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RME ADI-2 Pro Measurements

As usual, all measurements were taken using an Audio Precision APx515, with software running under Windows 7. The ADI-2 Pro has so many input, output, equalization, and sampling options that a complete set of measurements would occupy 100 pages or more, so I'm restricting this set to a few of the highlights.

Distortion vs. frequency with an AES (digital) input and the headphone output at 1.5 V into 32 Ω is shown in **Figure 1**. It remains impressively low across the audible spectrum, and does not exhibit the commonly-seen rise at higher frequencies. Distortion versus level at 1 kHz is shown in **Figure 2**, again with a 32 Ω load at the headphone output. It is shown using both the "normal" headphone output and with the "Hi Power" option engaged. The downward slope of the curve with increasing voltage indicates that the results are noise-limited up until the clipping point; actual distortion is minuscule. The Hi Power option increases clipping voltage to 6 V, at the expense of a small amount of extra noise because of the increased gain.

Note that in extended Hi Power testing, the ADI-2 Pro would have a thermal shutdown after 5 minutes or so of continuous output at 5 V into 32 Ω. The protection circuitry is effective—after shutdown, the unit returned to normal operation after a few minutes, unscathed. For the majority of headphones, this is a moot issue; these levels would destroy any headphones that I have on hand.

Figure 3 shows the residual distortion expanded 100,000 times; this certainly looks noise dominated, as implied by the Figure 2 curves.

One unusual feature is selectable reconstruction (anti-imaging) filters for each of the two DACs. Each DAC has five options (Slow, Fast, Short Delay Slow, Short Delay Fast, and NOS). And each of these options yields a different frequency response, impulse response, image rejection, and delay. **Figure 4** shows the frequency response for a 48 kHz sample rate with each of the filter options. The two Sharp options overlay one another, as do the two Slow

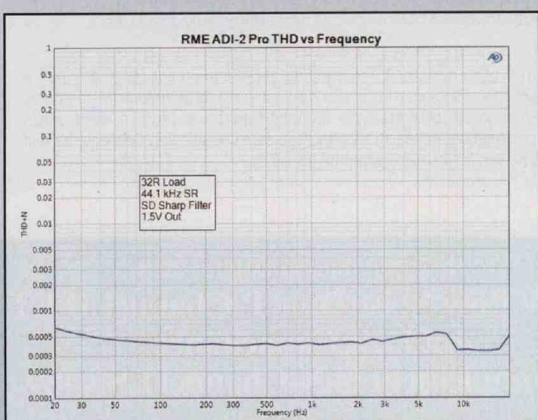

Figure 1: Distortion vs. frequency

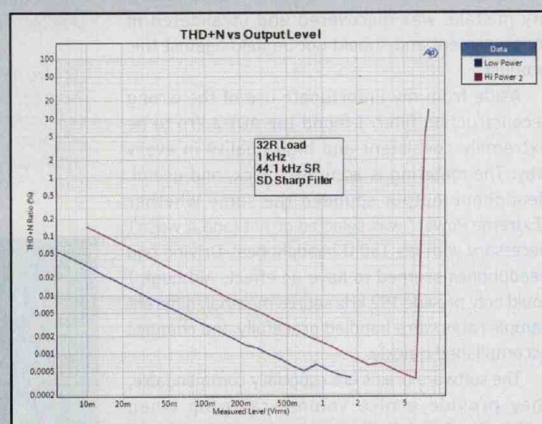

Figure 2: Distortion vs. level at 1 kHz

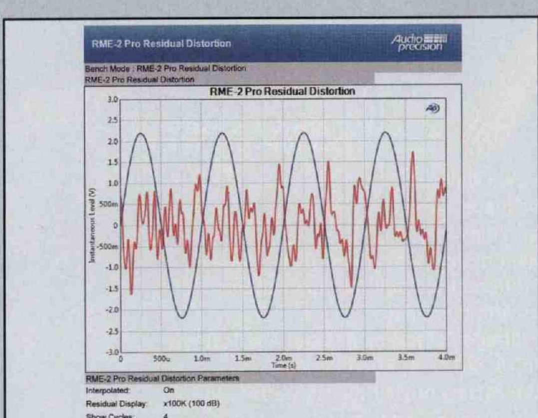

Figure 3: Residual distortion expanded 100,000 times

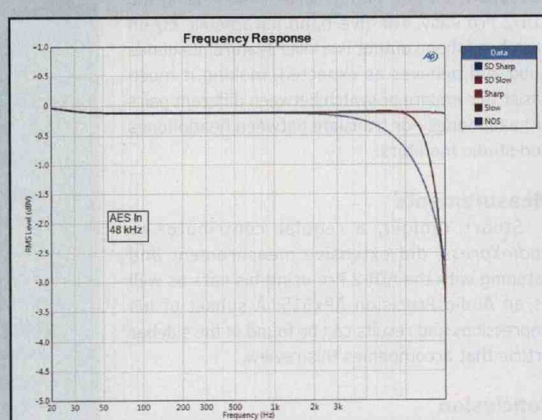

Figure 4: Frequency response for a 48 kHz sample rate

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options, with the latter showing significant rolloff in the top octave. The NOS option rolls off even earlier, something that should even be audible to a casual listener.

The amount of treble rolloff with the Slow and NOS is naturally a function of the sampling rate. **Figure 5** compares the frequency response with a Slow filter at 44.1 kHz and 96 kHz sampling rates, the difference being well into the "audible" magnitude.

The choice of filter also affects the suppression of images. The 10 kHz distortion spectra illustrated in **Figure 6** show this clearly. I displaced the fundamental by 500 Hz between the two filter measurements so that the differences would be more visible in the graphs. The image at sample rate minus fundamental (at about 34 kHz) shows 60 dB better for the Sharp filter compared to Slow.

Figure 7 shows impulse response differences for three of the filter options at a 44.1 kHz sample rate. The delay varies from about 0.2 to 0.9 ms, with NOS showing the shortest delay. All of those numbers are well below audibility, but the Short Delay (SD) option will reduce them even further, with SD Sharp showing a delay of under 350 microsecond.

My favorite signal torture test is a multitone measurement, with equal level tones spaced a half octave apart, covering the audio spectrum. Any misbehavior of the electronics shows as tones or hash between the "teeth" of the "comb." **Figure 8** shows the multitone spectrum of the ADI-2 Pro through the headphone output loaded with 32 ohms. It's textbook clean, an outstanding result. I ran this test two ways, using an AES input and using the analog inputs to exercise the AD converters. The results look identical, so the AD half of this unit does not let down the superb performance of the DA and headphone amps.

All in all, the bench test performance of the ADI-2 Pro is flawless. The sound can be tailored using the filter options or equalization if a departure from neutrality is desired.

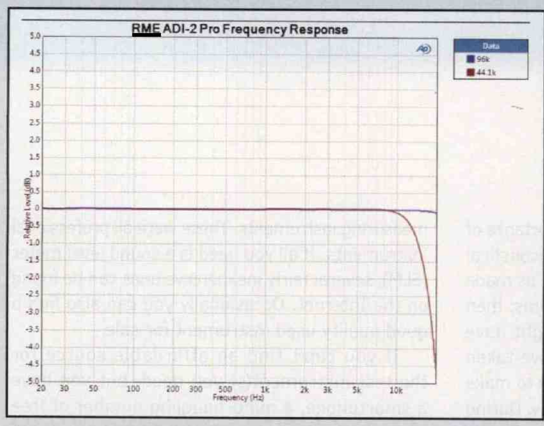

Figure 5: The frequency response with a Slow filter at 44.1 kHz and 96 kHz sampling rates

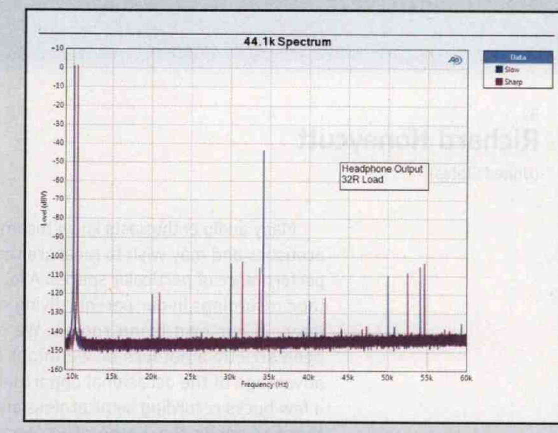

Figure 6: The distortion spectra at 10 kHz show the choice of filter also affects the suppression of images.

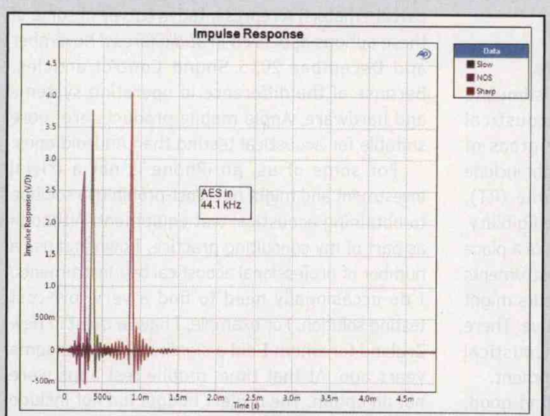

Figure 7: Impulse response differences for three of the filter options at a 44.1 kHz sample rate

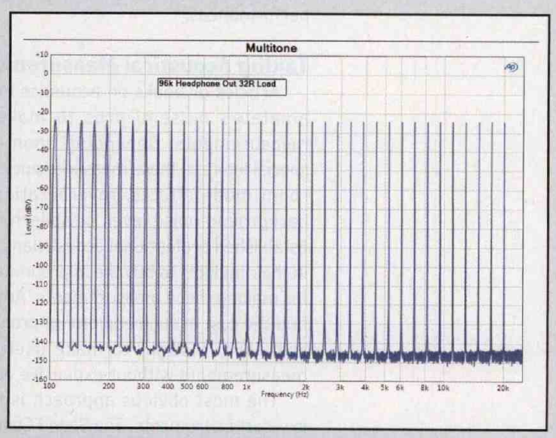

Figure 8: The multitone spectrum of the ADI-2 Pro through the headphone output loaded with 32 Ω