JOHN ATKINSON

Weiss Engineering Helios

D/A PROCESSOR



hen standalone digital/analog processors made an appearance a quartercentury ago, they were limited to the CD medium's 16 bits of resolution—at best. These days, almost every DAC can process at least 24 bits, and many models offer between 20 and 21 bits of real-world resolution. Modern models from Benchmark, dCS, MBL, Merging, Mola Mola,

Okto, and Weiss illustrate not just the skill of the circuit designer but also that of the engineer who laid out the printed circuit board. One of the first digital processors I encountered that offered 21 bits of resolution was the Weiss DAC202, which Erick Lichte reviewed in January 2012.¹ Subsequent processors from this Swiss company have consistently performed well, not just on the test bench but also in the listening room.

I didn't quite get up to dance in the first movement of the "Christen, atzet diesen Tag" cantata, but it was a close-run thing.

This was particularly true of the Weiss DAC502 I reviewed in the August 2020 issue. I concluded that review by writing, "The Weiss DAC502 retrieves more information from the digits than any other DAC I have au-

ditioned, with the possible exceptions of the Chord DAVE and dCS Vivaldi, both of which are long gone from my system and neither of which has either a headphone output or DSP functions." Notably, that superb transparency to the recorded data was not accompa-

1 See stereophile.com/content/weiss-dac202-firewire-da-converter.

2 See stereophile.com/content/weiss-engineering-dac502-da-processor and .com/content/weiss-engineering-dac502-da-processor-jason-victor-serinus-october-2020.

SPECIFICATIONS

Description Roon-Ready, two-channel, digital/analog converter with volume control, color LCD touchscreen, DSP, and remote control. Digital inputs: AES3 on XLR, S/PDIF on RCA jack and TosLink optical connector, USB Type A, USB Type B, Ethernet on RJ45 jack. PCM sample rates supported: 44.1kHz, 48kHz, 88.2kHz, 96kHz, 176.4kHz, 192kHz, 352.8kHz, and 384kHz, plus DSD64 and DSD128 (not all frequencies are supported with all inputs). Maximum input word length: 24 or 32 bits depending on input. Analog outputs: 1 pair balanced XLR, 1 pair single-ended RCA, all short circuit-proof. Maximum

RMS output voltage at 0dBFS: switchable, 16.3V (+26.5dBu), 10.2V (+22.5dBu), 6.5V (+18.5dBu), 4.1V (+14.5dBu), 2.6V (+10.5dBu), 1.6V (+4.5dBu), 1.0V (+2.5dBu), 650mV (–1.5dBu), balanced; half these voltages, unbalanced. Frequency response: 0Hz- $20kHz \pm 0.25dB$, Fs = 44.1kHz; 0Hz-20kHz ±0.25dB, 0Hz-40kHz ± 1 dB, Fs = 88.2 kHz; 0Hz-20kHz ±0.25dB, 0Hz-40kHz ±1dB, 0Hz- $80kHz \pm 4dB$, Fs = 176.4 kHz. THD+N: -116dBr (0.00016%) at -3dBFS input level, -128dBr (0.000056%) at -40dBFS input level; -128dBr (0.000056%) at -70dBFS input level. Linearity: <±0.2dB deviation from ideal, 0dBFS to -120dBFS input level.

Spurious components (including harmonics): at 0dBFS input level, maximum output level, 1kHz, all components <-120dB; at 0dBFS input level, maximum output level, 4kHz, all components <-115dB. Channel separation: >110dB, 20Hz-20kHz. Interchannel phase response: ±0.1°, 20Hz-20kHz, ±0.25° 20Hz-80kHz. Power consumption: 25VA max in use, 2.2VA max in standby.

Dimensions 17.7" (450mm)
W by 11.8" (300mm) D by 2.9"
(74mm) H (including feet).
Weight: 20.7lb (9.4kg).
Finish Silver or black anodized aluminum.

Serial number of unit reviewed 0010, "Made in

Switzerland." Firmware version: v2.7.0 revision r3161.

Price \$21,995. Optional headphone adapter cables cost \$495. Approximate number of dealers: 30 in US, 10 in Canada. Warranty: three years from original purchase date.

Manufacturer

Weiss Engineering Ltd.,
Florastrasse 42, 8610 Uster,
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Email: weiss@weiss.ch.
Web: weiss.ch.
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Bluebird Music Ltd.,
1100 Military Rd.,
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Tel: (416) 638-8207.
Web: bluebirdmusic.com.



nied by glare or exaggerated treble detail. "To resort to an audio reviewer cliché," I wrote, "the DAC502 cleaned the window into the recorded soundstage to an impressive extent."

The DAC502 is currently priced at \$10,995. The latest Weiss DAC, the Helios, which Jason Victor Serinus reported on at the 2023 High-End Munich show,³ is considerably more expensive, at \$21,995. Intrigued to find out what the additional dollars get the owner, I asked for a review sample.

The Helios

On the face of it, the Roon Ready Helios looks identical to the DAC502: a slim, anodized aluminum chassis, though now with a stainless steel internal frame. There is still a control knob at the far right of the front panel; a four-color touchscreen next to it; AES3, optical and coaxial S/PDIF, USB Types A and B, and Ethernet digital inputs; and balanced and single-ended analog outputs. But on closer inspection, the Helios lacks the earlier processor's headphone jack. It can still be used with headphones, however: Using optional adapter cables (\$495), the Helios can drive headphones from its balanced and unbalanced outputs. This is made possible by Weiss's new, proprietary OP2-BP discrete operational ampli-

fiers, used four per channel in the analog output stage. The output mode can be switched between Loudspeaker and Headphone, and the DSP options now include settings for use with headphones.

In addition to the new op-amps, the Helios offers an upgraded digital-to-analog stage. While it uses the same eight-channel, 32-bit ESS Sabre ES9038PRO HyperStream II D/A converter chip, the Helios uses four of the DAC channels operated in parallel for each analog output. The DAC502 uses two DAC channels in parallel for the speaker feed and two for the headphone feed. The ES9038PRO will handle PCM data sampled up to 768kHz and native DSD1024 data; Weiss says that the Helios uses a "high-precision/low jitter clock generator for ultra-stable clocking of the D/A converter section."

The Helios offers the same digital signal processing (DSP) functions as the DAC502 (although the headphone-related DSP functions had not yet been implemented when I auditioned the 502), realized with an Analog Devices SHARC chip. The following DSP algorithms are implemented: Room EQ, which can apply high-shelf and peaking/notch filters to deal with low-frequency room modes; Creative EQ, which applies low, mid, and high boost/cut; DeEsser,

3 See stereophile.com/content/new-weiss-helios-dac.

MEASUREMENTS

measured the Weiss Helios with my Audio Precision SYS2722,¹ repeating some of the tests with the higher-resolution APx555. All the measurements were performed with the Helios's DSP bypassed. Apple's USB Prober utility identified the Helios as "Helios" from "Weiss_Engineering_Ltd." with the serial number string "0.0.1." The USB port operated in the optimal isochronous asynchro-

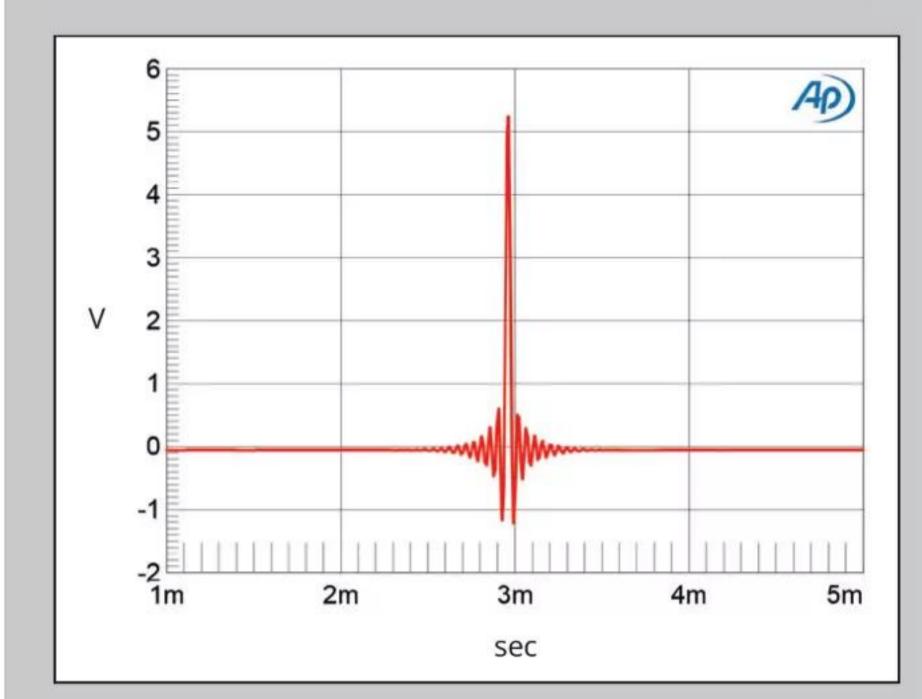


Fig.1 Weiss Helios, impulse response (one sample at 0dBFS, 44.1kHz sampling, 4ms time window).

nous mode, and Apple's AudioMIDI utility revealed that the Helios accepted 32-bit integer data sampled at all rates from 32kHz to 384kHz. The AES3 and coaxial S/PDIF inputs accepted data sampled at rates up to 192kHz; the TosLink input was restricted to sample rates of 96kHz and lower.

With the balanced output mode set to Loudspeaker, the Helios's maximum output level at 1kHz feeding 100k ohms

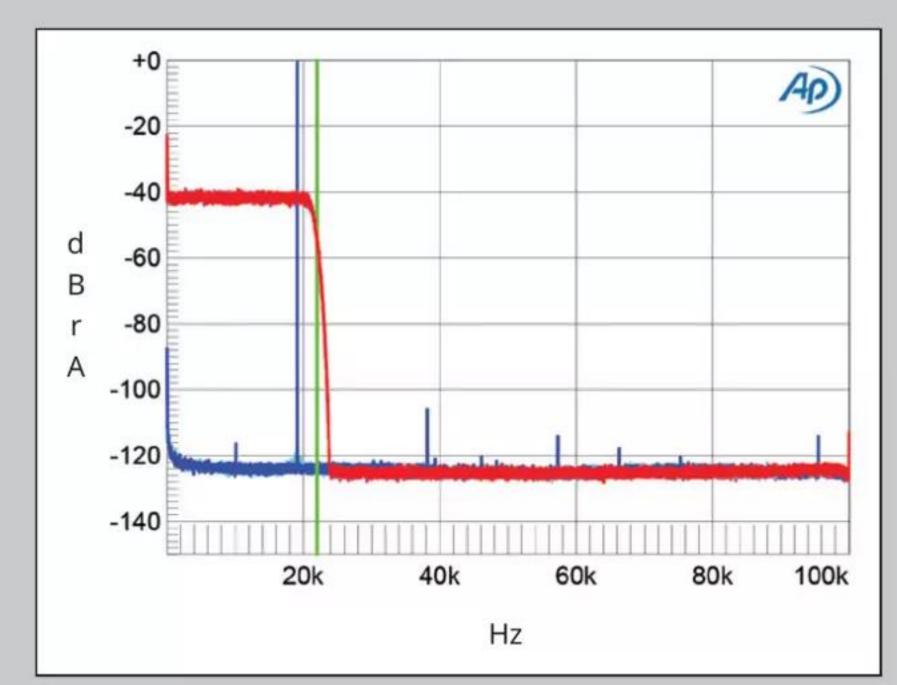


Fig.2 Weiss Helios, wideband spectrum of white noise at –4dBFS (left channel red, right magenta) and 19.1kHz tone at 0dBFS (left blue, right cyan) into 100k ohms with data sampled at 44.1kHz (20dB/vertical div.).

was 16.4V with the level set to "0dB"; 10.3V set to "-4dB"; 6.5V set to "-8dB"; 4.1V set to "-12dB"; 2.6V set to "-16dB"; 1.63V set to "-20dB"; 1.03V set to "-24dB"; and 648mV set to "-28dB." Each nominal reduction of 4dB in the output level reduced the actual level by 4dB. As expected, the maximum levels from the unbalanced outputs were

1 See stereophile.com/content/measurements-maps-precision.

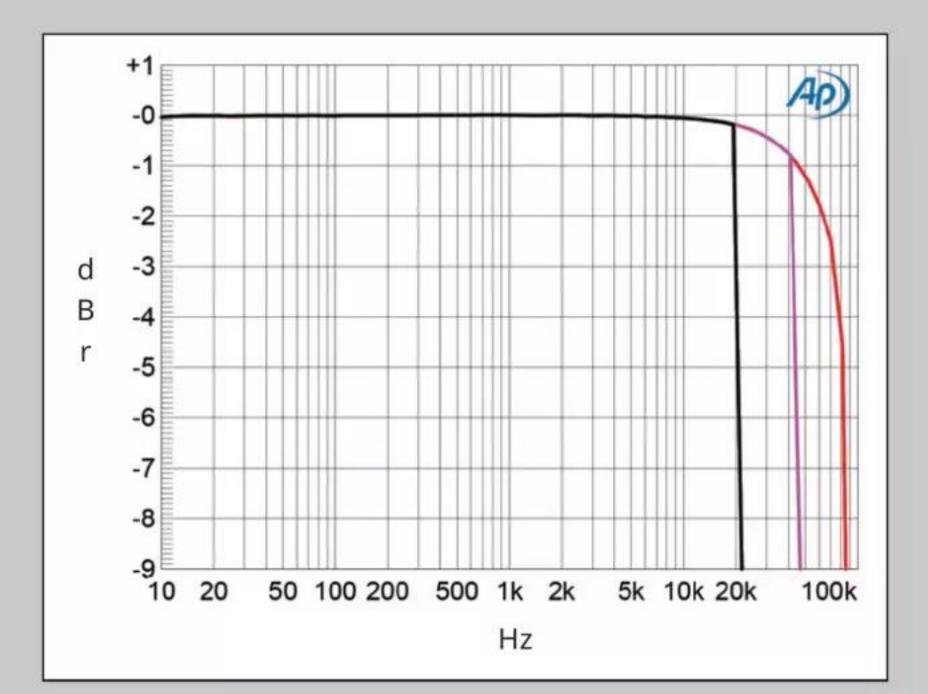


Fig.3 Weiss Helios, frequency response at –12dBFS into 100k ohms with data sampled at: 44.1kHz (left channel green, right gray), 96kHz (left cyan, right magenta), and 192kHz (left blue, right red) (1dB/vertical div.).

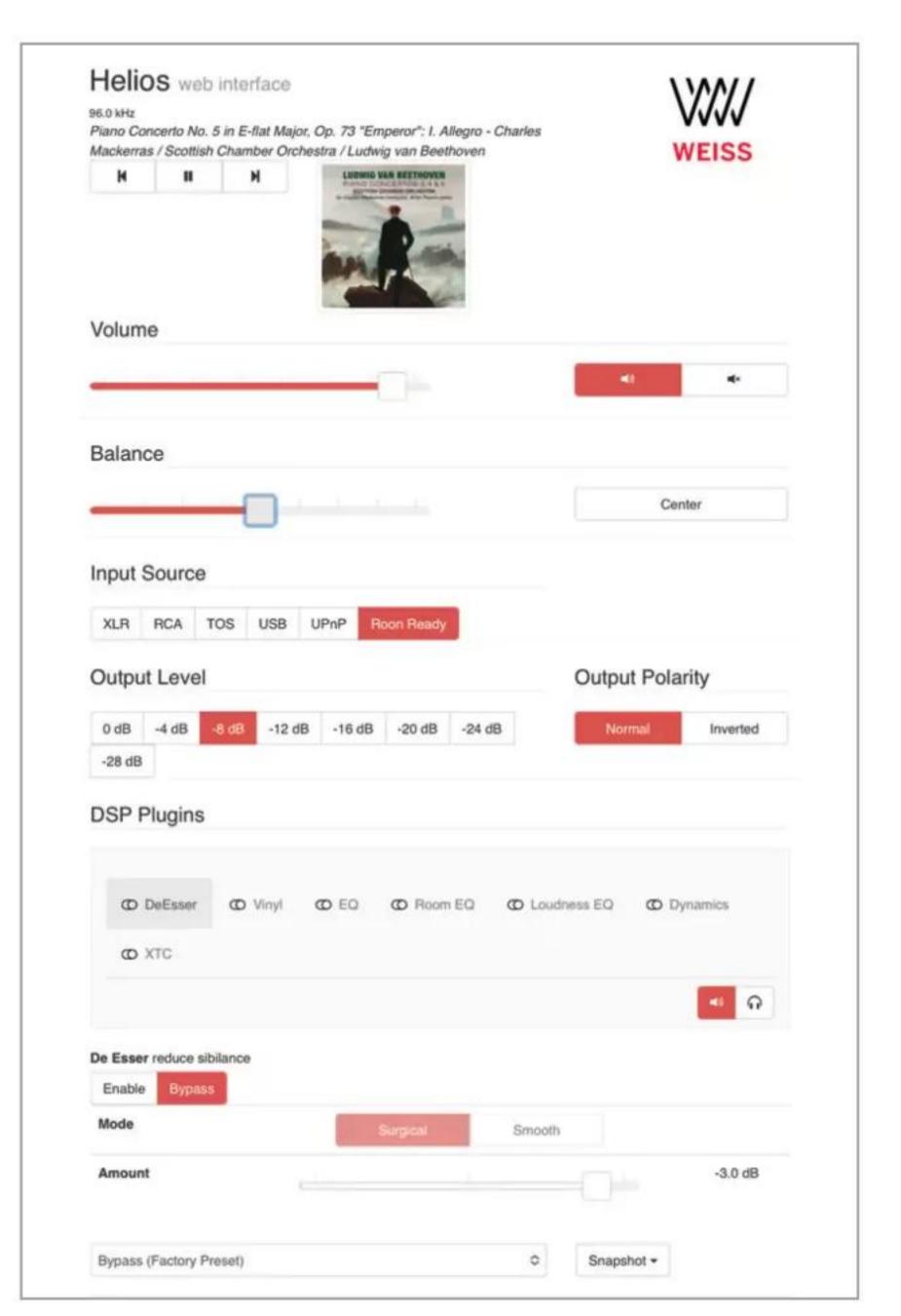
which removes overly bright sibilance from human voices; Dynamic Adaptation, a "party mode" that normalizes loudness; Vinyl Emulation, said to provide "that special sonic character of a record player based playback chain"; Crosstalk Cancellation (XTC), which allows binaural recordings to be correctly played back on loudspeakers; and Loudness Control, which equalizes the output to compensate for the ear-brain's differing frequency sensitivity at different listening volumes. Once you have chosen the parameters for each of these functions, the settings can be saved as a snapshot and recalled at the touch of a button on the control webpage or the metal remote control.

Setup

Like the DAC502, the Helios can be controlled in three ways: with the touchscreen and rotary control; the aforementioned metal IR remote control; or with a web browser by entering the address https:// [helios-serial-number].local. The web and front-panel interfaces allow setting the

volume, balance, mute, and polarity inversion controls, those DSP settings, and a choice of maximum output levels: "0dB," "-4dB," "-8dB," "-12dB," "-16dB," "-20dB," "-24dB," and "-28dB." I set the processor's output level to "-12dB," equivalent to a maximum level of 4.1V balanced and 2.05V unbalanced.

Once I had connected the Helios to my network and opened the local webpage, I was able to check for any firmware updates. ("FW



is up to date," it told me; the review sample was running v2.7.0 firmware, revision r3161, dated "2023-02-14.") The Roon app processor recognized the processor as "Weiss Helios," allowing Roon to control its volume. The Roon volume setting was immediately reflected on the front-panel display and mirrored in the local webpage. The webpage duplicated Roon's transport controls and displayed the artwork of any album selected with Roon.

I noted something unusual with Roon. With PCM data sampled up to 192kHz, clicking on "Weiss processor Synchronization" in Roon's "Signal path" window gave the following message: "The audio is being converted to a 195.312kHz sampling frequency for optimal signal quality and to help reduce any jitter related effects." The same was true for DSD64 and DSD128 data, both of which the Helios first converted to 176.4kHz PCM before resampling.

Listening

I started my auditioning with the Q

Acoustics 5040 loudspeakers I reviewed in the January 2024 issue, driven by a pair of Parasound Halo JC 1+ monoblocks. After the Q Acoustics speakers had been returned, I used my KEF LS50 minimonitors, then replaced the Parasounds with the Audio Research I/50 integrated amplifier I wrote about in the February 2024 issue. I subsequently replaced the Audio Research with my NAD M10 integrated and the KEFs with Golden Ear BRXes. I ended the audi-

measurements, continued

half those from the balanced outputs.
Switching the output to Headphone reduced all the maximum levels by 12dB.
With its polarity button set to Normal, the Helios preserved absolute polarity (ie, was noninverting) from all of its outputs.
The balanced output impedance was 93.5 ohms at all audio frequencies in both Loudspeaker and Headphone modes; the unbalanced output impedance was 47 ohms in both modes.

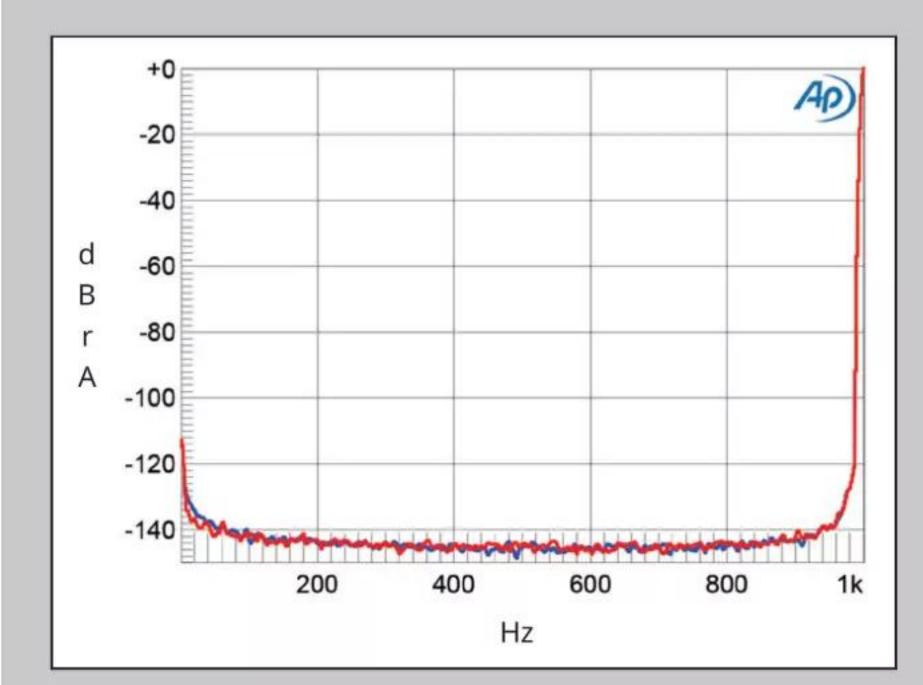


Fig.4 Weiss Helios, spectrum of 1kHz sinewave, DC-1kHz, at 0dBFS with volume control set to the maximum (left channel blue, right red; linear frequency scale).

Fig.1 shows the Helios's impulse response with 44.1kHz data. It is typical of a conventional linear-phase filter with a symmetrical ringing before and after the single full-scale sample. This filter's ultrasonic rolloff (fig.2, magenta and red traces) reaches full stop-band attenuation at 24kHz with complete suppression of the aliased image at 25kHz of a full-scale tone at 19.1kHz (cyan, blue). The harmonics associated with the 19.1kHz tone all

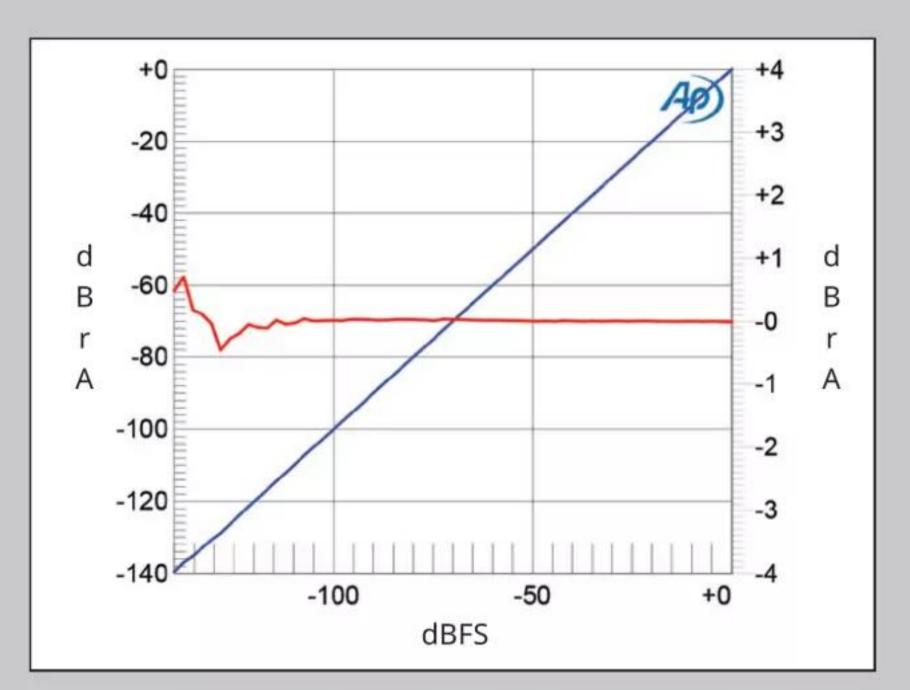


Fig.5 Weiss Helios, left channel, 1kHz output level vs 24-bit data level in dBFS (blue, 20dB/vertical div.); linearity error (red, 2dB/small vertical div.).

lie below –107dB. Fig.3 shows the Helios's frequency response with data sampled at 44.1, 96, and 192kHz. The response with all three sample rates is down by just 0.1dB at the top of the audioband with then a sharp rolloff just below half of the two lower sample rates. The response with 192kHz data continues the relatively gentle ultrasonic rolloff, reaching –3dB at 71kHz.

Channel separation was superb, at

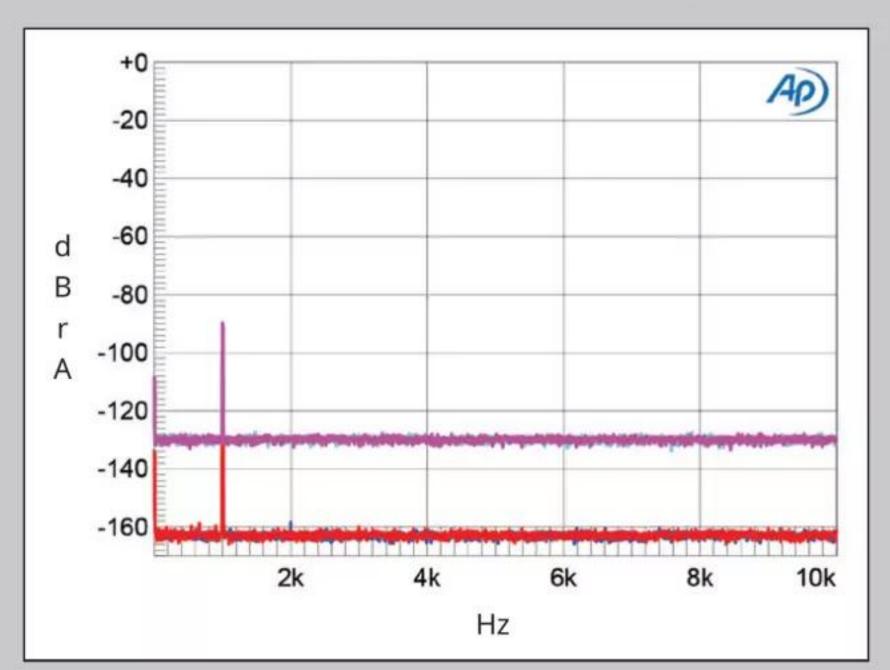


Fig.6 Weiss Helios, spectrum with noise and spuriae of dithered 1kHz tone at –90dBFS with: 16-bit data (left channel cyan, right magenta), 24-bit data (left blue, right red) (20dB/vertical div.).

tioning by returning to the Parasound monoblocks. I used Roon for all critical listening.

I reported on the effect of the DSP functions in my DAC502 review, so I won't repeat my findings here. Like the earlier Weiss DAC, the Helios's parametric EQ was useful in boosting and extending the low frequencies of the speakers I used for my auditioning. (I used a Low Shelf filter set to give a 3dB boost below 100Hz with a Q of 1.40.)

Throughout the changes of amplifier and loudspeakers, the Helios echoed the DAC502's extraordinary clarity but with an enhanced sense of involvement with the music. I listened to the recordings I had used for my DAC502 review—both my own and those recorded by other engineers—with the Helios. It is fair to note that I hadn't had the earlier processor in my system for more than three years, but if I had to swear on the very first issue of *Stereophile*, this impression was consistent throughout my auditioning of the Helios.

The clarity of the soundstage was just as superb, as I remember from my time with the DAC502. This was particularly evident on a new album of jazz duets produced by erstwhile *Stereophile* writer Michael Fremer: *Rufus Reid Presents Caelan Cardello* (16/44.1 WAV files, Liam Records), one of the last albums mastered by Bob Ludwig before he retired. Reid's round-toned double bass and Cardello's Fazioli piano were palpably present in the rather dry club acoustic, the instruments superbly well-defined in both space and tonal balance.

As I was finishing writing this review a few days before Christmas, I finished my listening first with the Dunedin Consort's "Hodie Christus natus est a 8," from *Magnificat* (24/192 ALAC, Linn Records). The sparse arrangement was laid meticulously clear by the Helios, each singer presented stably in the stereo image. I was intending to audition just this one track, but I ended up listening to the entire album. I didn't quite get up to dance in the first

movement of the "Christen, atzet diesen Tag" cantata, but it was a close-run thing.

Magnificat was followed by Sinéad O'Connor's "Silent Night (Long Version)" (16/44.1 FLAC, Chrysalis/Qobuz). O'Connor's vocals floated satisfyingly free in front of Peter Gabriel's synthesizer wash, though, peculiarly, her echoed sibilants were thrown to the far left and right of the soundstage. The Helios was allowing me to be aware of something I had never noticed before—that detail-retrieval thing!

A comparison

I have been using the MBL Noble Line N31 CD player/DAC as my reference digital source since I reviewed its Roon Ready version in December 2020.⁴ At \$19,980 with its optional Roon Ready module, the N31 is priced comparably to the Helios.⁵ The MBL's maximum balanced output level at 1kHz was 4.15V, which is almost identical to the Weiss's 4.1V when set to "-12dB." Even so, I matched levels to within 0.1dB using the 1kHz warble tone from my *Editor's Choice* CD (16/44.1 ALAC, STPH016-2; no longer available). I then compared the two processors' presentations of my recording of the Jerome Harris Quintet's *Rendezvous* album (16/44.1 ALAC files, STPH013-2⁶).

The N31 offers a choice of reconstruction filters; the minimumphase filter offers an optimal balance between the presentation of detail and listenability, particularly with CD-resolution files like *Rendezvous*. With this filter, Jerome Harris's soft-toned acoustic bass guitar purred as expected with the MBL processor, and

measurements, continued

>122dB in both directions below 3kHz, decreasing to a still-superb 113dB at 20kHz. Fig.4 shows the spectrum of the Helios's low-frequency noisefloor as it drove a full-scale 1kHz tone with the volume control set to its maximum and the level set to "0dB." The level of the random noise is extremely low, and there are no AC supply-related spuriae present. Reducing the maximum level didn't increase the level of the noisefloor.

The red trace in fig.5 plots the error in

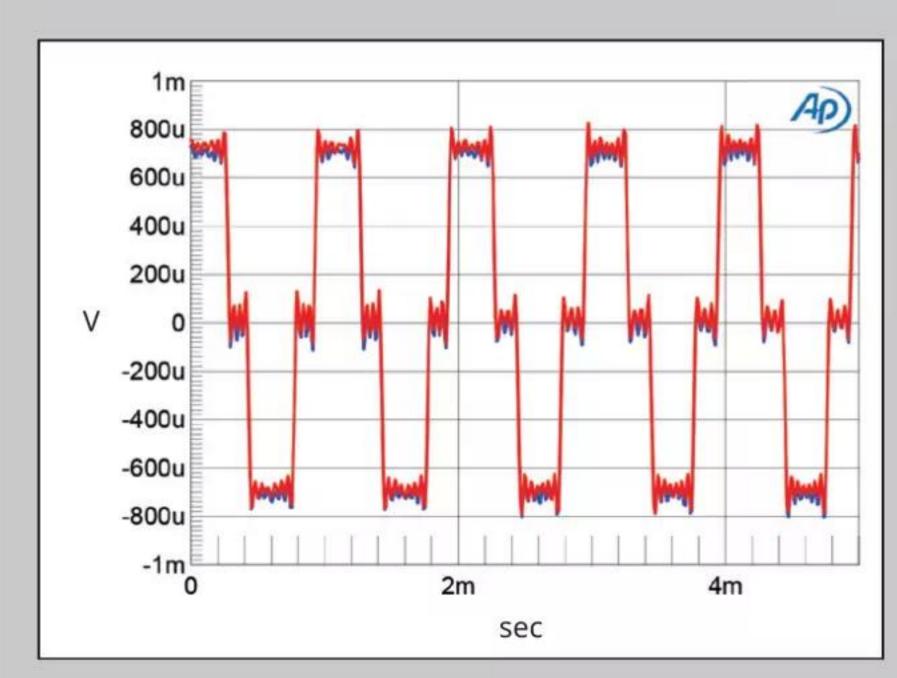


Fig.7 Weiss Helios, waveform of undithered 1kHz sinewave at –90.31dBFS, 16-bit data (left channel blue, right red).

the analog output level as a 24-bit, 1kHz digital tone stepped down from 0dBFS to –140dBFS. Even at the lowest level, the amplitude error is <1.1dB, which implies very high resolution. An increase in bit depth from 16 to 24, with dithered data representing a 1kHz tone at –90dBFS, dropped the Helios's noisefloor by 33dB (fig.6). This implies a resolution between 21 and 22 bits, which is the highest I have encountered, greater even than that of the Weiss DAC502 and of the Merging Hapi MKII

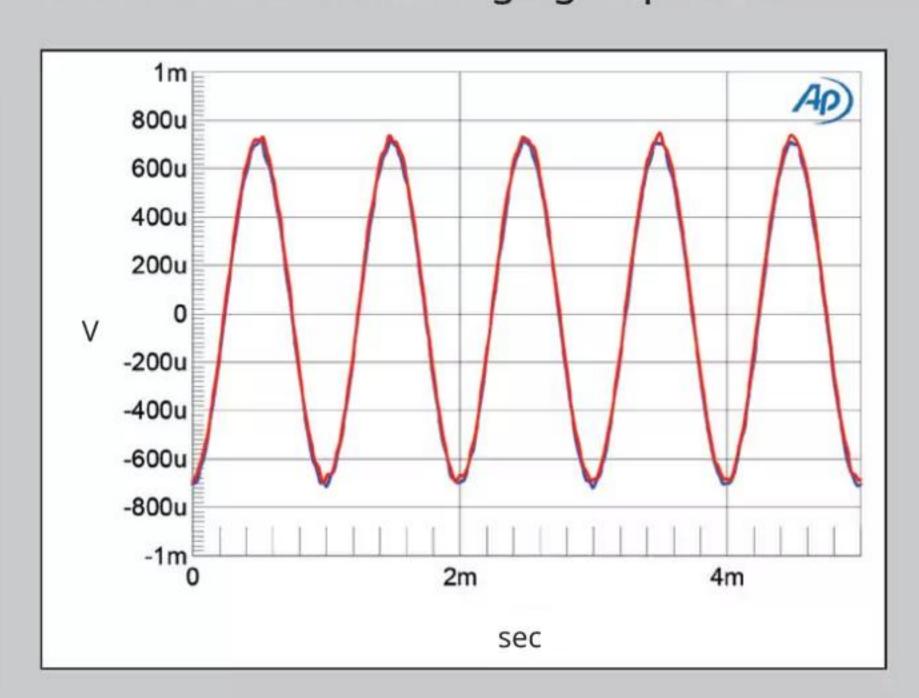


Fig.8 Weiss Helios, waveform of undithered 1kHz sinewave at –90.31dBFS, 24-bit data (left channel blue, right red).

that KR reviewed in January 2024.² When I played undithered data representing a tone at exactly –90.31dBFS, the waveform was symmetrical, with negligible DC offset, and the three DC voltage levels described by the data were free from noise (fig.7). With undithered 24-bit data (fig.8), the Helios's very low analog noisefloor means it can output a clean sinewave, even at this very low signal level.

2 See stereophile.com/content/weiss-engineering-dac502-da-processor-measurements.

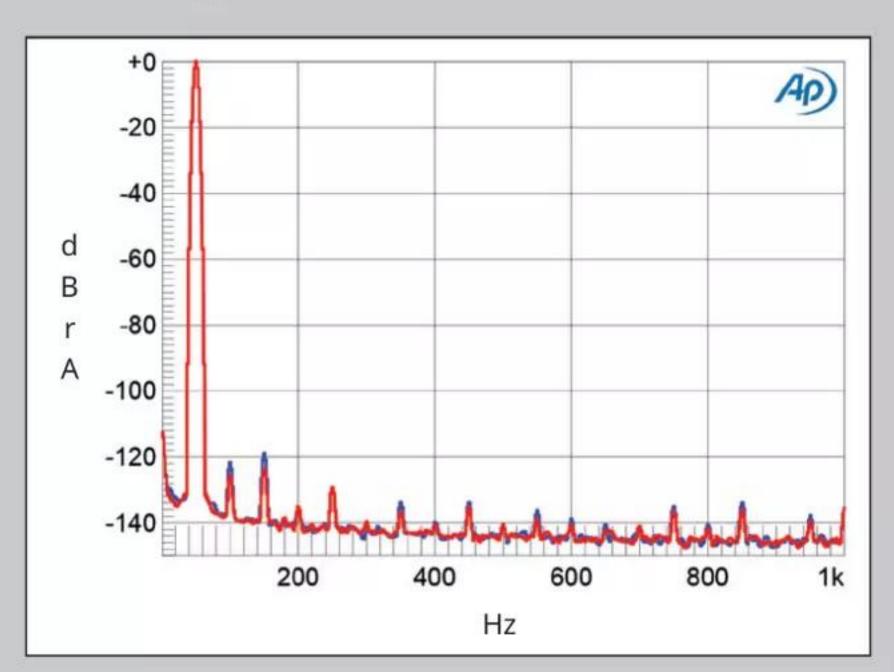


Fig.9 Weiss Helios, 24-bit data, spectrum of 50Hz sinewave, DC-1kHz, at 0dBFS into 600 ohms (left channel blue, right red; linear frequency scale).

⁴ See stereophile.com/content/mbl-noble-line-n31-cd-player-dac-roon-ready-december-2020.

⁵ Though, of course, the MBL includes a transport.

⁶ The CD is out of print, but the files can be downloaded or streamed from jeromeharris. bandcamp.com/album/rendezvous.





Billy Drummond's trap set was set back in the supportive church acoustic of Blue Heaven Studio. Playing the album with the Weiss Helios, with the levels matched, the Weiss sounded a little quieter. The drums were a little more forward, and Harris's bass was less warmly balanced. It was admittedly a close-run comparison, but the Helios offered a slightly more transparent window into the recording's soundstage than the N31. This was especially the case at high frequencies, which favored the sound of Drummond's cymbals.

An example of the Helios's resolving power was on "Decision Point," the first track on the Jerome Harris album. There is a splice between two of the takes of Marty Ehrlich's alto saxophone solo at 6:08, and the join sounded a touch less seamless than I was used to with the MBL. The character of the studio ambience is very slightly different before and after the crossfade due to the different decay

of the other instruments at the splice point in the two takes. The ambience is tens of decibels lower in volume than Erlich's sax, but I had no problem hearing that difference with the Helios.

Headphone listening

I used my Audeze LCD-X headphones to audition the Helios's balanced output, set to Headphone, using the optional balanced adapter cable together with a balanced Nordost Heimdall 2 cable. The Headphone setting reduces the chosen maximum level by 12dB, meaning the maximum level of "–12dB" I had been using with Loudspeaker was now "–24dB." I reset the maximum level to "–16dB" for my headphone listening, which meant that with the volume control set to its maximum, the presentation was just the right amount of loud.

measurements, continued

Even set to its highest output level, the Helios produced very low levels of harmonic distortion with full-scale data even into the punishing 600 ohm load (fig.9). The subjectively benign second and third harmonics were the highest in level, but each lay close to a negligible –120dB (0.0001%)! Intermodulation distortion with an equal mix of 19 and 20kHz tones at –6dBFS was similarly extremely low (fig.10),

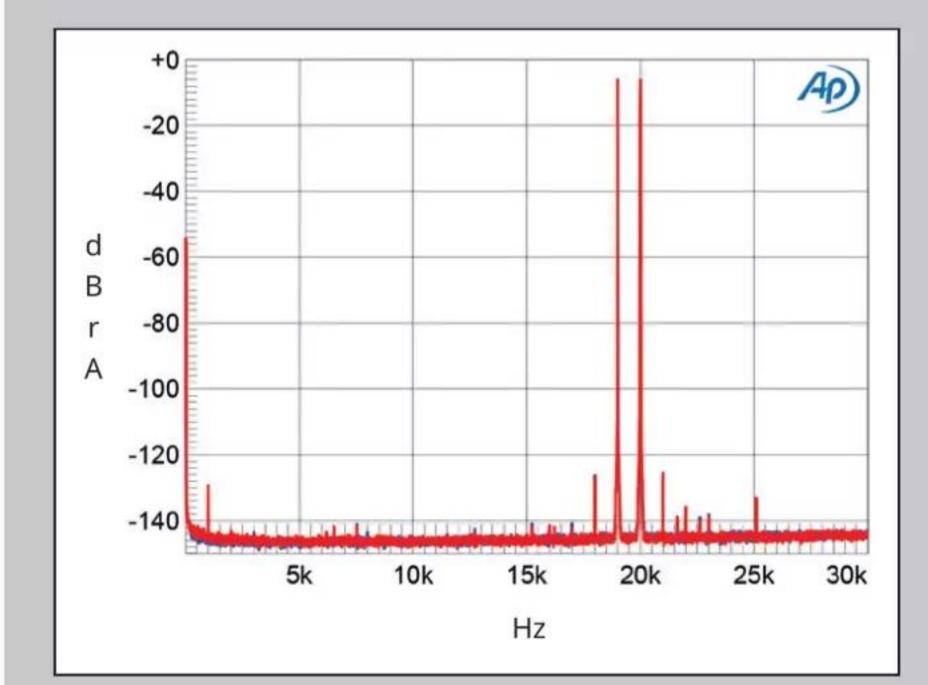


Fig.10 Weiss Helios, 24-bit data, HF intermodulation spectrum, DC-30kHz, 19+20kHz at 0dBFS into 600 ohms, 44.1kHz data (left channel blue, right red; linear frequency scale).

with the difference tone at 1kHz into 600 ohms lying at -130dB (0.00003%)!

The Helios offered excellent rejection of word-clock jitter. Fig.11 shows the spectrum of the Helios's output when it was fed high-level 16-bit J-Test data via AES3. All the odd-order harmonics of the undithered low-frequency, LSB-level squarewave lie at the correct levels, and no other sideband pairs are visible. The central spike that rep-

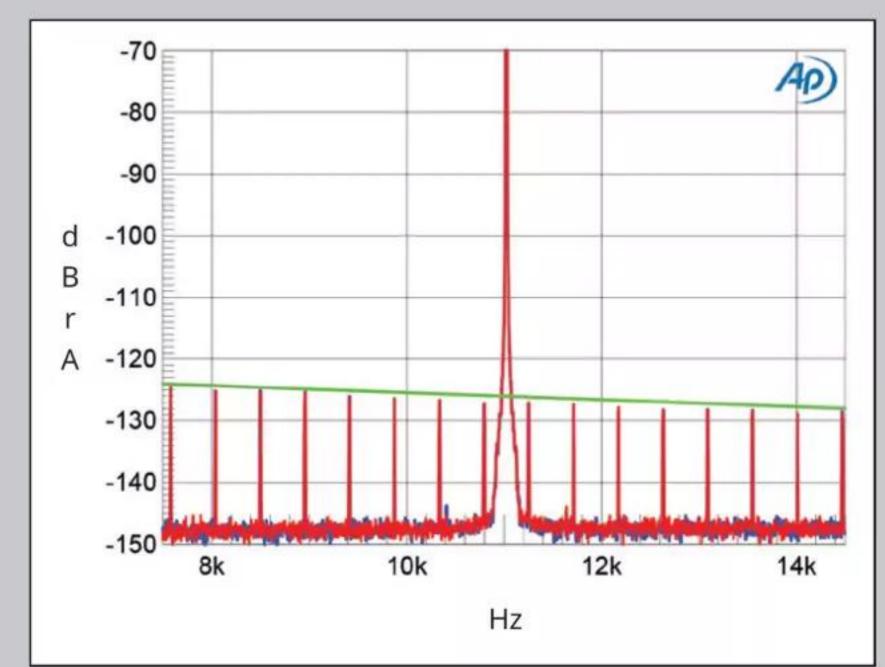


Fig.11 Weiss Helios, high-resolution jitter spectrum of analog output signal, 11.025kHz at –6dBFS, sampled at 44.1kHz with LSB toggled at 229Hz: 16-bit AES3 data (left channel blue, right red). Center frequency of trace, 11.025kHz; frequency range, ±3.5kHz.

resents the high-level tone at one-quarter the sample rate (Fs/4) is broadened at its base, which was not the case with USB and network data (fig.12).

Weiss's DAC502 performed supremely well on the test bench,³ but its measured performance was exceeded by that of the Weiss Helios!—John Atkinson

3 See stereophile.com/content/merging-hapi-mkii-multichannel-digital-processor-measurements.

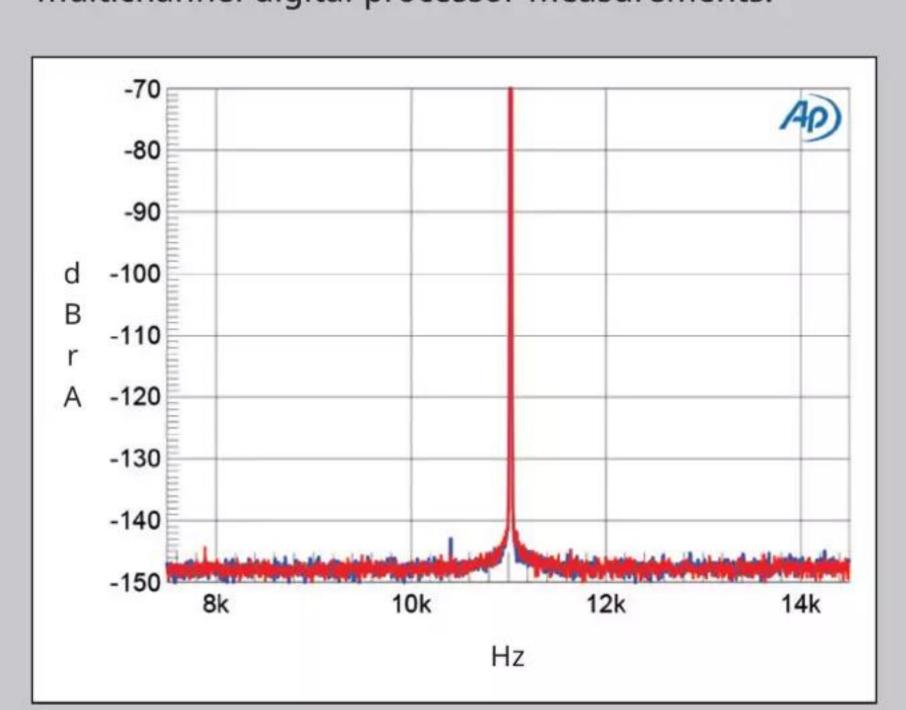


Fig.12 Weiss Helios, high-resolution jitter spectrum of analog output signal, 11.025kHz at –6dBFS, sampled at 44.1kHz with LSB toggled at 229Hz: 24-bit network data (left channel blue, right red). Center frequency of trace, 11.025kHz; frequency range, ±3.5kHz.

Before I did any serious listening, I experimented with the Headphone DSP settings. I tried the parametric EQ before realizing that the Helios offers a preset equalization curve for a long list of headphone models. Nineteen settings are available for Audeze models alone! Using the web app, I enabled Headphone EQ and selected the Audeze LCD-X setting. This applied a 3dB reduction in level below 80Hz, another 2dB reduction between 100Hz and 1kHz, and a narrow peak reaching 0dB between 3kHz and 5kHz.

With the Audeze LCD-X preset, Patricia Barber's "Use Me," from *Companion* (DSD64, Mobile Fidelity), was less overtly warm than with no equalization. Michael Arnopol's double bass was better defined, as were drums and percussion. As with my loudspeaker listening, the Helios's presentation pulled me into the music.

With conventional recordings like this, of course, headphones present the soundstage inside the listener's head, between the ears. Binaural recordings move the soundstage outside the head, and I made a lot of binaural recordings back in the day, using a portable cassette or DAT recorder with a pair of electret lavalier microphones suspended in front of my ears. The most memorable of these was a 1981 Grateful Dead concert at London's Rainbow Theatre (16/44.1 ALAC files, transferred from analog cassette original).

I was recording the sound of the Dead through their PA system, but the band was meticulous in getting good sound. I never could get my binaural recordings to project in front of my head, and it was somewhat peculiar to hear the drums behind me on this recording. But with Jerry Garcia's guitar outside my right ear, the keyboards outside my left ear, and Phil Lesh's bass guitar lighting up the Rainbow's low-frequency acoustic, the equalized Helios and the LCD-Xes placed me solidly in the center of the ecstatic audience, where I had been standing with a bunch of "tapers." And when my then-girlfriend asked me a question about the band during "Friend

ASSOCIATED EQUIPMENT

Digital sources Roon Nucleus+ music server; Ayre Acoustics C-5xe^{MP} universal player; MBL N31 CD player/DAC; Ayre Acoustics QA-9 A/D converter.

Integrated amplifiers Audio Research I/50, NAD M10.

Power amplifiers Parasound Halo JC 1+ monoblocks.

Loudspeakers GoldenEar BRX, KEF LS50, Q Acoustics 5040.

Headphones Audeze LCD-X.

Cables Digital: AudioQuest Vodka (Ethernet). Interconnect: Ayre/Cardas Reference (balanced). Speaker: AudioQuest Robin Hood. Headphones: Nordost Heimdall 2. AC: AudioQuest Dragon Source & High Current, manufacturers' own.

Accessories Target TT-5 equipment racks; Ayre Acoustics Myrtle Blocks; ASC Tube Traps, RPG Abffusor panels; Audio-Quest Niagara 5000 Low-Z Power/Noise-Dissipation System (amplifiers) and AudioQuest Niagara 1000 Low-Z Power/Noise-Dissipation System (source components). AC power comes from two dedicated 20A circuits, each just 6' from breaker box.

—John Atkinson

of the Devil," her voice was so solidly placed to my right that I instinctively turned my head to mansplain the answer.

Conclusion

Three decades ago, I chaired a seminar at a show entitled "Accuracy or Musicality?" Choosing a product that favored one or the other of these may have been necessary back then, but today it isn't necessary to choose: The Weiss Helios shows you can have both.

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-ROGIER VAN BAKEL, Stereophile

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