40V_{RMS}$ can be tolerated. With attenuator on, momentary application of up to 37 dBV = $70V_{RMS}$ can be tolerated.
Input Noise Floor	-114 dBV, 0 dBV input range, inputs shorted, 32K FFT, avg 5, rectangular window, 48kSPS
THD	-110 dB (loopback, single-ended, L- shorted, -2 dBV input, 128K FFT, Hann window
THD+N	-98 dB (loopback, single-ended, L- shorted, -2 dBV input, 128K FFT, Hann window)

Electrical DAC

Outputs	Differential, BNC x 2 for LEFT and BNC x 2 for RIGHT
Output Z	100Ω DC-coupled single ended
Expected Load	Minimum = 200Ω || 100pF. Preferred load is resistive and > 1kΩ. Output stage will limit to ±60 mA. Extended operation at limits can cause heating in output stage and could cause a shift in performance. Output can drive into non-zero DC loads between ±10V, but current must be limited to < 5mA. Contact support if you have non-typical loads (reactive or otherwise) and we can provide a more detailed assessment.
Output Full Scale	+18 dBV = $8V_{RMS}$
Output Attenuators	0, 10, 20 and 30 dB.
Input Overload Protection	With attenuator off, momentary application of +32 dBV = $40V_{RMS}$ can be tolerated. With attenuator on, momentary application of up to 37 dBV = $70V_{RMS}$ can be tolerated.
Input Noise Floor	-114 dBV, 0 dBV input range, inputs shorted, 32K FFT, avg 5, rectangular window, 48kSPS
THD	-110 dB (loopback, single-ended, L- shorted, -2 dBV input, 128K FFT, Hann window
THD+N	-98 dB (loopback, single-ended, L- shorted, -2 dBV input, 128K FFT, Hann window)

General

Included Accessories	None

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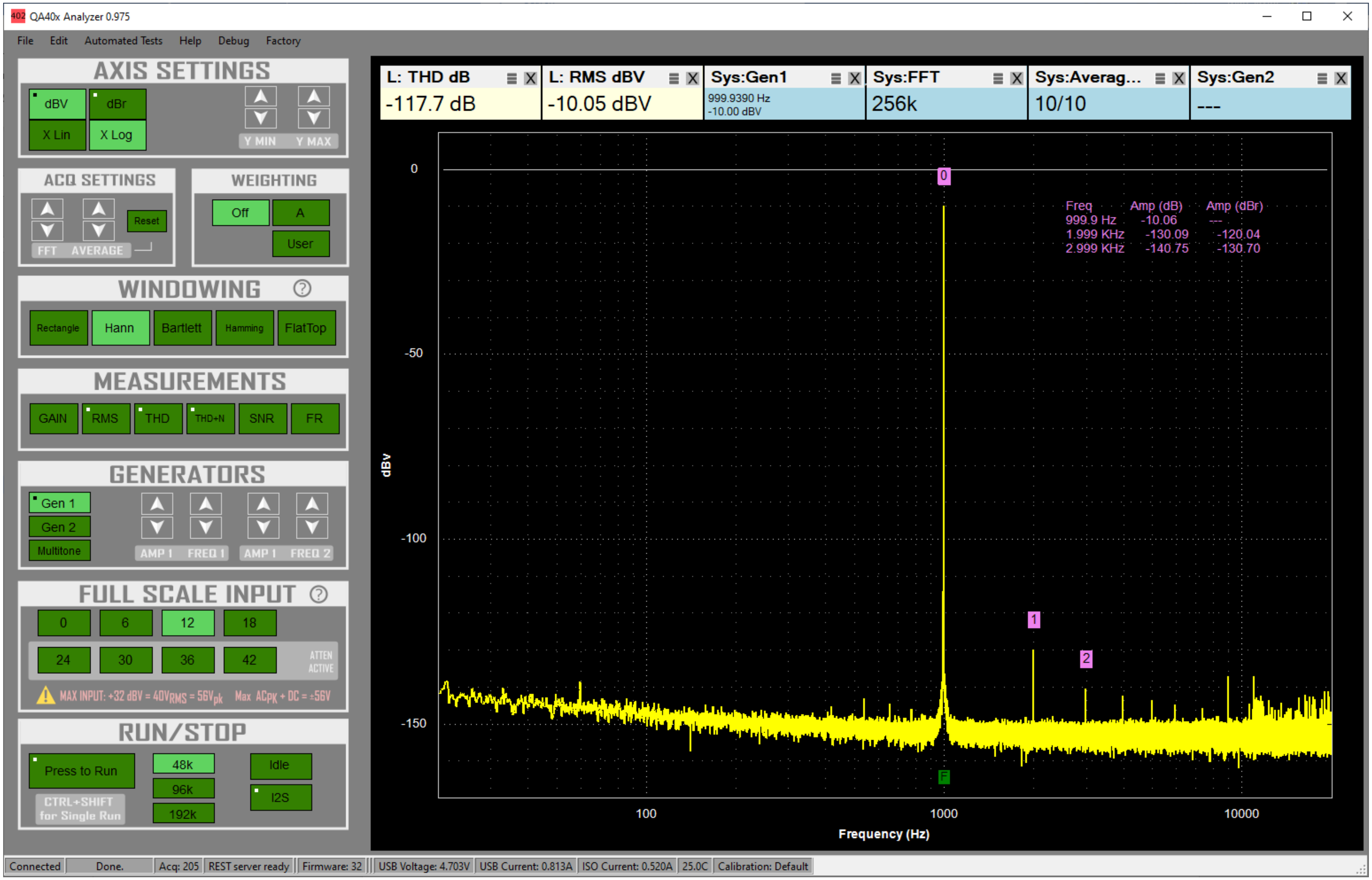
Sample UI



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Measurements

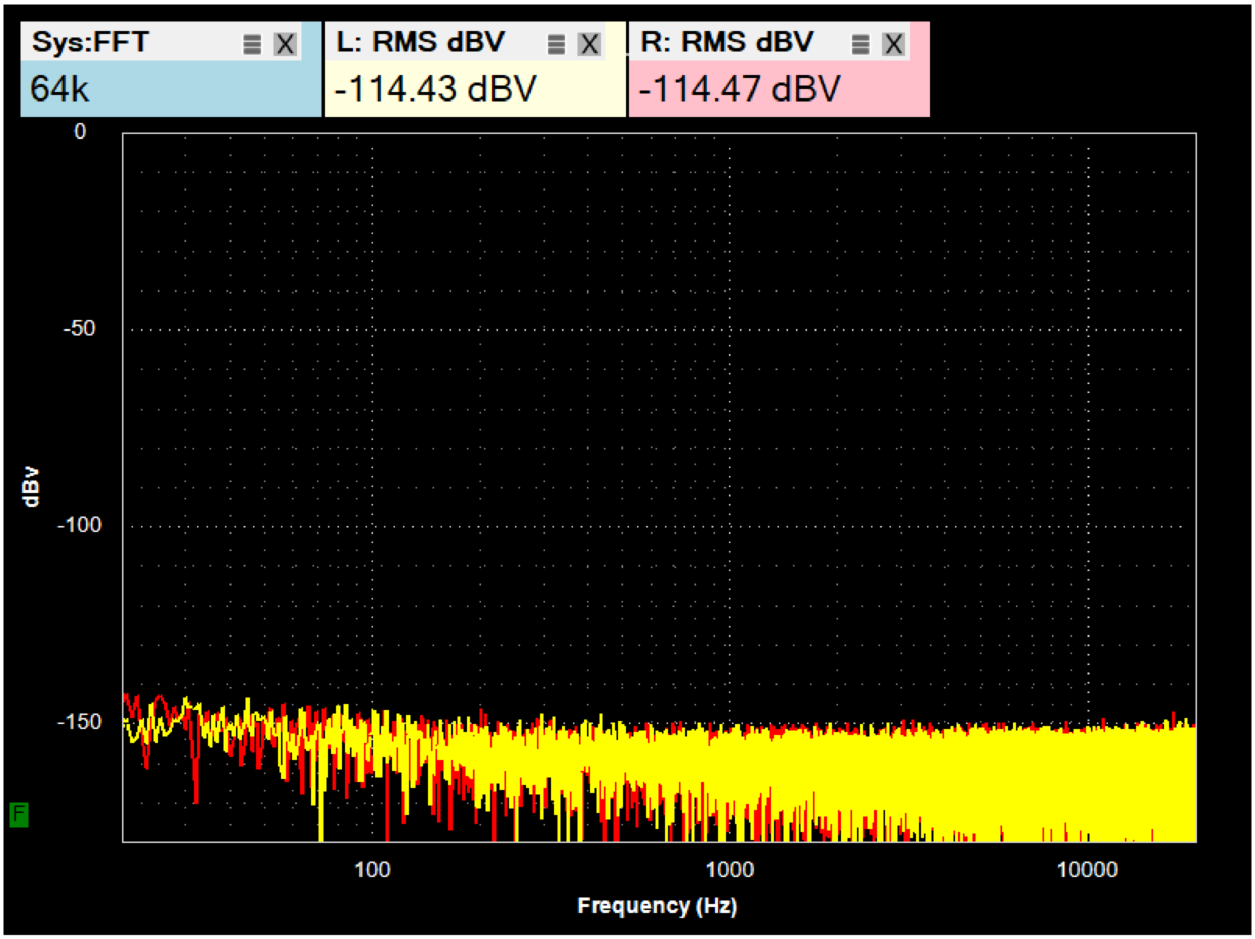
The measurements shown below are made in loopback mode. There are two types of plots shown: The first is the application screen. In this mode, the measurements can be read directly from the application display (black background). The second measurement is a swept-parameter measurement (white background). These graphs are created inside the QA402 application by specifying various sweep parameters. The graphs will complete automatically based on your specified parameters.

The graphs shown below are representative of performance: other units may perform slightly better or worse in some areas. Unless stated otherwise, the measurements shown are at 48Ksps. Generally, higher sample rates will yield slightly worse performance.

Noise Floor

The noise floor is measured by shorting both input channels. The RMS noise (20 to 20 KHz, no weighting) is reported at -114.40 dBV. Note that low-level spurious tones can occasionally appear in some units.

Measurement Parameters: 64K FFT, Rectangle window, no averaging, no weighting



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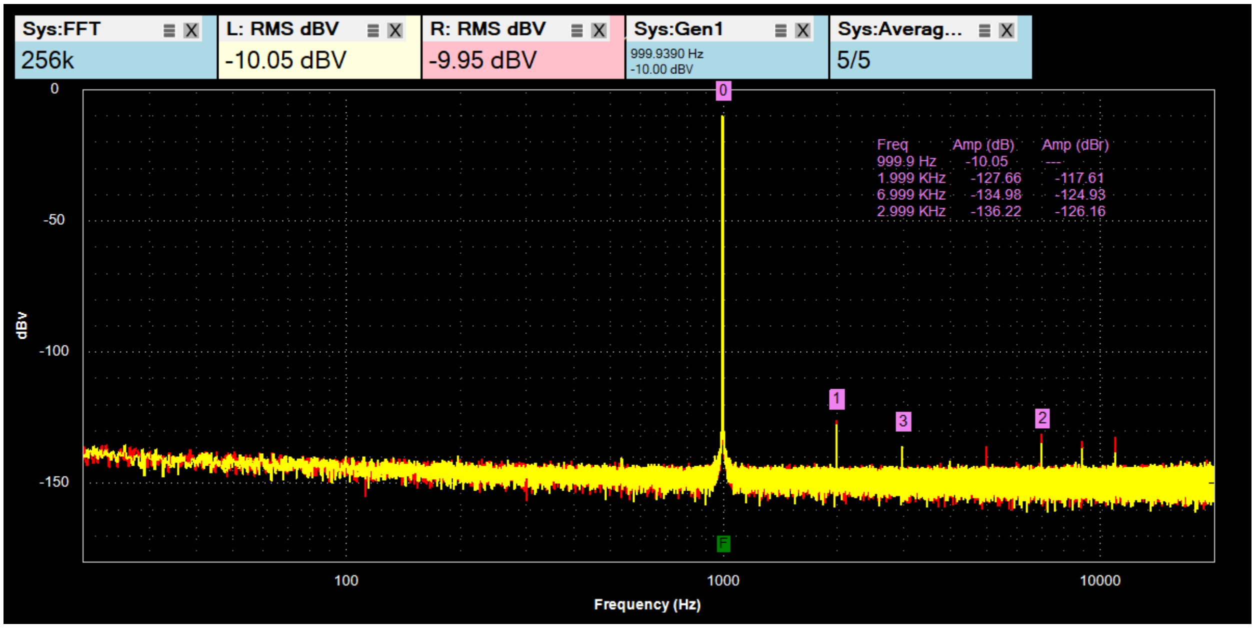
THD

THD is measured in loopback at -10 dBV, Rectangle window, 256K FFT, 5 averages. Note in the screen capture below, the markers are reflecting left channel measurements. In some cases, the right channel is a few dB worse.



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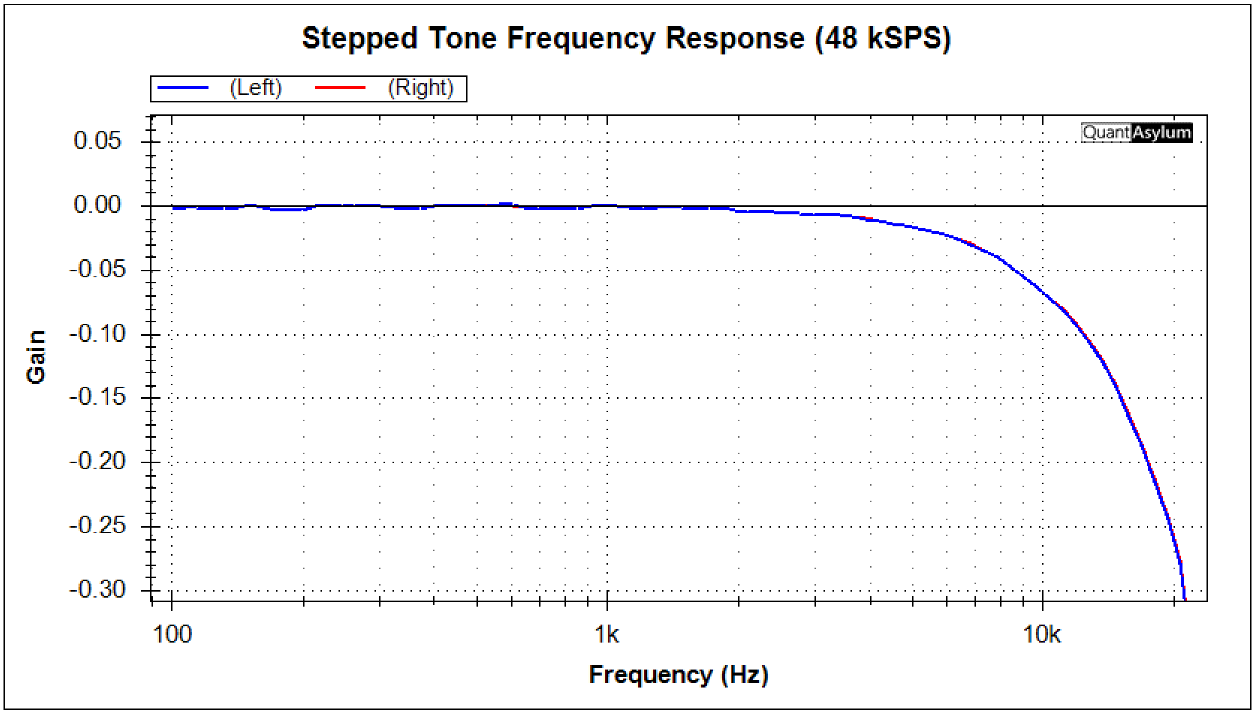
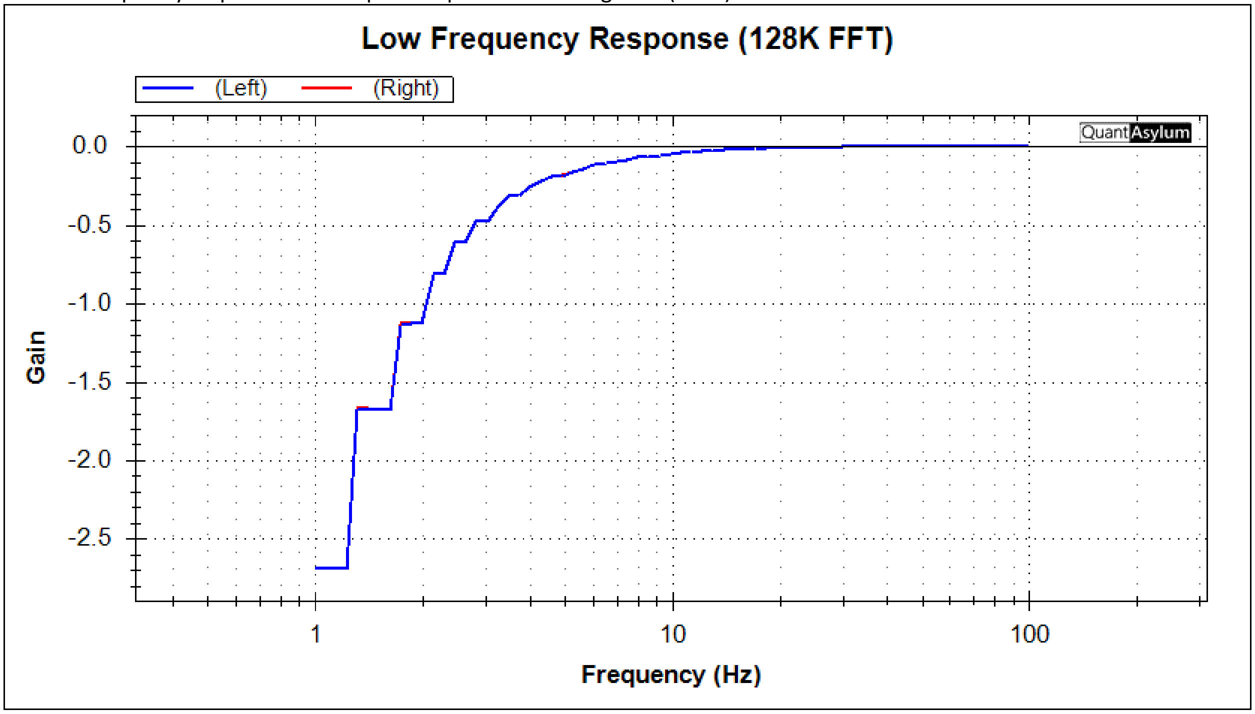
Frequency Response

A stepped tone frequency response in loopback is shown below for 48K sample rate. This was measured from 100 Hz to 23 kHz, 10 points per octave, -5 dBV sweep level, Flat Top window:



The low frequency response was swept in loopback with a large FFT (128K)



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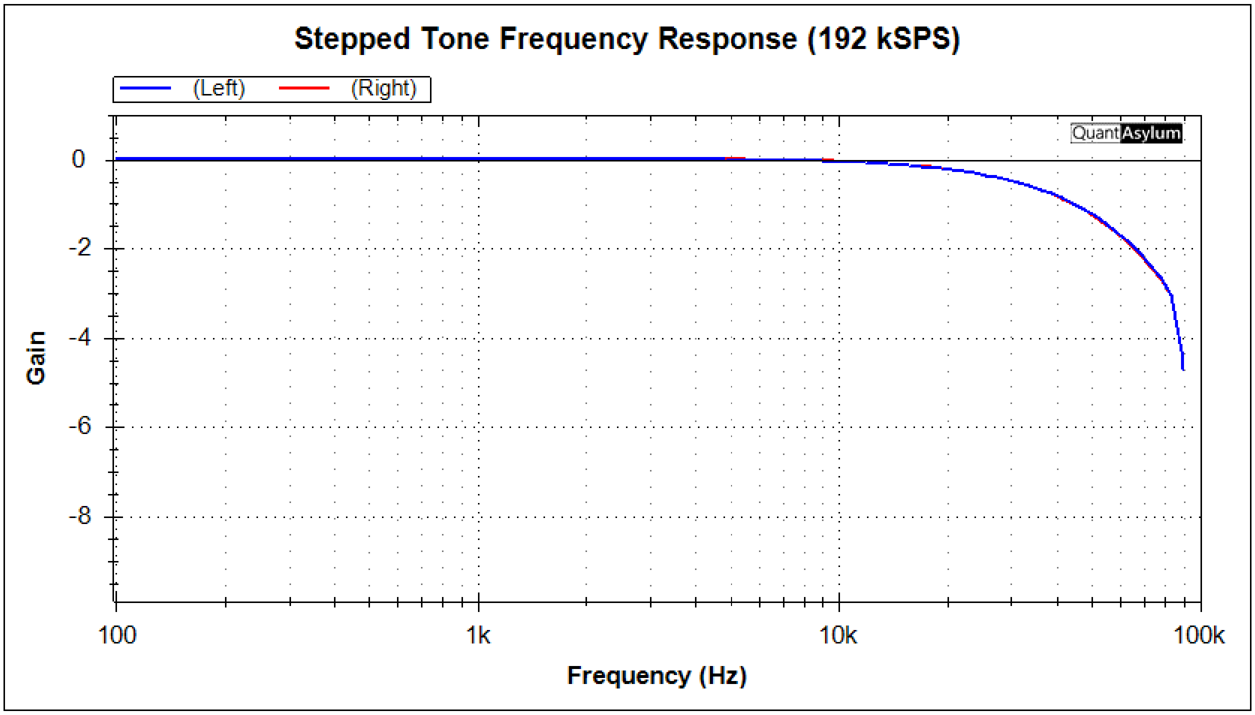

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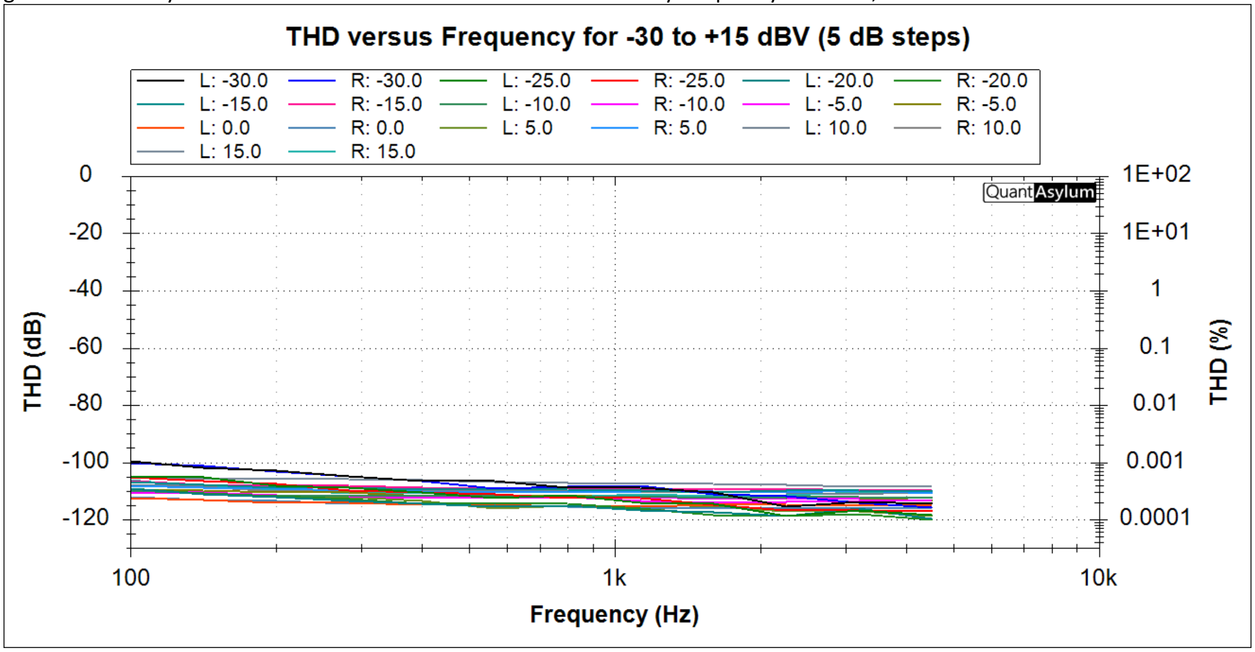
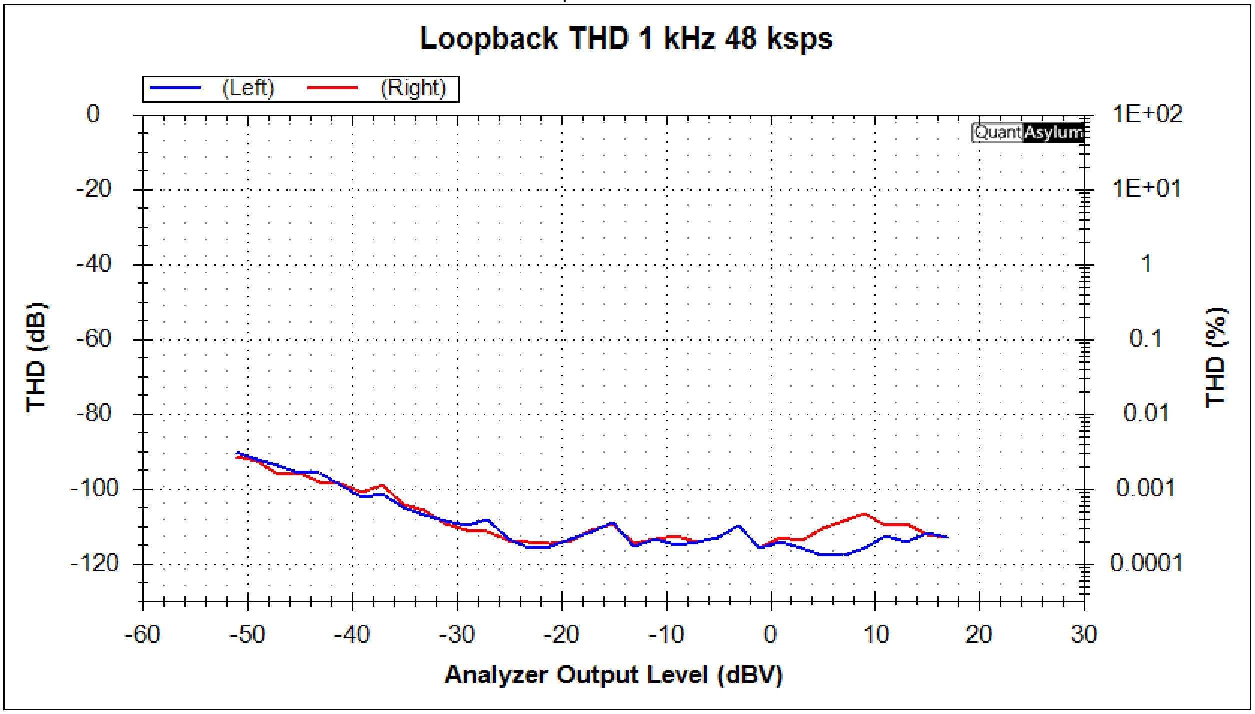
THD

The plot below shows THD in loopback from 100 to 6000 Hz (20 kHz measurement bandwidth). The graph is crowded, but the general takeaway is that THD in excess of -100 dB is measured at any frequency and level, from -30 to +15 dBV.



Below is the THD at 1 kHz from -51 to 17 dBV in +2 dB steps:



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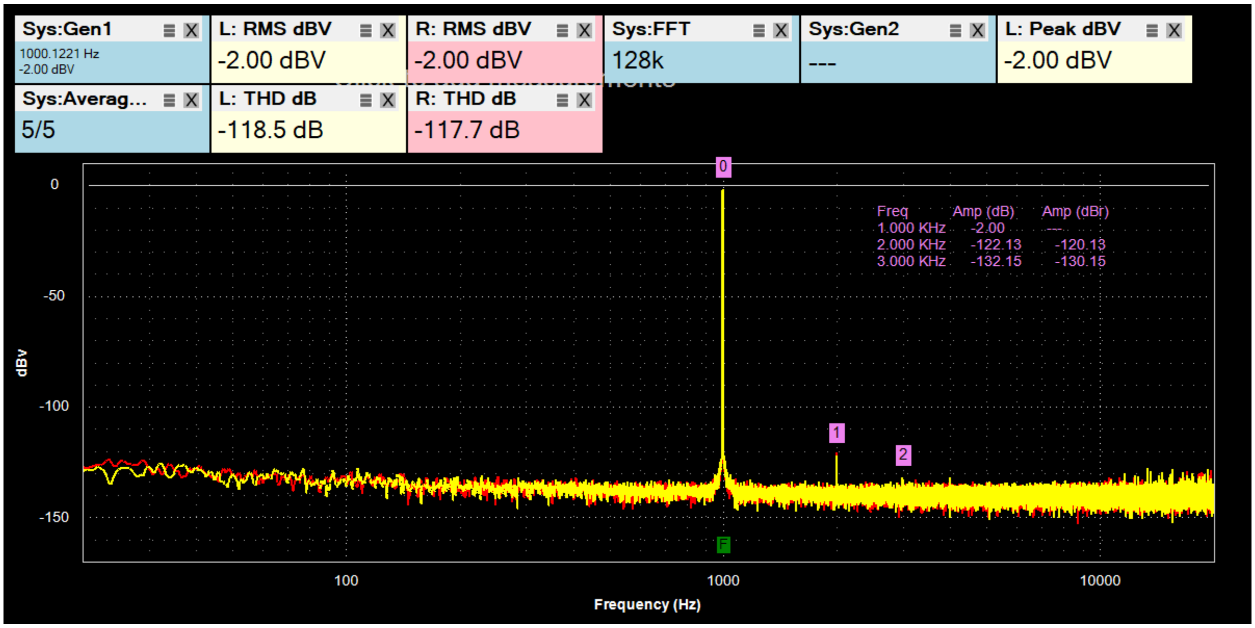
The spectrum below shows THD for both right and left channels at -2 dBV. The spurious components to the right of 10 kHz will appear and disappear depending on amplitude settings. These are related to the ADC.



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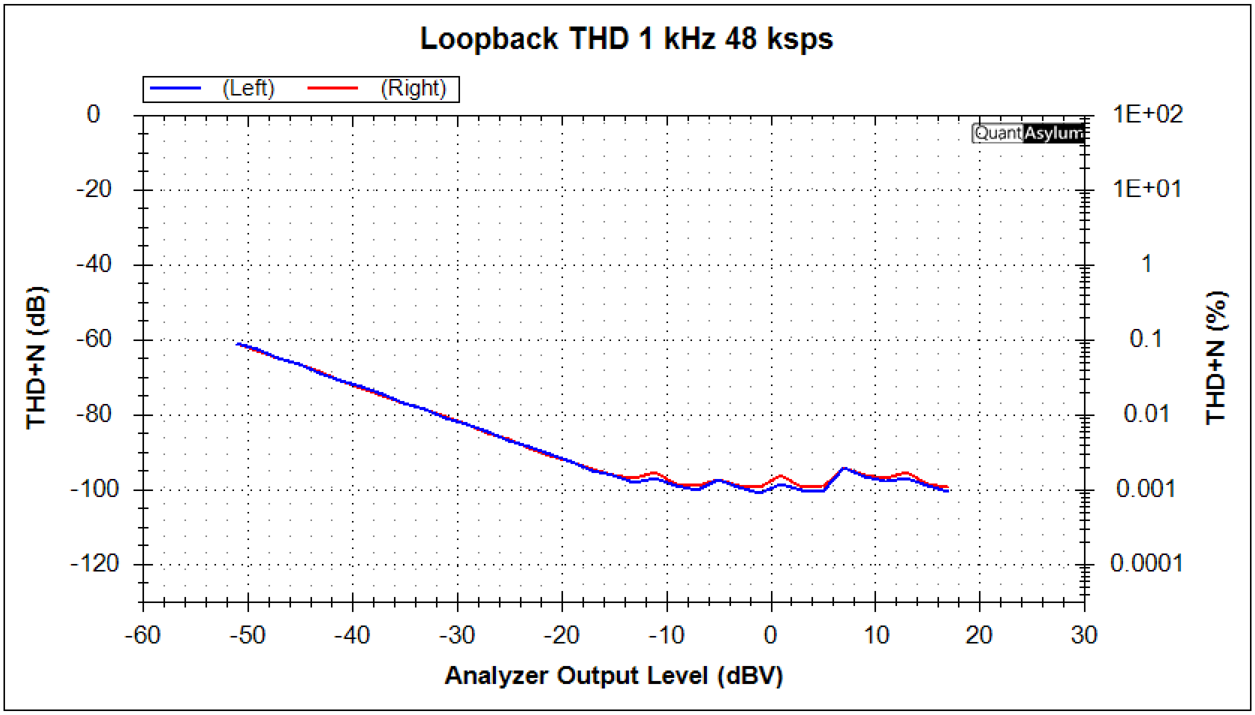
THD+N

Below is the THD+N at 1 kHz from -51 to 17 dBV in +2 dB steps.



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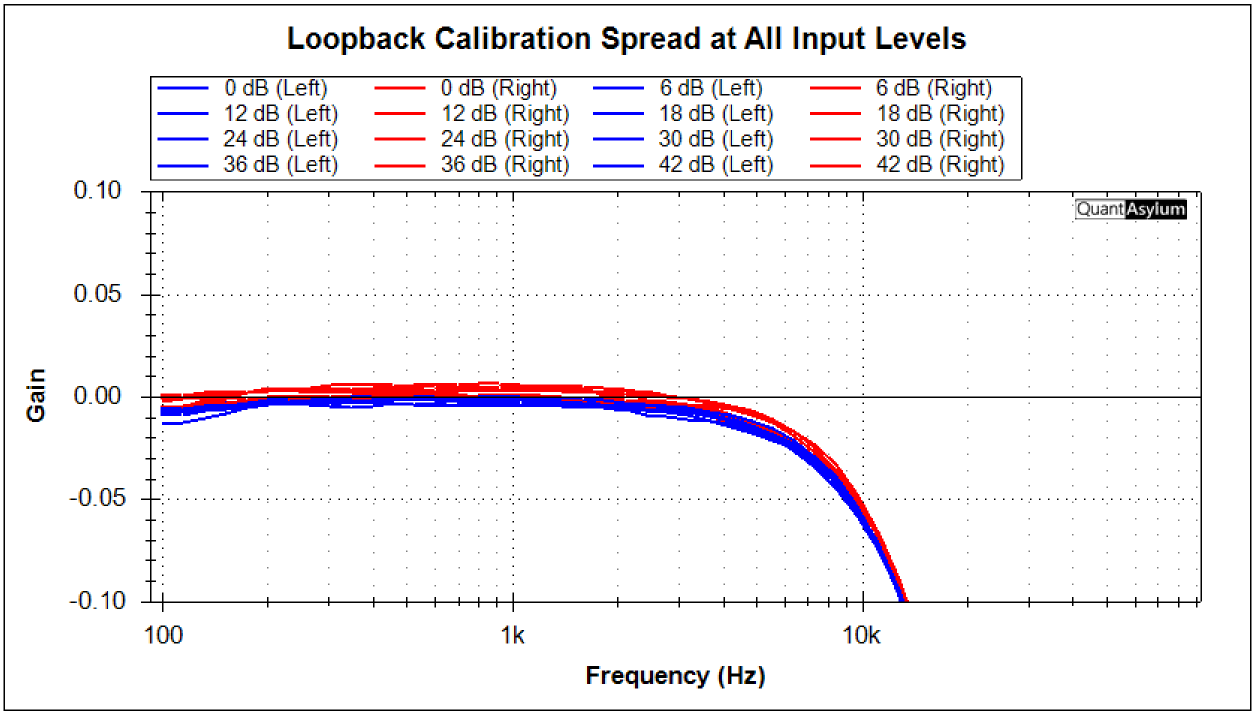
Calibration Spread

The plot below shows a loopback gain sweep at a fixed output level (-5 dBV) and at every input level (0, 6, 12, 18, 24, 30, 36, 42 dBV). The input and output gains are calibrated, and the result is that regardless of input gain range, there is very good (+/- 0.02 dB or so) agreement between readings. Roll-off at higher frequencies are the DAC/ADC internal filters.



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