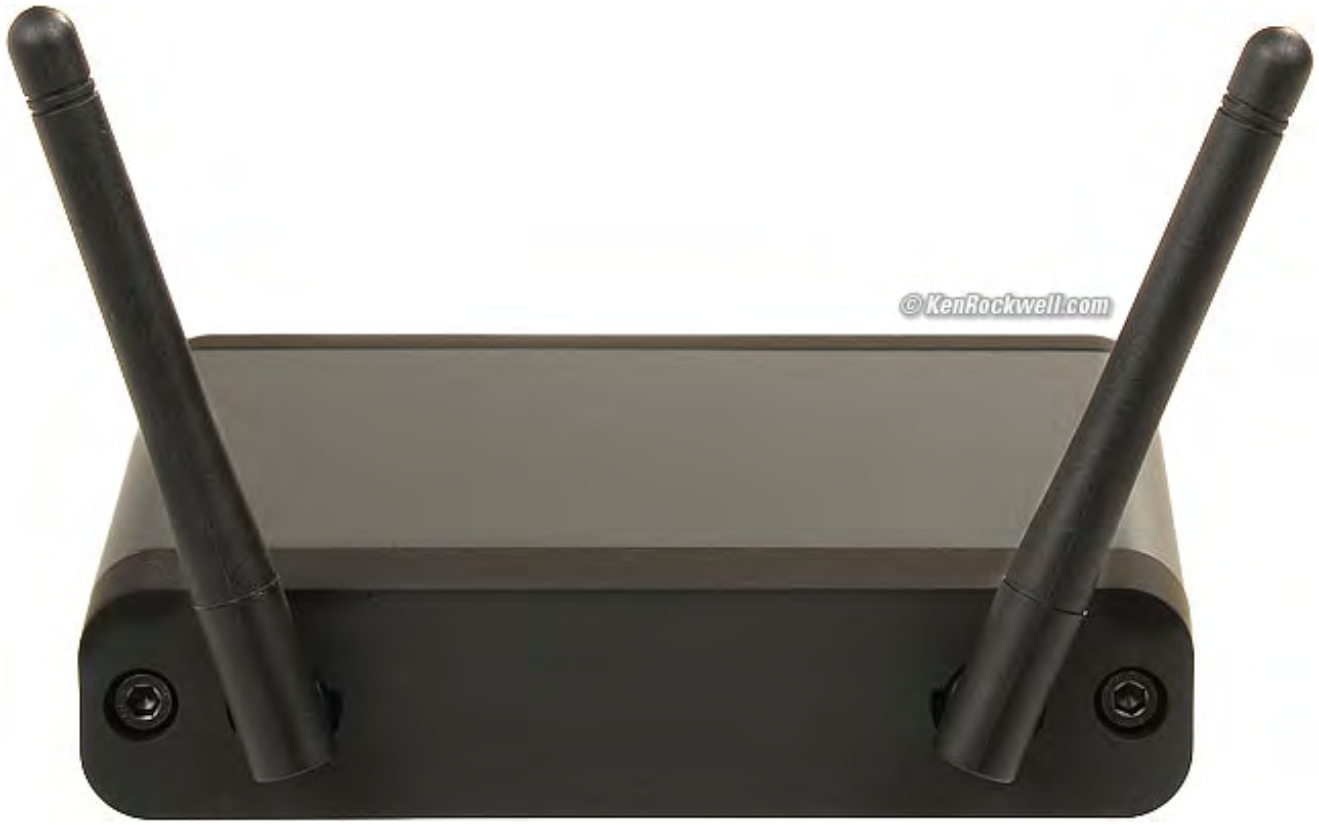
audioengine D2 Review

audioengine D2
Remote-output 24-bit/96kHz DAC (2011-)

Intro Specs Performance Measurements Recommendations

audioengine D2 transmitter (9.6 oz./271g). bigger.

audioengine D2 receiver (10.3 oz./292g). bigger.



Back, audioengine D2 (transmitter and receiver look the same).

The set comes with both transmitter and receiver for about $599). This free website's biggest source of support is when you use these links, especially this link to them at Amazon or at B&H, when you get *anything*, regardless of the country in which you live. Thanks! Ken.

February 2012 All Reviews > Audio Reviews

Inputs: USB and TOSLINK digital.

Outputs: Stereo RCA analog at -10 dBu, TOSLINK digital.

Power: AC adapters, USB optional at transmitter.

Notable: Small, light and portable, complete with little fuzzy carry bags. USB powered transmitter with gain control to set playback level at receiver.

Missing: No analog input. No Coax or AES digital inputs. No headphone output. No Coax or AES digital outputs. No reference mark on volume control knob.

Introduction top

Intro Specs Performance Measurements Recommendations

The audioengine D2 is a DAC (digital-to-analog converter) transmitter and receiver pair. It allows you to transmit and control a digital audio signal from one place, and receive it as either a digital or DAC-converted analog signal elsewhere.

While I use an Apple AirPort Express to play into each of my hi-fi systems (as well into my whole-house audio system) from everyone's laptops, iPads, and iPods, not everything on my computer plays through iTunes and AirPlay, nor does my CD player. The reason for this wireless device is if you want to play *everything* from your computer through it, or play from a dedicated TOSLINK audio source.

With this pair, you can send digital (not analog) audio from your computer, hi-fi, CD-transport, DAT, stereo receiver, DAW, or etc. and have it received remotely at your power amplifier or active monitors. You control the volume at the transmitter, so all you need to do is plug the receiver into your powered monitors, power amplifier or pre amplifier, and you've got an instant remote-volume-controlled hi-fi playback system. Sit in your favorite chair next to your source, and control the volume and run great analog into your amps on the other side of the room for critical listening. You can play out of your computer via USB, and you can use the TOSLINK output at the other end.

One transmitter will talk to up to three receivers at the same time.

I was caught off guard with this setup; its performance is absolutely fantastic. It's not at all like all the other made-in-China plastic digital audio gear that comes across my desk like the crappy Zoom H4n recorder; this audioengine D2 has superb audio quality, even if you plug it into audio chains as transparent as the world-standard Stax SR-007 Omega Mk II via an appropriate amplifier.

The volume control is a real knob, and each position gives an exact setting; it's not like a crappy car radio knob that turns and turns and turns. The volume control setting (gain) is transmitted along with the data to the receiver, and the actual attenuation takes place in the receiver.

The volume control, the most important and only control on this setup, works great. While there is some "zipper noise" if you spin it fast with audio present, it responds immediately, and covers a huge range. The DAC is so quiet and its 56 dB volume control range so broad that you can plug its analog output directly into an ordinary hi-fi power amplifier and put your speakers a foot away from you on your desktop, and not hear any noise. The gain (volume) control covers a broad enough range that you can cover from full-power down to a whisper without having to change levels at the source.

The volume control is great because not only does each position always give the same setting (I drew a line on mine so I could see it), its control covers the same amount of change anyplace in its range: 90º of rotation always changes the volume by about 20 dB. Unlike ordinary analog volume controls, it has the same effect anywhere in its range; its effect doesn't become less at the high end or lose the ability to set precise levels at the low end.

Specifications top

Intro Specs Performance Measurements Recommendations

Transmitter Inputs

USB and TOSLINK.

Up to 24 bits, up to 192 ksps, PCM only (no Dolby Digital or other baloney).

Receiver Outputs

Two ¼" RCA jacks for stereo analog out, 2 V RMS.

TOSLINK.

Frequency Response

10 ~ 30,000 Hz ±0.5 dB.

SNR

>115 dB, DC-20 kHz.

THD+N

<0.0015%.

Range

Typically > 100 feet (30 meters).

Power

AC adapters, two included. (one each for transmitter and receiver).

The transmitter is also powered by USB if you prefer not to use the adapter.

If you use the TOSLINK and USB inputs on transmitter, audio is taken from the TOSLINK and powered by USB, again not needing the AC adapter.

The receiver always needs the AC adapter.

Transmitter rated 270 mA, receiver, 300 mA.

AC power consumption

Measured power drain of AC adapters while powering each unit:

Transmitter: 2.3 watts AC.

Receiver: 3.2 watts AC.

Size

Excluding projections, transmitter and receiver the same:

1.03 x 4.75 x 5.52 inches HWD.

26 x 121 x 140 millimeters HWD.

Weight

Transmitter: 9.570 oz. (271.3g).

Receiver: 10.290 oz. (291.7g).

Quality

Made in China.

Included

D2 transmitter and D2 receiver.

Two AC adapters and cords. They each have white ready lights.

Two fuzzy carry bags.

USB input cord.

58" (147 cm) stereo RCA cable that feels nice, but measures 550 pF, not a great cable at 114 pF/foot.

Literature.

Performance top

Intro Specs Performance Measurements Recommendations

The D2 just works.

Plug in both boxes, put in USB or TOSLINK, all the lights come on, and music comes out the other end.

There's no need to have to synchronize anything or install anything on a computer, or even use a computer at all. If there's a problem, just tap the blinking PAIR button on the transmitter to get them to talk. If they lose each other, the PAIR light on each unit blinks.

Sound

It has no fans and makes no noise.

It's so quiet that it's silent even connected directly to a power amp, with the speakers a foot away from your ears. Since it's always ON, there are never any thumps as your Mac wakes and sleeps.

It's clean and transparent. Listening with consumer (audiophile) gear, people imagine all sorts of funny things, but listening with the reference Stax SR-007 Omega Mk II via an appropriate amplifier, the D2 doesn't sound different from any other good DAC, is quieter than most, and does this all over the air.

I can't overemphasize how good it is to have a silent DAC. Hearing music against an inky black background adds a lot to it, instead of hearing it over an audible noise floor as too often is the case with other gear today.

As we'll see at Measurements, performance is spectacular in that it doesn't vary with the relative level of the audio signal itself, or with the setting of the volume control.

If you dislike the sound you're getting with this DAC, it's probably your recordings or elsewhere in your system, not in this DAC.

Range

Your house will be different, but in my house, I got 30 feet (10 meters) through a few walls and full closets with perfect reception.

By the time I added a few more walls and mirrors at 50 feet, it was starting to cut out.

It's much happier if you don't move it around as I did carrying it around testing; leave it sitting unmoved and the signal is much steadier at the edges of range.

If you're getting out of range, the audio simply starts muting quickly. It's obvious and not a gradual effect.

It's the proverbial digital cliff.

Your house will be different, and I have no idea why you'd need any more than 15 feet of range anyway.

Software and Installation

None, which is superb!

There is no software, no firmware, and no baloney: just plug-in and enjoy.

Ergonomics

The audioengine D2 is a small desktop sender, but oddly with the USB and TOSLINK inputs on the front along with the volume control, looks stupid sitting on my desk in actual use. The antennas are on the back, and I wish the inputs were, too, so I wouldn't have to stare at them snaking back from the front of this unit to the back of my desk.

The white LEDs are too bright for use at night. With gear like this, I presume you have a window office and never work as late as the people you manage.

The volume control skips and clicks a bit more than a real potentiometer when turned quickly, but it also immediately grabs the correct volume setting, unlike many electronically-controlled attenuators which lag.

The volume is always at the same level for the same position of the volume control, as it should be. Put a mark on the knob, and you'll know instantly where your volume is set, and be able to knock it around as you like with no more fiddling. I suggest you draw one strong black line drawn with a Sharpie on a piece of Scotch Magic tape, like the white minute hand of the Pictowatch.

If used with a Mac, the Mac's volume and mute controls are ignored, but your screen will tell you so.

There is no indication of having a valid digital audio input or not, but relays in the receiver click as the input appears or disappears.

As I covered in the introduction, the volume control works great, although you need two fingers to twist it, not just one as you can do on the Apogee Duet 2.

Measurements top

Intro **Specs** **Performance** **Measurements** **Recommendations**

Output Levels Output Impedance Noise Gain Control

Channel Tracking Frequency Response THD

Output Spectra Low-Level Linearity Jitter Rejection

Most of these measurements were made from the TOSLINK digital input to the analog outputs.

A $50,000 Rohde & Schwarz UPL laboratory analyzer was fed to into the transmitter via a 12-foot TOSLINK cable, and then the transmitter was put in another room. The two units were about 14 feet apart.

The receiver was put on a desk behind a monitor, and its analog inputs were fed back into the analyzer with the D2's own included 58" RCA cable. (The included RCA cable measures 58" (147cm) and 550

pF.)

Signals were 44.1 ksps at 24 bits, undithered and unjittered, unless otherwise noted.

The traces are color coded for the Left Channel and for the Right Channel. When they don't lie on top of each other, it's due to channel imbalance.

Analog Output Levels measurements top

At 0 dBFS at maximum gain below, THD measured 0.001% with both 200 kΩ and 600 Ω loads.

Output (left over right)

	V RMS	dBV	dBu	dBm
200 kΩ load	1.9709 V RMS	5.898 dBV	8.116 dBu	
	1.9491 V RMS	5.799 dBV	8.017 dBu	
600 Ω load	1.6889 V RMS	4.556 dBV	6.774 dBu	6.774 dBm
	1.6699 V RMS	4.457 dBV	6.675 dBu	6.675 dBm

At maximum gain, this is 0.175 dB less than a standard CD player.

Analog Output Source Impedance measurements top

103.8 Ω at 1 kHz.

Unchanged at 50 Hz and 20,000 Hz.

Noise measurements top

The outputs are super-quiet, quieter than any preamp I've measured. (The Apogee Duet 2 is almost as quiet, with about 10 dB more output, so it has more dynamic range.)

The noise levels don't vary with the setting of the level control

Playing digital zeros:

	Left	Right	SNR*	ENOB**
Unweighted	-111.6 dBV	-108.3 dBV	115.8 dB	18.95 bits
A-weighted	-114.7 dBV	-111.3 dBV	118.85 dB	19.45 bits

* referred to maximum output.

** Effective Number of Bits : (SNR - 1.72 dB) / 6.0206.

DC Offset: -32 µV left, -37 µV right (-95 dB SNR, average, ref. 2 V RMS).

Gain Control measurements top

Knob in transmitter sends a control signal to the attenuator in the receiver.

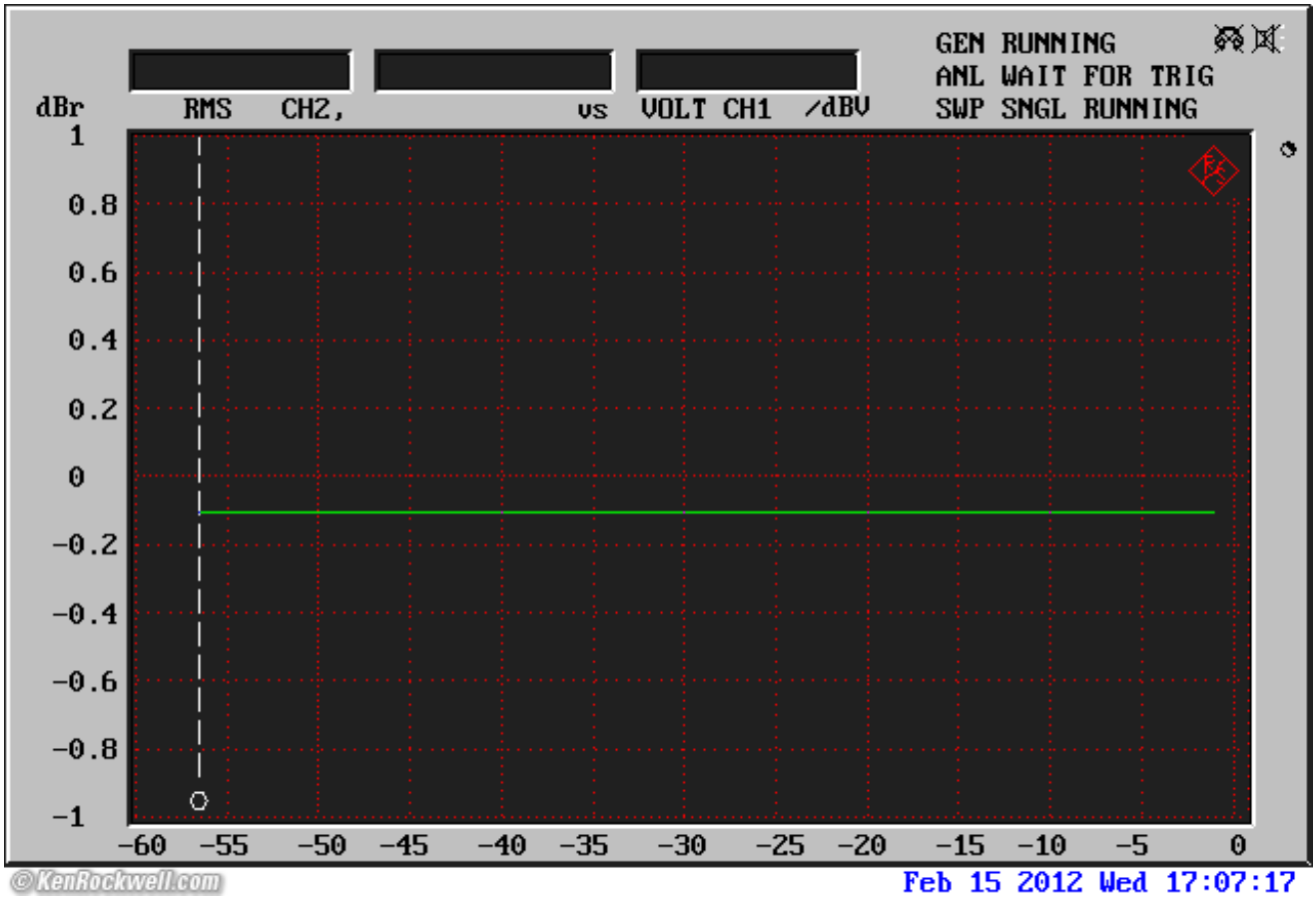
0 ~ 56.5 dB attenuation in precise 0.5 dB steps.

Maximum attenuation: about 56.5 dB, and off (-135 dB of noise in 1% bandwidth at 1 kHz).

Gain control at 12 o'clock: about -28 dB; the gain tracks linearly in dB as the knob is rotated, brilliant!

Channel Tracking measurements top

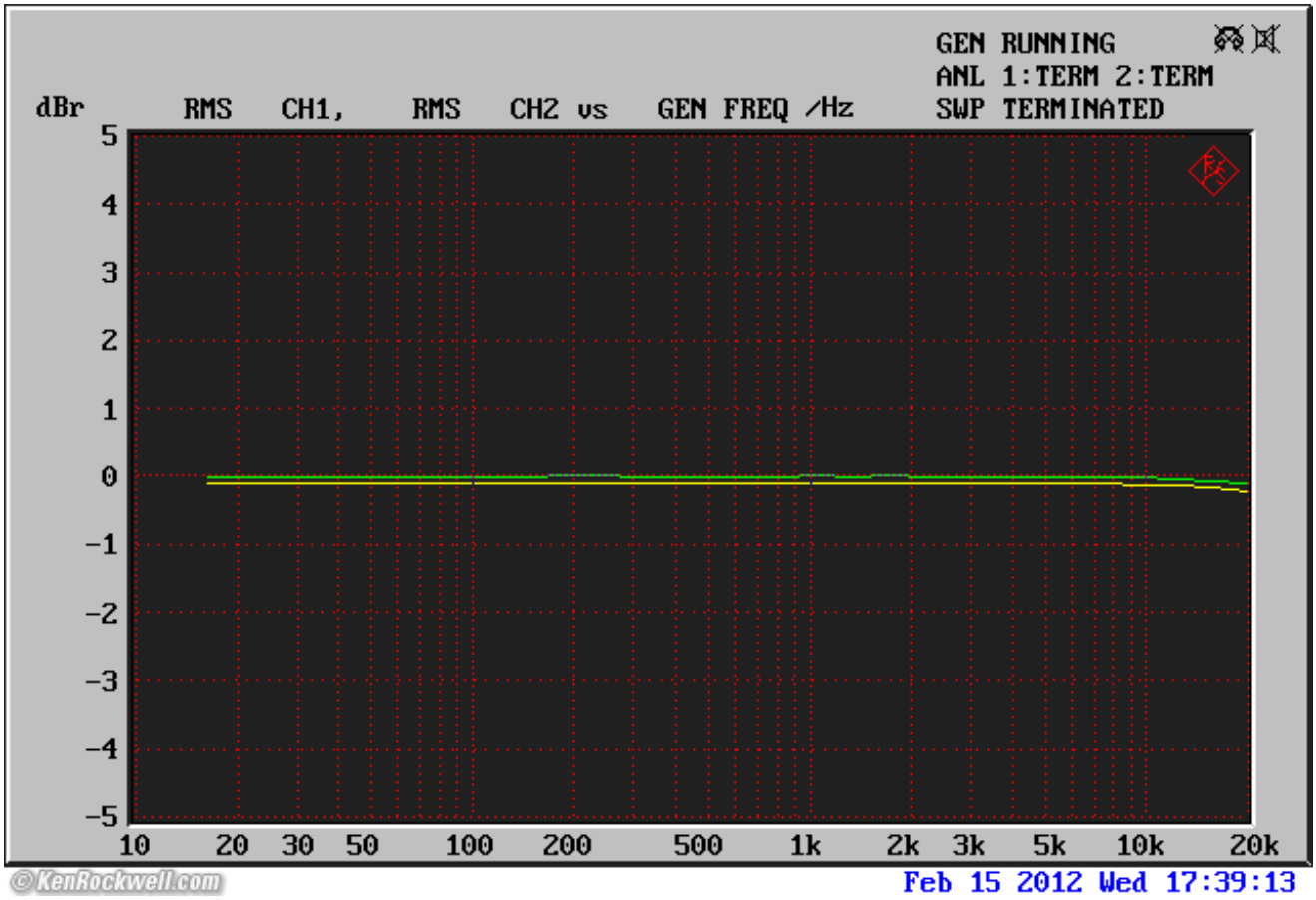
The channel tracking is extremely tight; the stereo image will not wander at all as the levels are changed.



Right channel level versus left channel volume control setting. (positive means the image moves to the right. R&S UPL.)

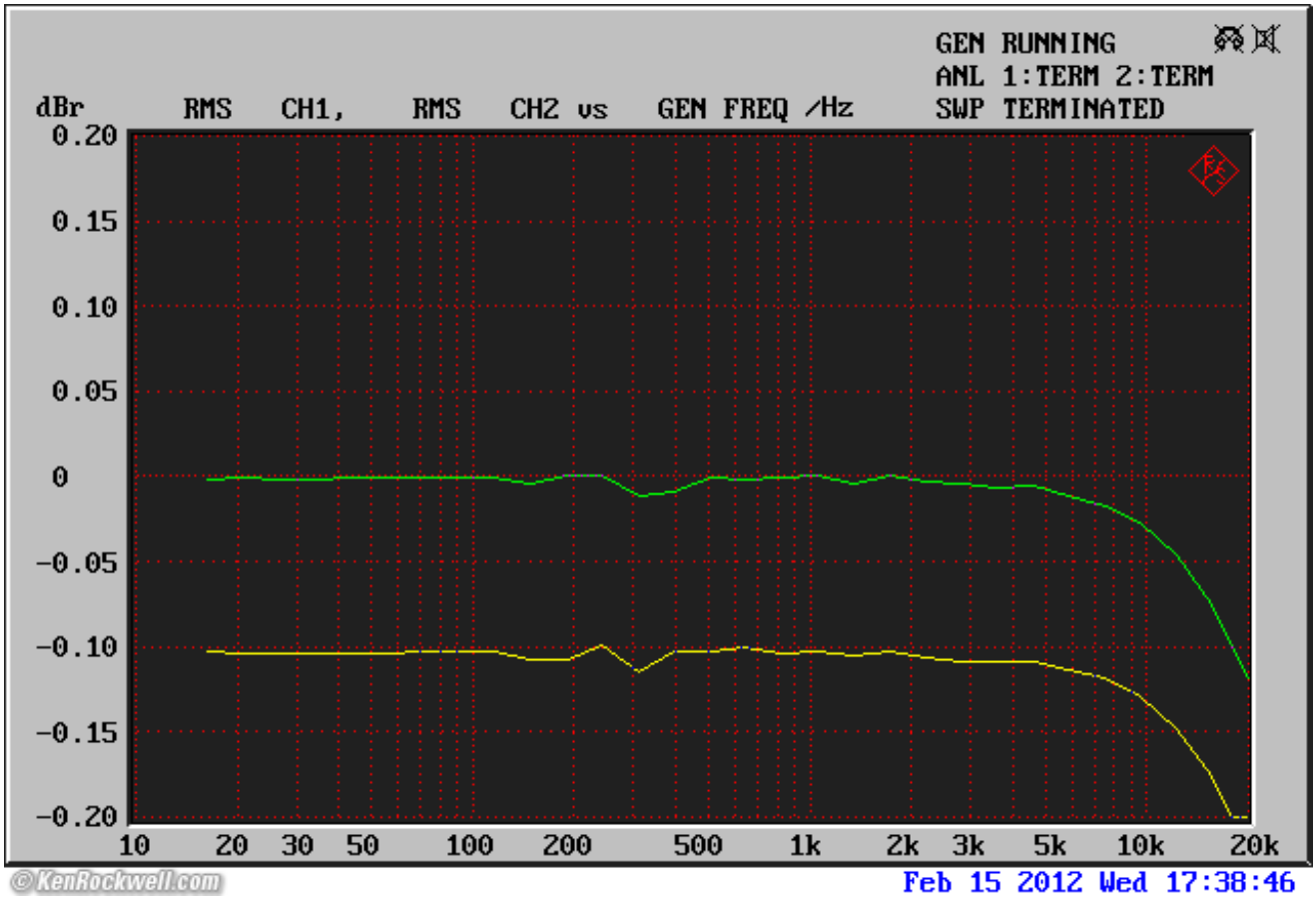
The as we saw at Output Levels, the right channel is 0.1 dB lower than the left. Tracking is superb, never varying from this at any setting.

Frequency Response measurements top



Frequency response, TOSLINK to analog, maximum gain and 0 dBFS. (R&S UPL.)

I also measured response with the level set to - 30 dB, and it was unchanged. I didn't bother to show that here.



Same thing, greatly expanded scale. (R&S UPL.)

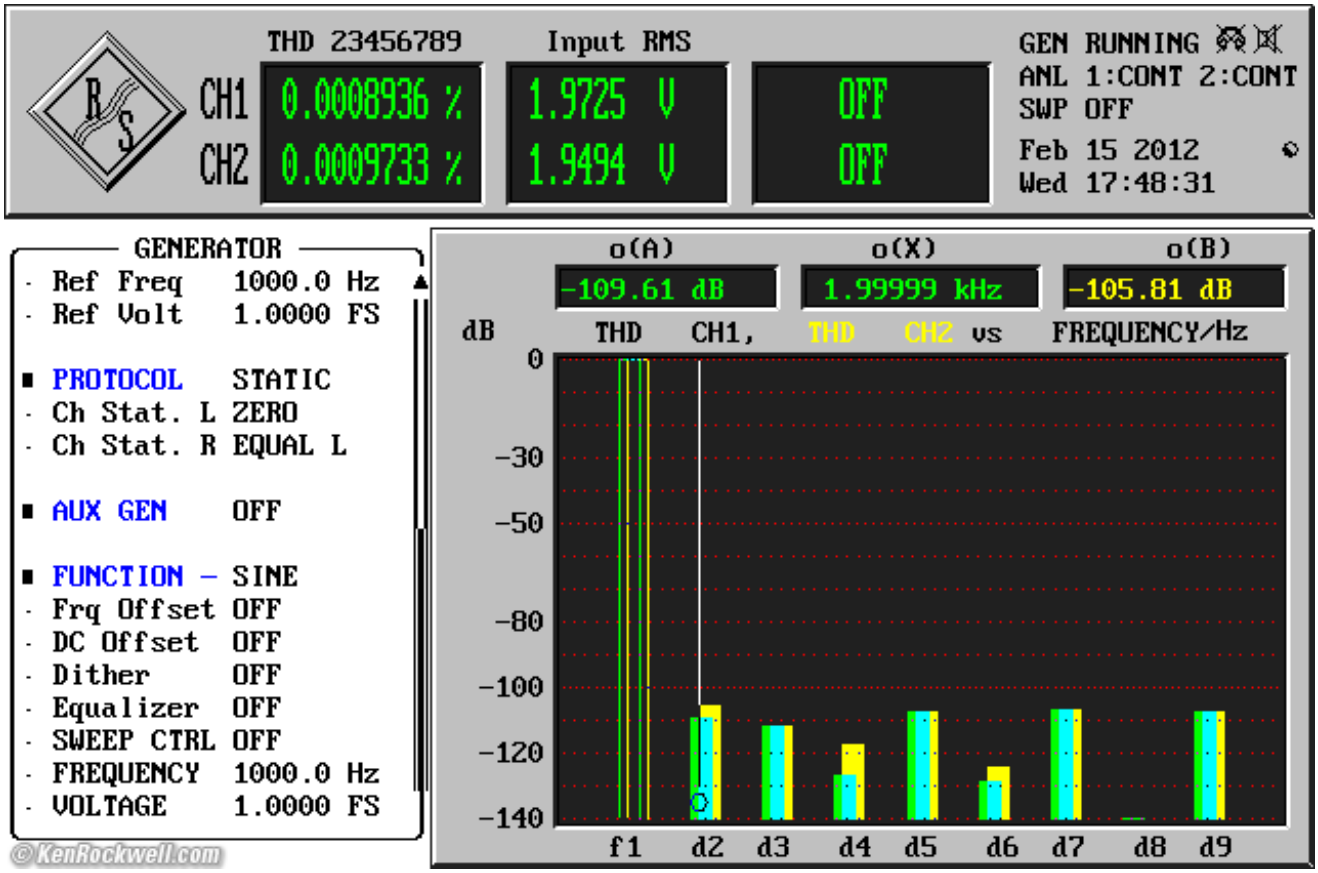
The capacitance of the included RCA cables is 550 pF, which with the 103.8 Ω source impedance, is what's causing this 0.11 dB drop at 20 kHz.

The wiggles at a few hundred cps seemed like noise, but I couldn't get them to go away. As they're only a couple of hundredths of a dB, ignore them.

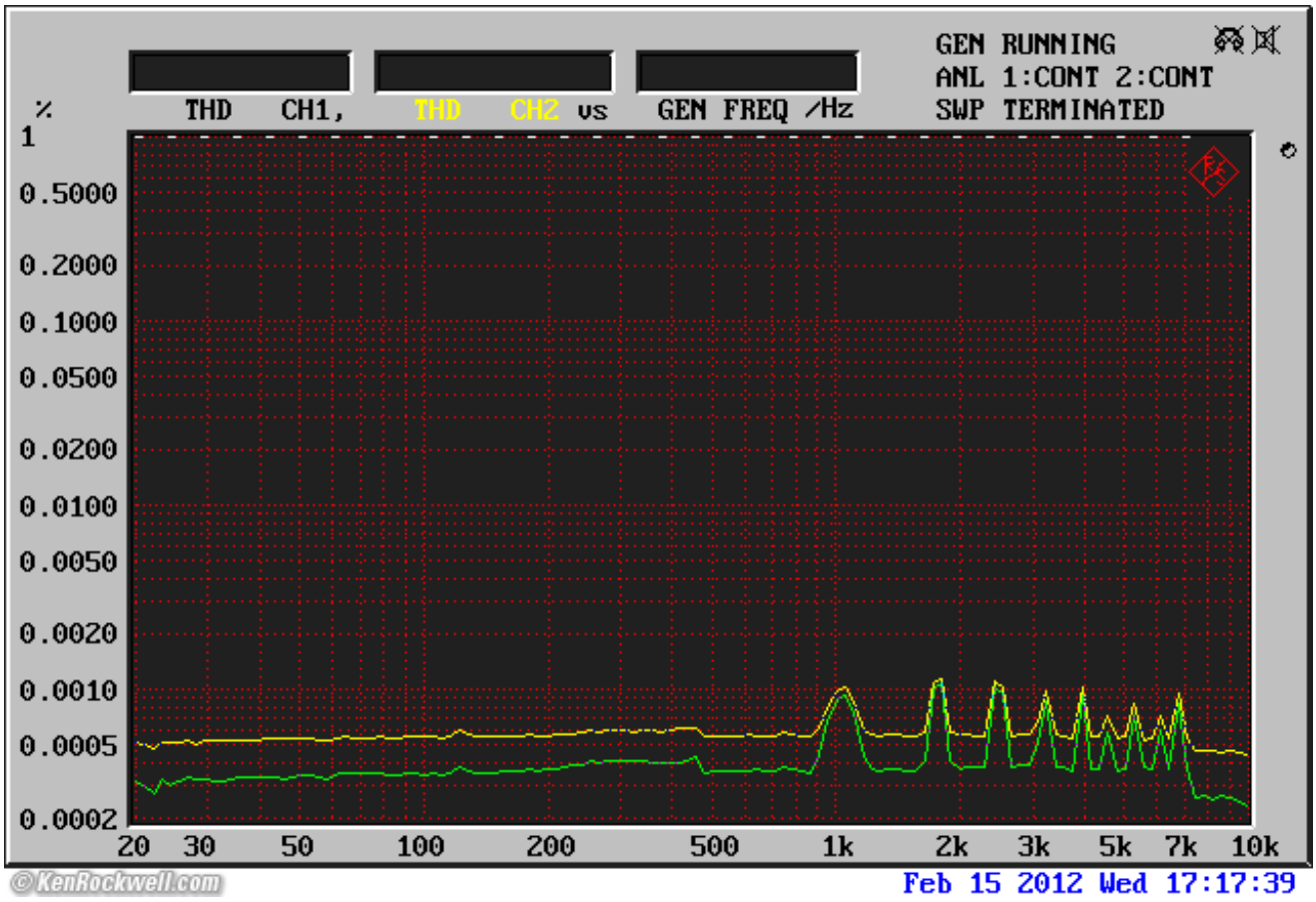
Deemphasis

Playing files from CDs with preemphasis in iTunes played with deemphasis.

THD: 0.0009% (-101 dB) measurements top

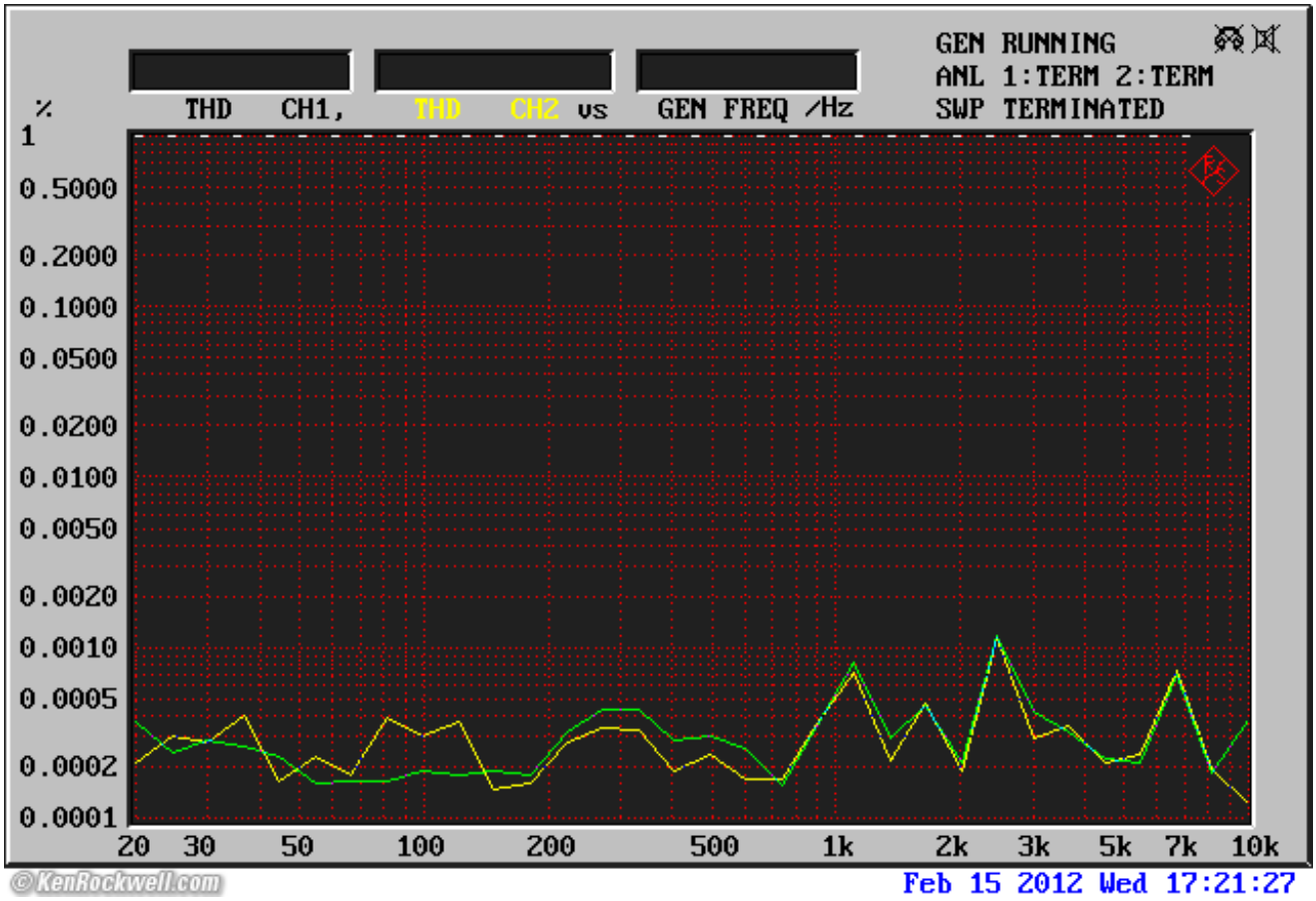


Harmonic content at 0 dBFS and 2V output, 24-bit/44.1 input. (R&S UPL.)



THD at 0 dBFS and 2V output, 24-bit/44.1 input, 22 kHz bandwidth. (R&S UPL.)

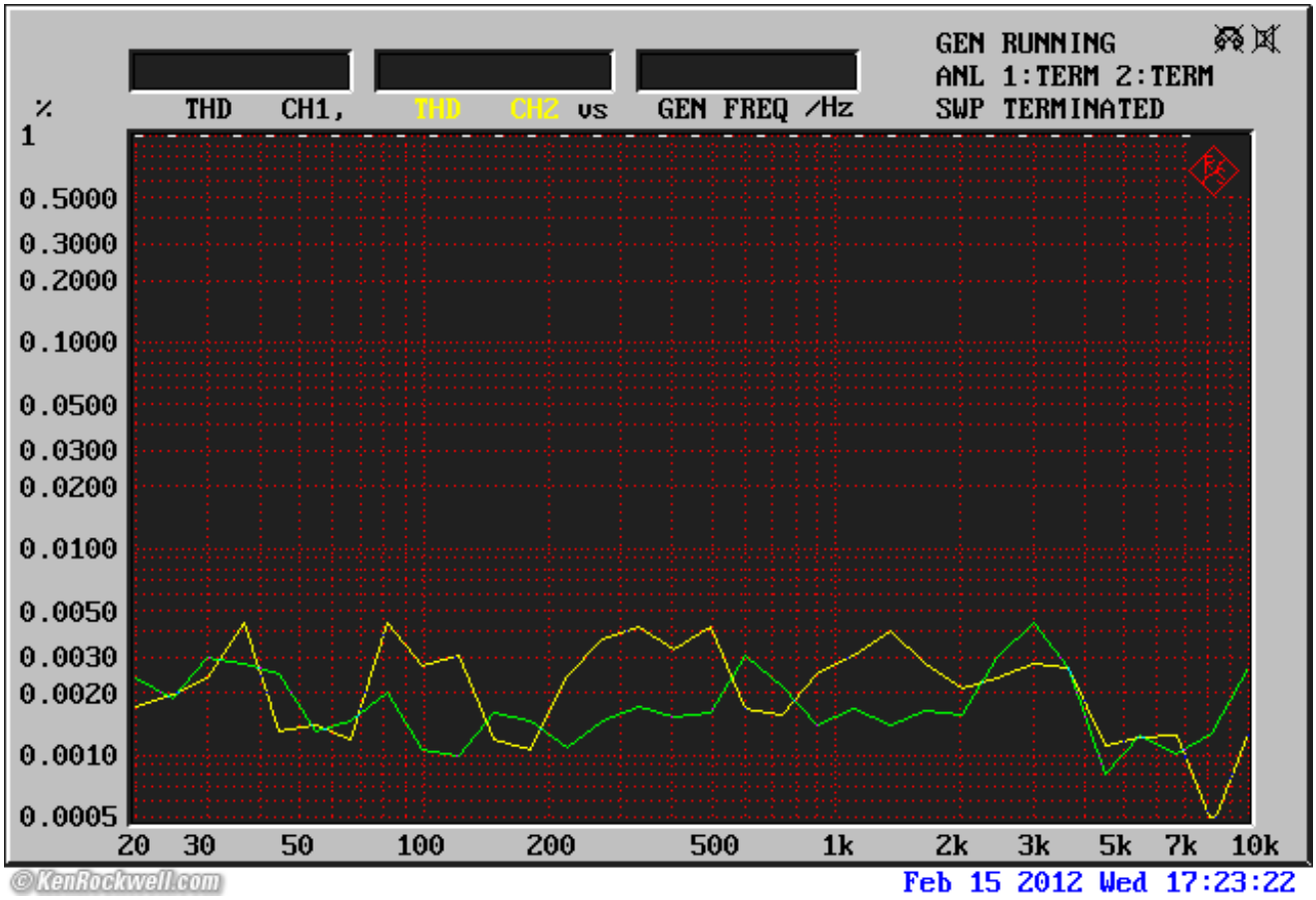
Hmm, weird to see a series of little bumps at 1 kc and above, but as none of then exceed 0.001%, who cares? The rest of the curve is below what most ordinary analyzers can measure.



THD with level control set to -20 dB, 0 dBFS 24-bit/44.1 input, 200mV output, 22 kHz bandwidth. (R&S UPL.)

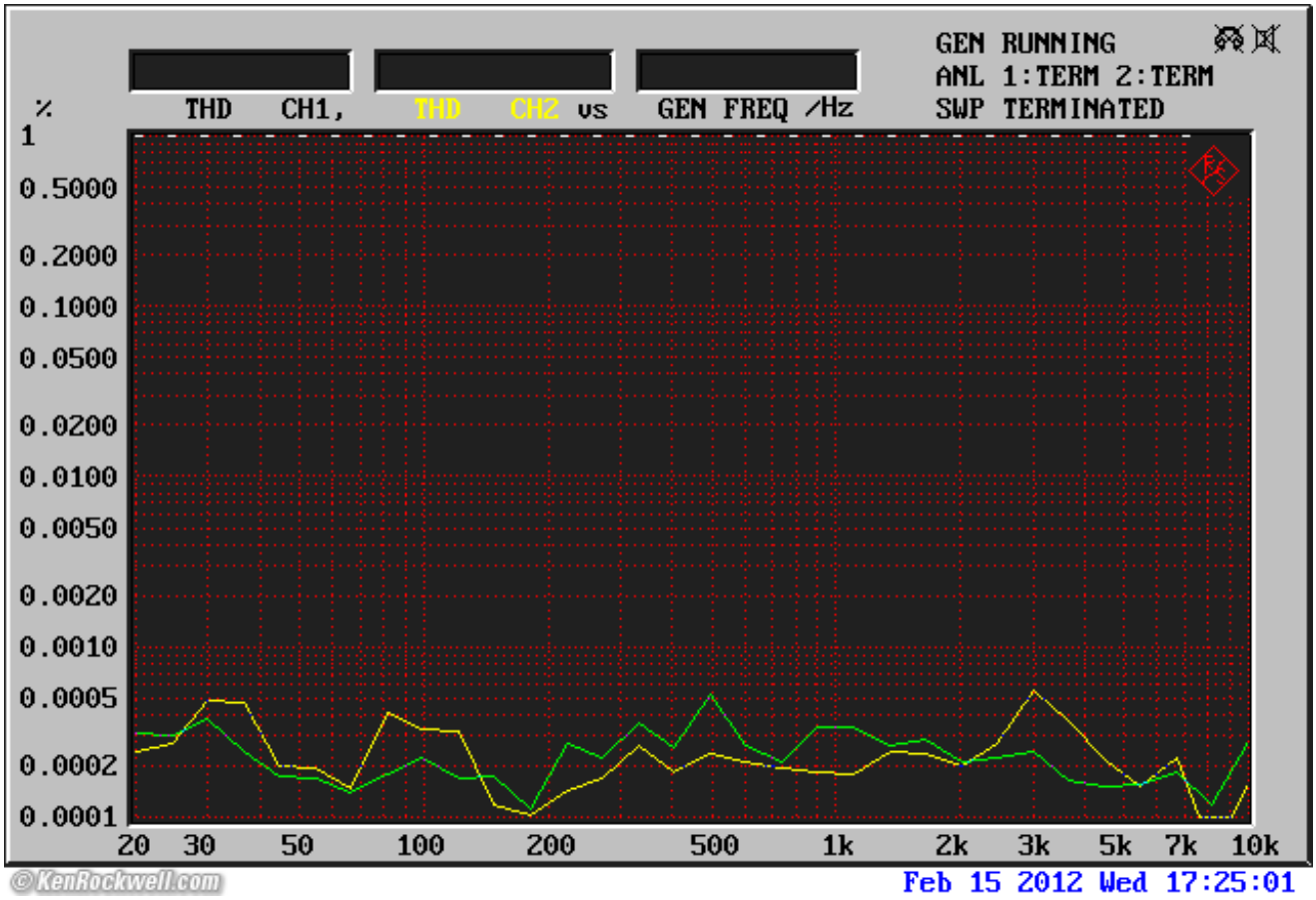
This and the following THD traces are rougher-looking because I didn't have all day to wait around for traces to average.

This is extraordinary to see distortion measure this low with the level control set to - 20 dB. Good job!



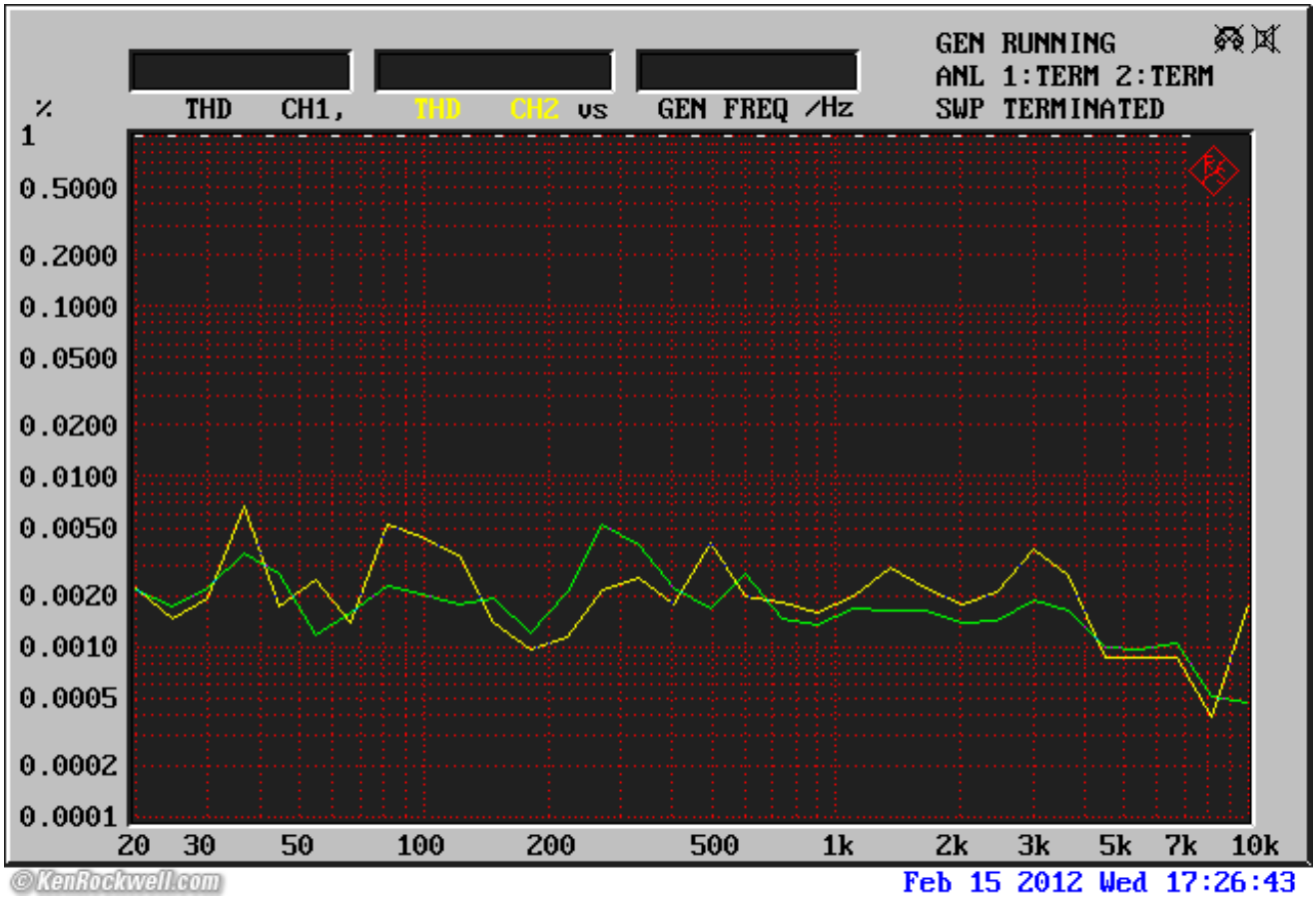
THD with level control set to -40 dB, 0 dBFS 24-bit/44.1 input, 20mV output, 22 kHz bandwidth. (R&S UPL.)

Gracious, even at - 40 dB (20 mV), it's still very, very low. Put in perspective, this curve is at about 0.00002% referred to 2 V RMS full scale.



THD with level control set to maximum, -20 dBFS undithered 24-bit/44.1 input, 200mV output, 22 kHz bandwidth. (R&S UPL.)

Oh my golly, this curve is even more impressive. Now I'm lowering the digital signal, and only using 10% of the DAC's range, and distortion is even lower than at full-scale. Astounding.

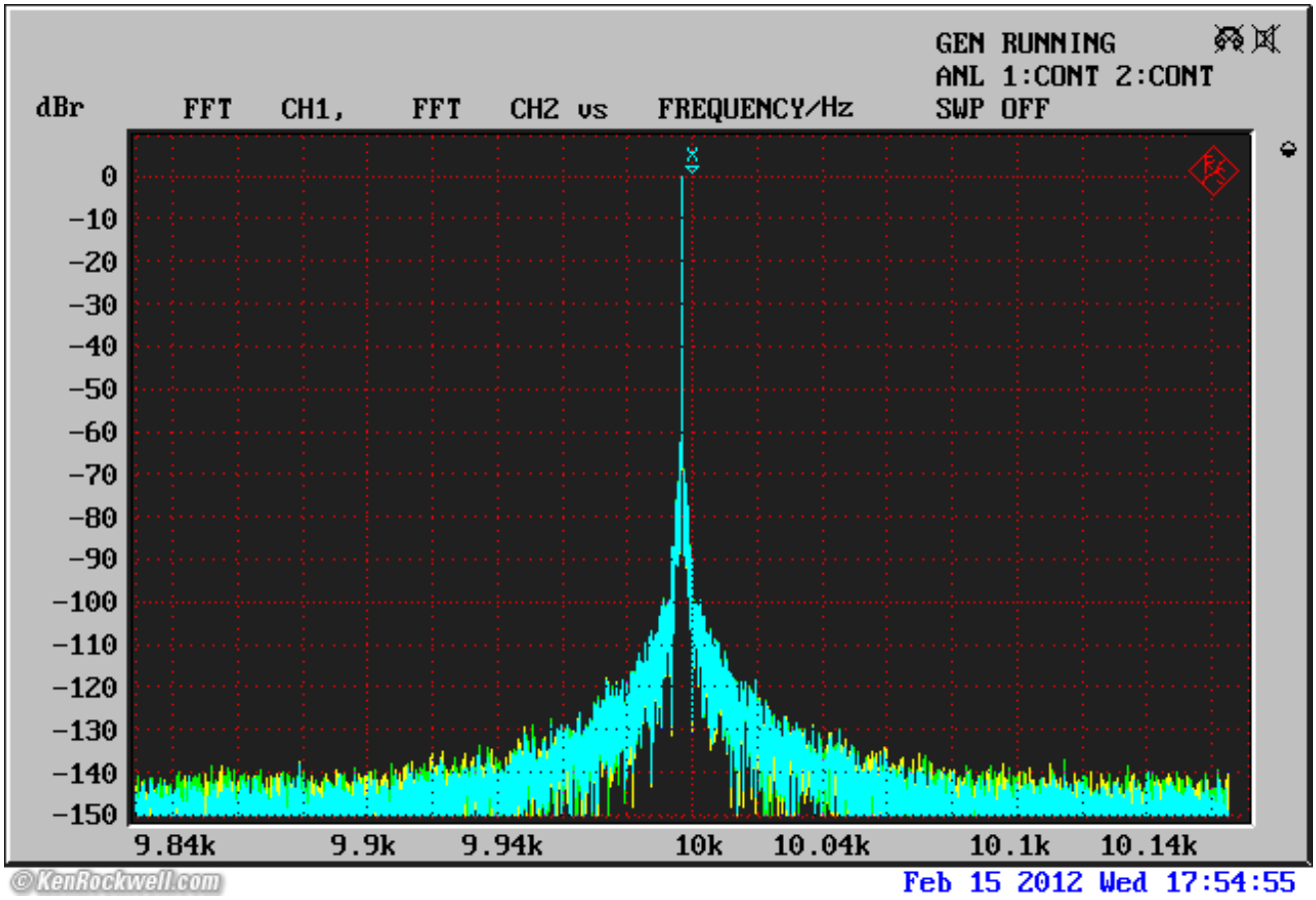


THD with level control set to maximum, -40 dBFS undithered 24-bit/44.1 input, 20mV output, 22 kHz bandwidth. (R&S UPL.)

This curve is as impressive as the -20dBFS curve. In this curve, I'm only using 1% of the DAC's range, and distortion is the same as the best power amplifiers I've tested.

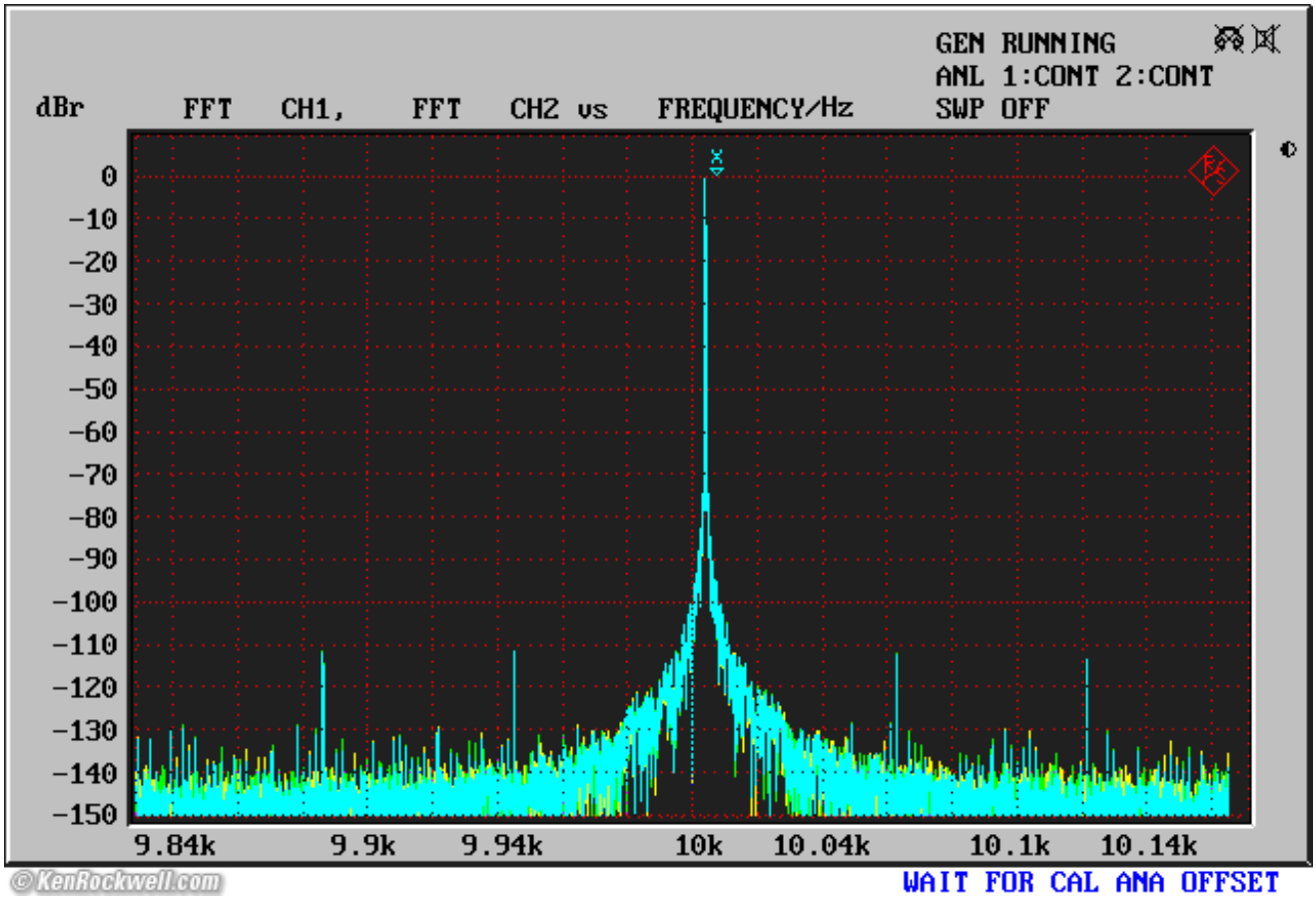
Distortion isn't an issue here; the D2 tests almost as well as if it's a piece of laboratory equipment.

Output Spectra measurements top



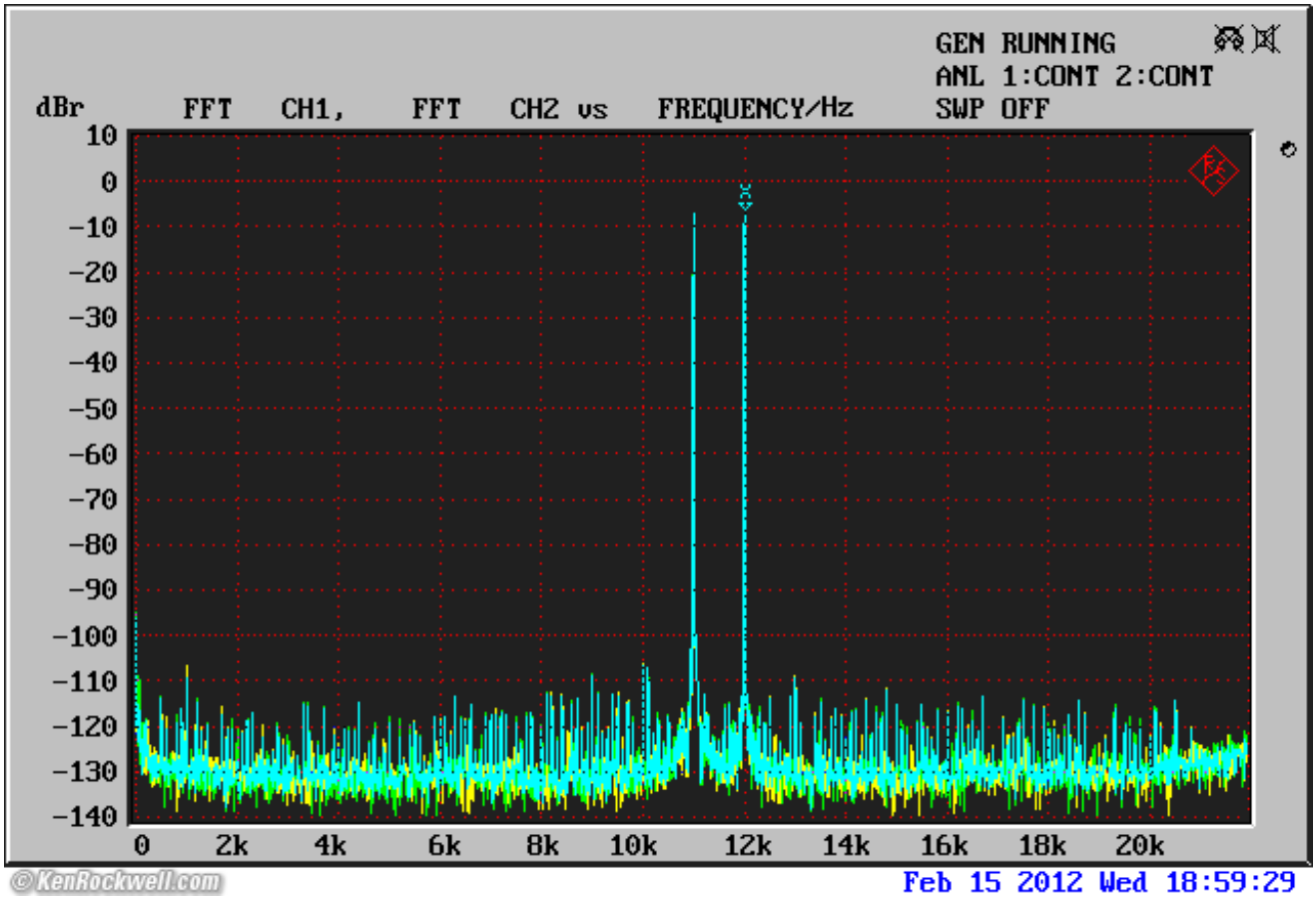
TOSLINK input, 10 kHz at 0 dBFS 44.1k/24-bits, 2 V RMS line output.

Aha! This isn't as good as a dedicated high-end CD player like the Sony SCD-XA777ES, presumably from jitter pickup someplace along the way. Dedicated CD players have a huge advantage, as their crystal oscillators directly drive the DAC clock and control the platter speed as part of a servo loop that feeds a FIFO buffer; with external DACs, the clock signal has to be recovered from being hidden in the data itself.



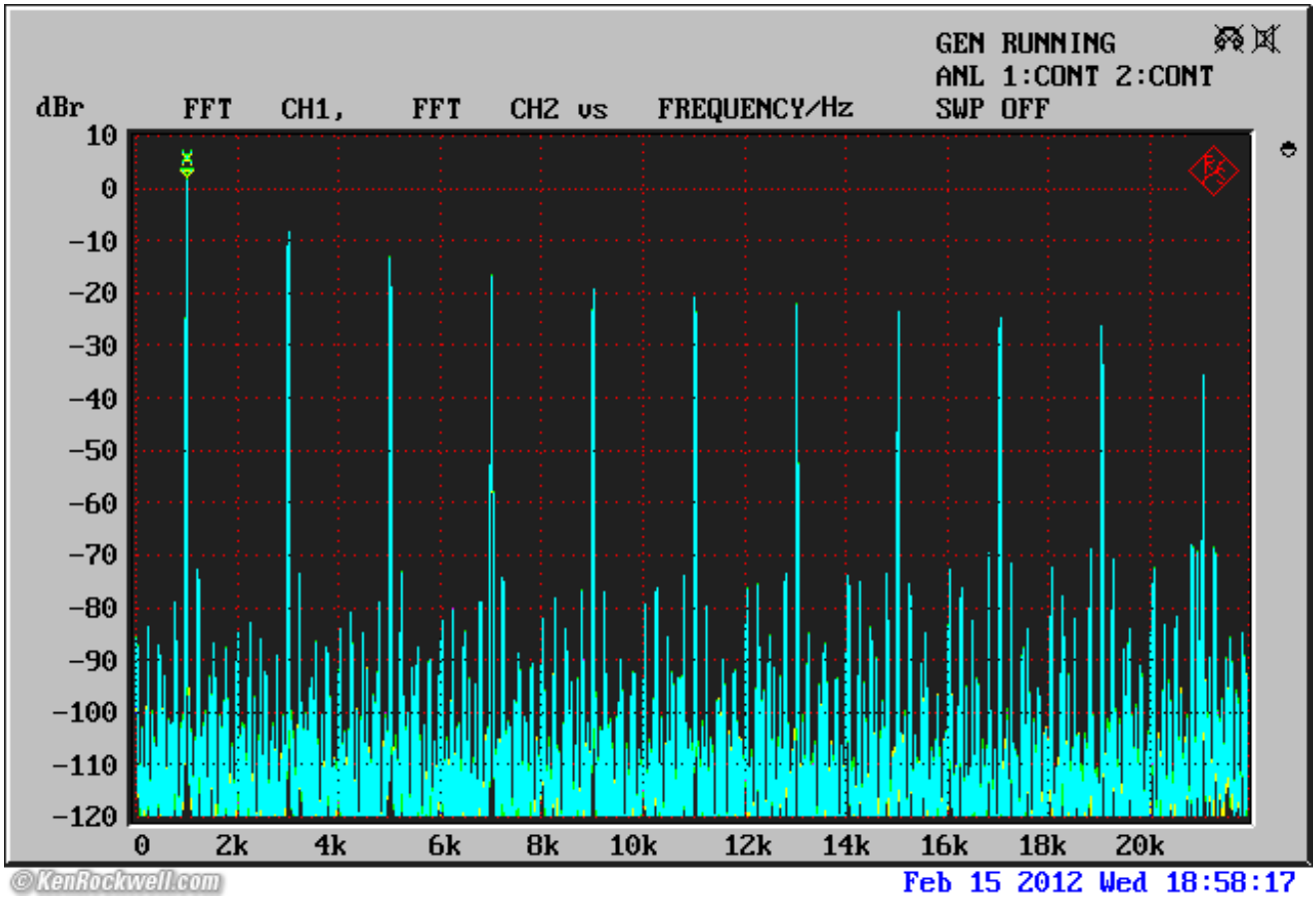
USB input, CBS CD-1 track 9 (10 kHz at 0 dBFS), ALC file played from a 2010 Mac Pro via iTunes, 2 V RMS line output.

Compare this to my other DAC and CD player tests to see the relative effects of real-world jitter. The narrower and more attenuated the skirts, the better. The Sony SCD-XA777ES is much cleaner.



USB input: audioengine D2 line output at 11 kHz and 12 kHz 1:1. (CBS CD-1 track 13, index 2, R&S UPL.)

Compare this to my other DAC and CD player tests to see the relative effects of intermodulation distortion and other noise. This audioengine playing wirelessly from iTunes playing the ALC file of the CD is dirtier than the Sony SCD-XA777ES. Note that the Sony chart is at a different vertical scale; the important part is that the largest spur from the audioengine is about -105 dBFS, while it's about -110 from the state-of-the-art Sony XA777ES.

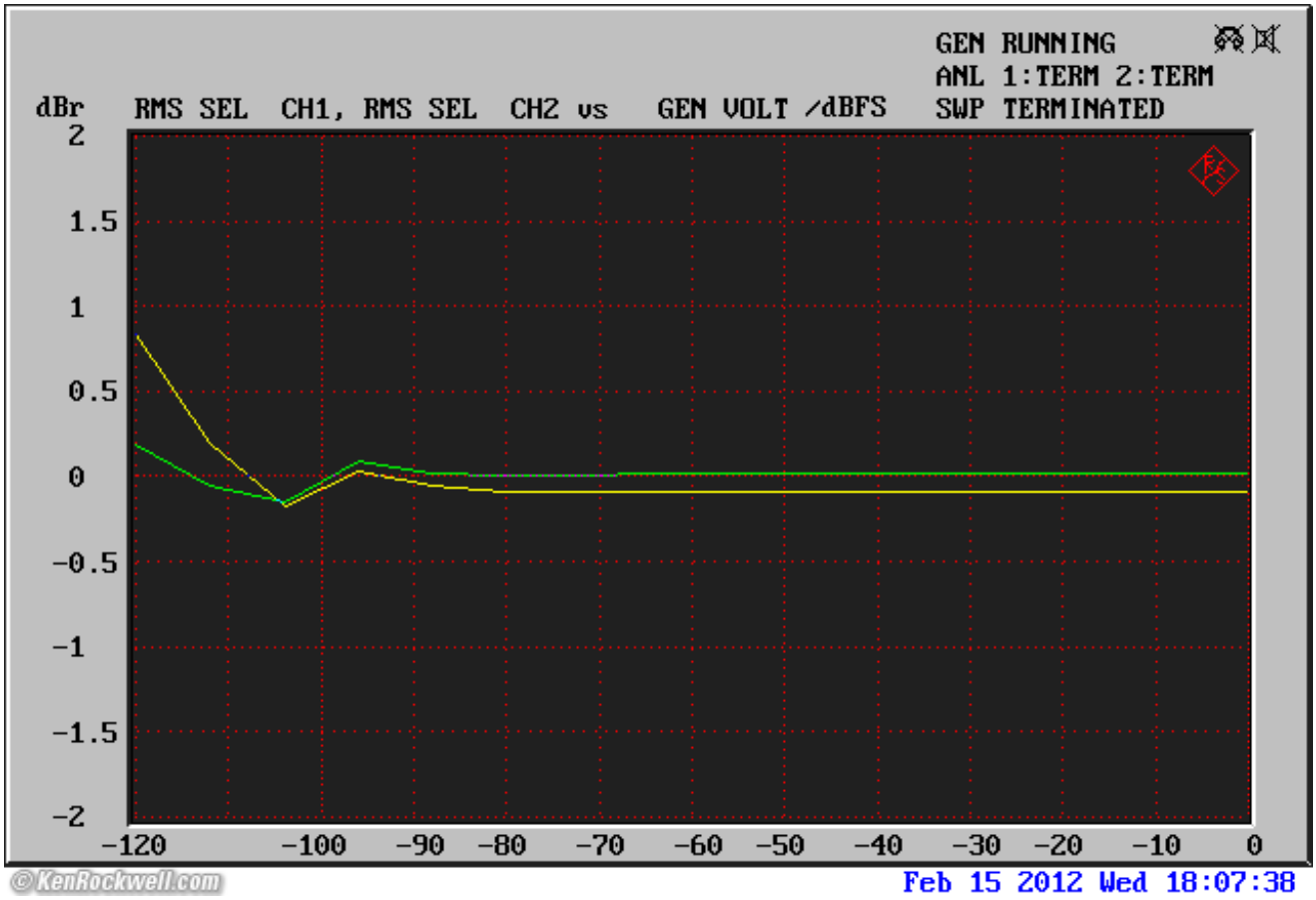


audioengine D2 line output spectrum, 1 kHz square-wave. (CBS CD-1 track 16, R&S UPL.)

The output from the Sony SCD-XA777ES is much cleaner, without all the spurs starting at -70 dB. From a 1 kHz square wave, there should be strong harmonics at every odd kHz (3 kHz, 5 kHz, 7 kHz, 9 kHz etc.) and nothing else. I didn't break out a scope, but for all I know, the audioengine like many other DACs might not have the analog or digital filter headroom to deal with the overshoots that are supposed to be there when interpolated from a difficult signal like a full-scale unfiltered square wave.

Low-Level Linearity measurements top

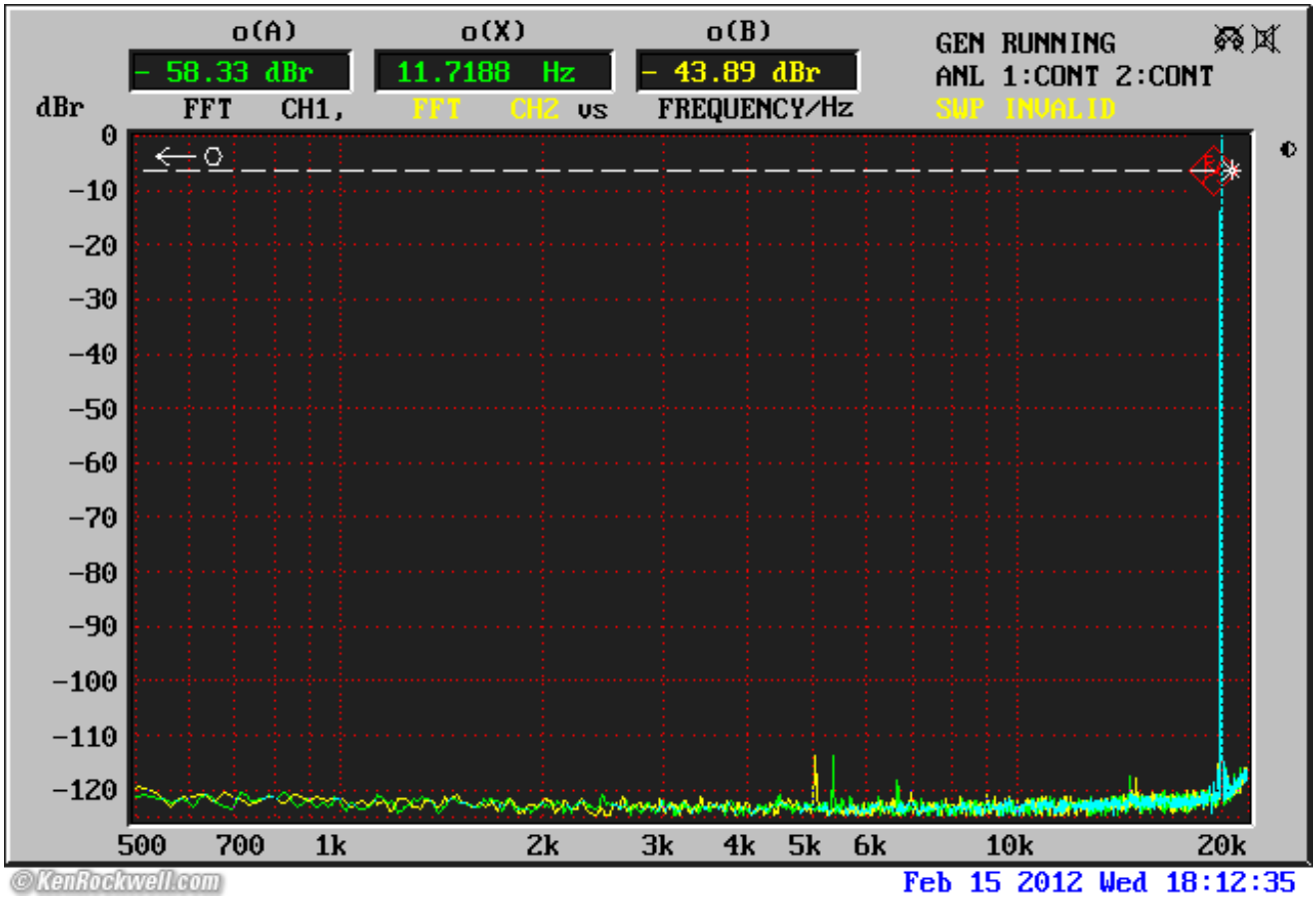
The 500 Hz dithered fade-to-noise from -60 dBFS to -120 dBFS (CBS CD-1 track 20) sounds perfect; no problems here!



Level error versus level (linearity), 1 kHz sine, 24-bit 44.1 ksps. (R&S UPL.)

The bump at -120 dBFS is probably noise. I was too lazy to narrow my tracking filter from 1% and have to wait any longer for this trace to trace.

Jitter Rejection measurements top



Output spectrum, 20 kHz FS sine, 24-bit 44.1 ksps, with 0.1 UI of jitter at 19 kHz. (R&S UPL.)

PASS!!! The audioengine D2 effectively rejects digital jitter.

Some other "audiophile" DACs I've measured that sold for triple the price (and aren't wireless) show a huge peak at - 80 dB at 1 kHz as an intermodulation product from this same jitter.

As this trace shows any engineer, the audioengine D2 is completely ignoring the jitter I'm injecting directly into the bitstream with the UPL to try to interfere with the signal.

The little blips around 5k didn't change when the jitter was removed. Ignore them.

Recommendations top

Intro Specs Performance Measurements Recommendations

At any price, the audioengine D2 is a great DAC.

For $599, you even get the option of putting its receiver right next to your amplifier to eliminate the effects of long cables. It also has an excellent volume control to let you completely bypass a preamplifier for even better sound.

Used on a desktop with a computer, it's a great way to get audio controlled easily and sent to your monitors.