JOHN ATKINSON

HiFi Rose RS250

AUDIO & VIDEO STREAMING D/A PREAMPLIFIER

In the summer of 2021, MoFi Distribution's Jonathan Derda emailed me about the South Korean HiFi Rose brand. "This brand strikes me as being the spiritual successor to the original Slim Devices Transporter and Squeezebox Touch," he wrote. "We're all really excited about it."

I bought a Wi-Fi–connected Slim Devices Squeezebox at the beginning of 2006, to experiment with streaming.[1] When Slim Devices released the high-performance Transporter, I was sufficiently impressed that I purchased the review sample after measuring it for Wes Phillips's review in the February 2007 issue.[2] I used the Transporter for several years, but after Logitech, which had purchased Slim Devices at the end of

1 See stereophile.com/digitalprocessors/906slim/index.html.
2 See stereophile.com/mediaservers/207slim/index.html.

SPECIFICATIONS

Description Roon Ready music streamer/digital processor, with ES9038Q2M DAC, dual-core Cortex-A72 processor up to 1.8GHz, and quad-core Cortex-A53 up to 1.4GHz, running Android 7.1 and compatible with Airplay, DLNA, Roon, Spotify Connect, Tidal, Qobuz, Bugs, Internet Radio, RoseTube (YouTube), and RosePodcast. Display: 8.8" TFT LCD & capacitive touchscreen (MIPI-DSI). Digital audio inputs: one each coaxial S/PDIF, TosLink S/PDIF, USB, Ethernet network port; USB ports. Analog inputs: 1 pair single-ended on RCA jacks. Digital audio outputs: USB, S/PDIF coaxial, S/PDIF optical. Analog outputs: 1 pair single-ended on RCA jacks, 3.5mm headphone jack. Video output: HDMI 2.0 × 1 (up to 3840 × 2160/60Hz). File system: NTFS/exFAT/FAT32. Network protocol: SMBv1, SMBv2/FTP/WebDav. Storage interface: USB3.0 ×2, SATA ×1. Audio file formats supported: MQA, WAV, FLAC, AIFF, WMA, MP3, OGG, APE, DFF, DSF, AAC, CDA, AMR, EC3, E-EC3, MID, MPL, MP2, MPC, MPGA, M4A, ALAC. PCM sample rates supported: 8kHz–768kHz (8/16/24/32 bits per sample). Native DSD rates supported: DSD64 (2.8MHz), DSD128 (5.6MHz), DSD256 (11.2MHz), DSD512 (22.4MHz). Analog frequency response: 20Hz–20kHz, ±0.5dB. Maximum analog output level: 2.3V RMS. Analog output impedance: 100 ohms. Headphone output: 1V RMS into 32 ohms (2V RMS maximum into 300 ohms). THD: 0.0002% (1kHz at 2.3V RMS). THD+N: 0.0003% (1kHz at 2.3V RMS). IMD: 102dB (SMPTE 4:1, 60Hz:7kHz). S/N ratio: 126dB max (CCITT filter); >133dB, 20Hz–20kHz. Optional accessory: internal SSD for music data storage, CD drive. Supplied accessory: Bluetooth remote control. Can also be controlled with RoseConnect Premium app for iOS and Android devices.

Dimensions 11" (278mm) W × 3" (76mm) H × 7.95" (202mm) D. Weight: 7lb (3.2kg).

Finish Anodized aluminum with black side and rear panels.

Serial number of unit reviewed ESL 106AB000084, bottom panel; 0B4450, system info display. System info: v3.8. Audio firmware: XMOS 3115. "Made in Korea."

Price Approximate number of dealers: 50. Warranty: 1 year from date of purchase.

Manufacturer
Citech Co., Ltd. 11F, 932 Yangjae-daero, Songpa-gu, Seoul, South Korea.
Tel: 82-1899-6042.
Web: hifirose.com.
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MoFi Distribution
1811 W. Bryn Mawr Ave.
Chicago, IL 60660.
Tel: (312) 841-4087.
Web: mofidistribution.com.

2006, stopped supporting the Squeezebox devices, I put it aside. By that time, I had started using the Pure Music and Audirvana streaming apps, which I preferred to Slim Devices' SlimServer software.[3] But every few months, I fire up the Transporter, feed it audio data over my network, and spend a nostalgic evening enjoying what it does.

Given that history, it should come as no surprise that I eagerly agreed to review HiFi Rose's RS250 Roon Ready, streaming D/A preamplifier.

The RS250

Priced at this is a relatively small device, its front panel dominated by a large four-color touchscreen display almost 9" wide. To the screen's right are the standby button, a volume control knob, and a 3.5mm headphone jack. By contrast, the rear panel is crowded, by a pair of single-ended analog inputs and several digital inputs: coaxial and TosLink S/PDIF; USB Type B for connecting to the USB output of a PC or similar; USB 3.0 Type A for connecting to a storage device; and an Ethernet network port. The RS250 has one pair of single-ended analog outputs and three digital audio outputs: coaxial and optical S/PDIF and USB Type A. A video output, with a resolution up to 3840 × 2160 at 60Hz, is available on an HDMI 2.0 port. AC power connects to a 15A IEC jack. In addition to these wired connections, the RS250 does Airplay, DLNA, Roon, Spotify Connect, Tidal, Qobuz, and other streaming services.

Internally, two ARM Cortex 64-bit processors—a dual-core Cortex-A72 and a quad-core Cortex-A53 with 4GB RAM—run the Android 7.1 operating system. The power supply is linear rather than switch-mode and features a configuration said to minimize electrical noise. The analog output stage features the relatively new ESS ES9038Q2M two-channel DAC chip, which has what is described as a "Femto Clock." Internal SSD data storage is an optional extra; this was not fitted to the review sample.

That screen is what makes the RS250 both noteworthy and useful. When the unit is turned on for the first time, it prompts you to enter your time zone, country, and preferred language. After that, a horizontal stream of icons is displayed. There are so many icons that you need to scroll left or right to see them all. Some are self-explanatory—Music, Video, Qobuz, Tidal, Clock, Settings, In-Out Setting—while others are enigmatic: Bugs, RoseFM, RosePodcast, RoseRadio, RoseStore, RoseTube, CD Play, and CD Ripping. (The RS250 doesn't have a CD drive.)

Pressing the Settings icon allows you to adjust things like the display brightness, the format of the clock display, the appearance of the VU meters that appear when music is playing, and rearrange the order of the icons. You can also check the operating system version and IP address, connect to a Wi-Fi network, and watch a tutorial video. An In-Out Setting icon allows you to choose an external input, digital or analog, set the input to Internal, where it defaults to the network input, and choose a digital or analog output. When you select the analog outputs, a gearwheel icon appears and allows you to choose one of seven FIR Interpolation reconstruction filters (see the "Measurements" sidebar); select variable output level or one of eight fixed output levels ranging from 100mV to 2.2V; resample the incoming digital data (choices are from 44.1kHz to 192kHz) or not; invert polarity; and apply correction for the bottom 8 bits with 32-bit audio sources.

Phew.

Setup and use

When I first turned on the RS250 and connected it to my network by Ethernet, it assigned itself an IP address then told me that it needed to update its operating system. This it

3 Now called Logitech Media Server, this open-source app is still being regularly updated. It can be used with servers like the Antipodes K50 that Jason Victor Serinus reviewed in the November 2021 issue.

MEASUREMENTS

I measured the HiFi Rose RS250 with my Audio Precision SYS2722 system (see the January 2008 As We See It[1]), repeating some tests with the magazine's more recent Audio Precision APx500 analyzer.

I first looked at the RS250's performance as a D/A processor. Apple's USB Prober utility identified the HiFi Rose as "RS250-DAC" from "HiFi ROSE." The USB port operated in the optimal isochronous asynchronous mode, and Apple's AudioMIDI utility revealed that the RS250 accepted 16-, 24-, and 32-bit integer data via USB sampled at all rates from 44.1kHz to 768kHz. The coaxial and TosLink S/PDIF inputs accepted data sampled at rates up to 192kHz from my MacBook Pro's optical output, but the optical input was limited to sample rates of 96kHz and below when connected to the APx500's TosLink output. Peculiarly, the RS250's S/PDIF inputs would only lock to data sampled at 48kHz when connected to the SYS2722's digital outputs.

The RS250's single-ended analog outputs can be set to variable gain or to one of several fixed maximum outputs: "100mV," "150mV," "200mV," "300mV," "500mV," "1000mV," "2000mV," or "2200mV." The output level with full-scale 1kHz data fed to the RS250's TosLink, USB, and network inputs was within a few millivolts of the nominal value, with the greatest discrepancy at "2200mV," where I measured 2.26V. (Note that this is the only fixed level available with USB data.) The maximum headphone output level with a 1kHz tone at 0dBFS was 507.3mV. The HiFi Rose's analog and headphone outputs preserved absolute polarity (ie, were noninverting) from all of the RS250's digital inputs. The analog output's source impedance was the specified 100 ohms at all audio frequencies and that from the headphone output was just 1 ohm. The RS250 should have no problem driving low-impedance headphones.

In common with other processors using ESS Sabre DAC chips, the RS250

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

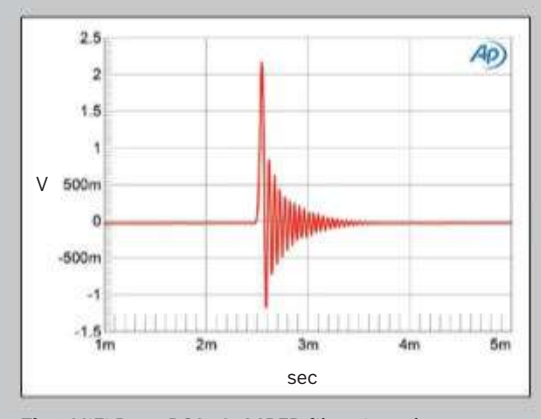

Fig.1 HiFi Rose RS250, MPFR filter, impulse response (one sample at 0dBFS, 44.1kHz sampling, 4ms time window).

did, and the front-panel display identified the system as "3.8.13" and the audio firmware version as "XMOS 3115." I then set the time, my language, and my country.

Roon recognized the network-connected HiFi Rose as an endpoint; I also connected the RS250's USB Type B input port to the USB Type A slot on the back of my Roon Nucleus+. When I selected the USB input with the RS250's In-Out Setting icon, Roon recognized it as an ALSA device. For CD playback, I connected an MBL N31 player's optical output to the RS250's TosLink input with a 1m length of AudioQuest OptiLink 5 cable. I learned that the RS250's animated front-panel meters don't function with the S/PDIF and USB connection, nor is the file's metadata displayed with USB data as it is with the network connection or with playback from an external memory device.

I mainly used the RS250's single-ended analog outputs connected directly to the Parasound monoblocks, those in turn connected first to the PSB Synchrony T600 loudspeakers I reviewed in November, then to the GoldenEar BRXes. Playback volume could be adjusted with Roon's level control (network and USB) or with the front-panel knob or Bluetooth-connected remote control (analog and S/PDIF inputs and local media). Mostly, however, I used the RoseConnect Premium app (v3.04.27) from the comfort of my listening chair. This app requires iOS 13.0 or later, and my older iPad Mini runs iOS 12.5.4, so I installed RoseConnect Premium on my iPhone 11, which was running iOS 14.8. The RS250 was identified as "ROSE 5-D." I used the app to log in to my Qobuz and Tidal accounts, and the Tidal and

measurements, continued

offers a choice of reconstruction filters for PCM data fed to its S/PDIF and network inputs, though not to its USB input. These are labeled "Brick Wall" (BW), "Apodizing Fast Roll-off" (AFR), "Corrected minimum phase Fast Roll-off" (CMPFR), "Minimum phase Slow Roll-off" (MPSR), "Minimum phase Fast Roll-off" (MPFR), "Linear phase Slow Roll-off" (LPSR), and "Linear phase Fast Roll-off" (LPFR). Fig.1 shows the MPFR filter's impulse response with 44.1kHz data, a conventional minimum-phase filter with all the ringing following the single full-scale sample. (This is the default filter and the only one available with the USB input.) The impulse response of the MPSR filter was much shorter (fig.2), while that of the CMPFR filter (fig.3) had less post-ringing than MPFR along with a small amount of preringing. The BW, AFR, and LPFR filters had identical linear-phase impulse responses, with equal amounts of ringing before and after the single full-scale sample (not shown).

The MPFR filter with 44.1kHz white-noise data (fig.4, magenta and red traces) rolls off quickly above 20kHz. The ultrasonic rolloff is disturbed by aliased images of the audioband noise signal centered on 44.1kHz. However, as these ultrasonic images lie below –90dBFS, they will be inconsequential. The aliased image at 25kHz of a full-scale tone at 19.1kHz (cyan, blue) is suppressed by around 52dB, though a higher-level, higher-order image can be seen at 63.2kHz (2 × 44.1–25kHz). As its name suggests, the MPSR filter rolls off more slowly above the audioband (fig.5, magenta, red), but still with the low-level, aliased noise images visible. The aliased image of the full-scale tone at 19.1kHz (cyan, blue) is suppressed by just 32dB. The CMPFR, AFR, and BW filters all behaved similarly, reaching

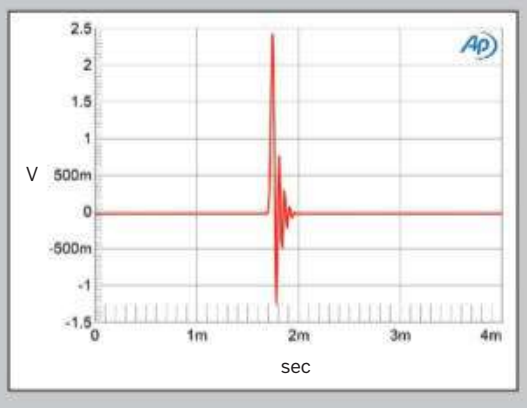

Fig.2 HiFi Rose RS250, MPSR filter, impulse response (one sample at 0dBFS, 44.1kHz sampling, 4ms time window).

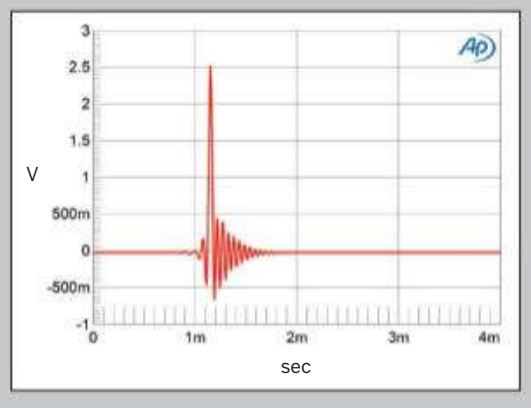

Fig.3 HiFi Rose RS250, CMPFR filter, impulse response (one sample at 0dBFS, 44.1kHz sampling, 4ms time window).

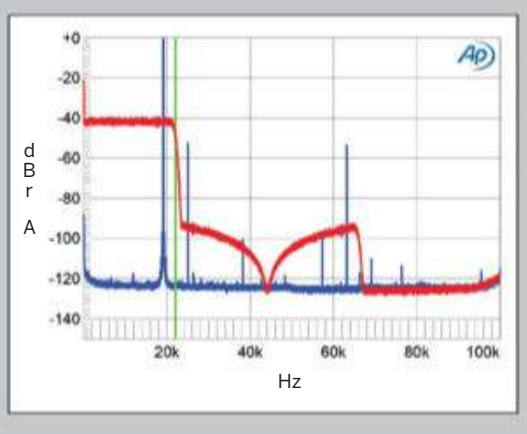

Fig.4 HiFi Rose RS250, MPFR filter, wideband spectrum of white noise at –4dBFS (left channel red, right magenta) and 19.1kHz tone at 0dBFS (left blue, right cyan) into 100k ohms with data sampled at 44.1kHz (20dB/vertical div.).

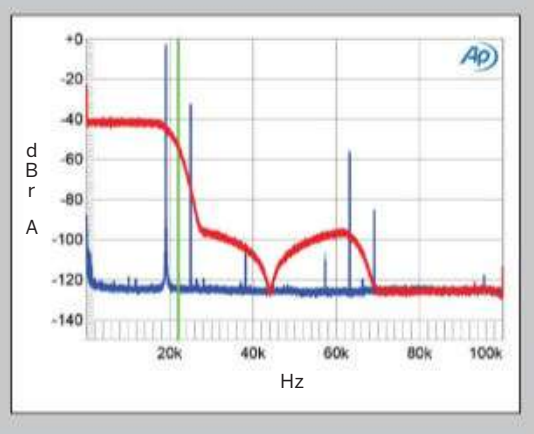

Fig.5 HiFi Rose RS250, MPSR filter, wideband spectrum of white noise at –4dBFS (left channel red, right magenta) and 19.1kHz tone at 0dBFS (left blue, right cyan) into 100k ohms with data sampled at 44.1kHz (20dB/vertical div.).

Qobuz albums I had previously added to my Roon Library appeared in the Tidal and Qobuz album windows, both in the app and in the RS250's front-panel display.

Some audio settings, I learned, are available only via the In-Out Setting icon on the front-panel display and then the gearwheel icon mentioned earlier. Based on my experience with the reconstruction filter settings with other D/A processors that use ESS Sabre DAC chips,[4] I selected the "Corrected minimum phase Fast Roll-off" filter (see "Measurements" sidebar) and set the RS250 to play files at the original sample rates rather than upsample them. I don't have any 32-bit audio files, so I left "Lower 8-bit correction for 32 bit sound source" switched off.

A Menu item allows the RS250 to access a music library stored on a NAS network drive. However, as my NAS is currently offline, I plugged a 16GB USB stick carrying some reference recordings into the USB 3.0 "In" port on the RS250's back panel. The RS250 recognized the storage device and asked if I wanted to scan the contents and create a database. Once this was done, after a delay the albums appeared in the app's and front panel's Music window. There was also an MPEG video file on the USB stick, and I could play this with the RS250, the video image appearing on the front-panel display. Selecting RoseTube with the app or display brought up a selection of music videos on YouTube. Similarly, selecting Radio and (in response to a prompt) selecting "USA" as my country brought up a list of internet radio stations.

The last setup step I performed was to select the blue "Micintosh style" [*sic*] illumination for the front-panel VU meters. Three things I didn't try: the RoseFM tuner function and playing back and ripping CDs. (Both of these require an external CD-ROM drive to be attached.) I also didn't try connecting the RS250's HDMI output to an external monitor, as there was no room on my equipment rack.

Listening

For my first listening session, I selected the HiFi Rose RS250's network connection as Roon's active Audio Zone and played files from the internal hard drive I had fitted to

4 See for example the discussion of the filters in my review of the Okto dac8 Stereo at stereophile.com/content/okto-dac8-stereo-da-processor-page-2.

measurements, continued

full stop-band attenuation at exactly half the sample rate, shown by the vertical green line in fig.6. The harmonics associated with the 19.1kHz tone are all very low in level.

Fig.7 shows the frequency responses with the MPFR filter and data sampled at 44.1, 96, and 192kHz. All conform to the same shape but with a fast rolloff just below half the sample rate. Channel separation was >90dB in both directions above 3kHz but decreased at lower frequencies, reaching 62dB at 100Hz. This is unusual and suggests that the RS250's power supply has a relatively high source impedance.

When I examined the spectrum of the RS250's noisefloor, the levels of power supply–related spuriae depended on whether I had the HiFi Rose connected to my network. (My router is in the listening room, and I ran a 75' CAT-5 cable from it to the RS250 when the latter was in the test lab.) The cyan and blue traces in fig.8 show the spectrum of the noisefloor with the network connection when the RS250 was decoding 24-bit, 1kHz data sourced from my battery-powered MacBook Pro via USB; the magenta and red traces show the spectrum with the network disconnected. The 60Hz, 180Hz, and 300Hz spuriae are still very low with the network connected but drop by 9–12dB when I removed the connection. A 120Hz component visible at –113dB effectively disappears when disconnected from the network.

Repeating this analysis with optical S/PDIF data (not shown) eliminated the lower-frequency supply-related spuriae, but low-level sidebands associated with the 1kHz tone at ±120Hz and ±240Hz were still present. None of this should have any influence on sound quality.

An increase in bit depth from 16 to 24, with dithered network data

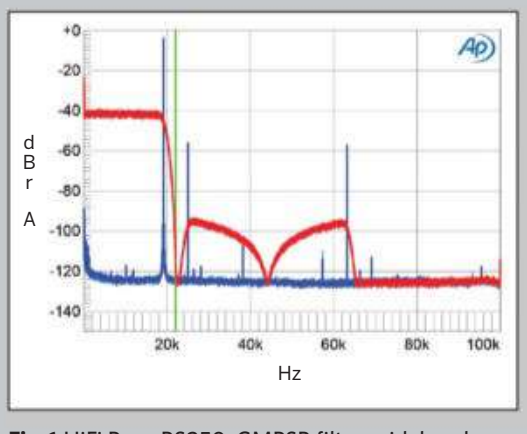

Fig.6 HiFi Rose RS250, CMPSR filter, wideband spectrum of white noise at –4dBFS (left channel red, right magenta) and 19.1kHz tone at 0dBFS (left blue, right cyan) into 100k ohms with data sampled at 44.1kHz (20dB/vertical div.).

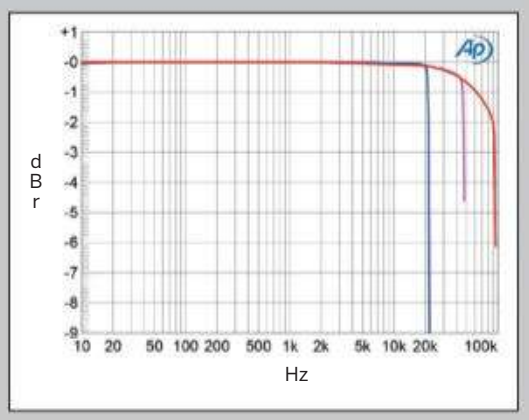

Fig.7 HiFi Rose RS250, MPFR filter, frequency response at –12dBFS into 100k ohms with data sampled at: 44.1kHz (left channel green, right blue), 96kHz (left cyan, right magenta), and 192kHz (left gray, right red) (1dB/vertical div.).

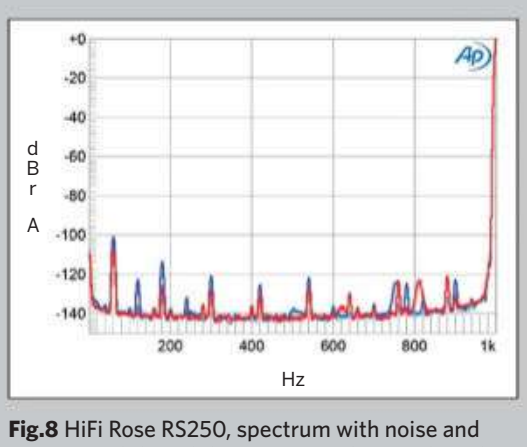

Fig.8 HiFi Rose RS250, spectrum with noise and spuriae of dithered 1kHz tone at 0dBFS with 24-bit data sourced from MacBook Pro via USB with RS250's Ethernet port connected to the network (left channel blue, right cyan) and without the RS250 connected to the network (left magenta, right red) (20dB/vertical div.).

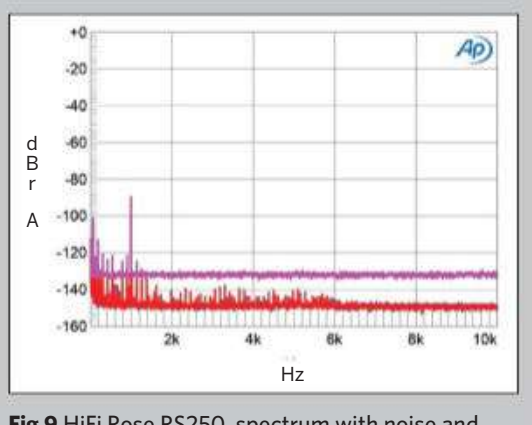

Fig.9 HiFi Rose RS250, spectrum with noise and spuriae of dithered 1kHz tone at –90dBFS with: 16-bit Ethernet data (left channel cyan, right magenta), 24-bit Ethernet data (left blue, right red) (20dB/vertical div.).

my Roon Nucleus+ server. I wasn't sure what to expect. Had the efforts of the HiFi Rose design team been focused on versatility and functionality rather than sound quality? The RS250's diminutive chassis contained a powerful computer and what appears to be a hefty power transformer close to the signal circuitry; won't the analog output be contaminated with noise? Finally, my system has been based on balanced analog connections for many years; would substituting the RS250's single-ended analog outputs compromise the sound?

I started my auditioning with an album I know intimately, having engineered and mixed it at the end of the 1990s for release as a *Stereophile* CD: Jerome Harris's *Rendezvous* (16/44.1 ALAC files, STPH013-2[5]). Electric bass player Harris had assembled an all-star band for the sessions at Chad Kassem's Blue Heaven Studios: Art Baron on trombone, Marty Erlich on alto sax, Steve Nelson on vibes, and Billy Drummond on drums. Listening to "Cool Pursuit" played back from the USB stick, the RS250's soundstaging accurately preserved what I had intended in the mix. Harris's Taylor bass guitar was dead center, Erlich's saxophone was positioned far right, Baron's trombone slightly right of center, Nelson's vibes, which I had miked in stereo, were spread across the left of the stage. Drummond's kit was placed slightly behind the other players, his drums illuminating the studio's churchlike acoustic. The kickdrum sounded a little tubbier than I was used to, and the bass guitar had a touch of extra upper-bass bloom.

This was with the RS250 set to the original sample rate. Upsampling to 176.4kHz took away some of the attack on the sound of the vibe, which I liked, but it also flattened the soundstage a little, moving the cymbals closer. This was not what I was expecting from my experience with other upsamplers.

I stuck with the RS250's CMPFR filter and turned to music that had been recorded more recently. During the time the HiFi Rose resided in my system, I was producing recording sessions at Oktaven Studios in New York's Westchester County for an album of classical works, including a symphony that Sasha Matson had composed for a jazz big band and a piano concerto. The engineer was the multitalented Ryan Streber. Each day, after returning from the studio, I used the HiFi Rose to audition the various takes

5 See stereophile.com/features/91/index.html. This CD is out of print, but the files can be downloaded or streamed from jeromeharris.bandcamp.com/album/rendezvous.

measurements, continued

representing a 1kHz tone at –90dBFS sourced from Roon, dropped the RS250's noisefloor by around 20dB (fig.9). This implies a resolution of better than 19 bits, and when I played undithered data representing a tone at exactly –90.31dBFS, the waveform was symmetrical, with negligible DC offset—25µV in the left channel, 50µV in the right—and the three DC voltage levels described by the data were free from noise (fig.10). This measurement was taken with the MPFR filter; the random noise level in the RS250's output is sufficiently low that the minimum-phase ringing is clearly visible at the bit transitions.

The RS250 produced very low levels of harmonic distortion with full-scale data, challenging the resolution of my SYS2722 analyzer. I therefore used the higher-performance APx555. The result, taken with TosLink data, is shown in fig.11. The third harmonic is the highest in level at just –116dB (0.00015%) in the left channel and at –124dB (0.00006%) in the right, though the low-level sidebands at ±120Hz that I mentioned earlier are visible. This spectrum was taken into the high 100k ohm load. When I reduced the load impedance to the punishing 600 ohms, the levels of the harmonics didn't change. Intermodulation distortion with an equal mix of 19 and 20kHz tones, each lying at –6dBFS, was very low (fig.12), with the difference tone at 1kHz not visible above the noisefloor. This graph was taken with the MPFR filter; the aliased images of the primary tones can be seen. A suspicious-looking rise in the noisefloor can also be seen on either side of the 19kHz and 20kHz tones.

This behavior, which is most likely due to jitter with a random low-fre-

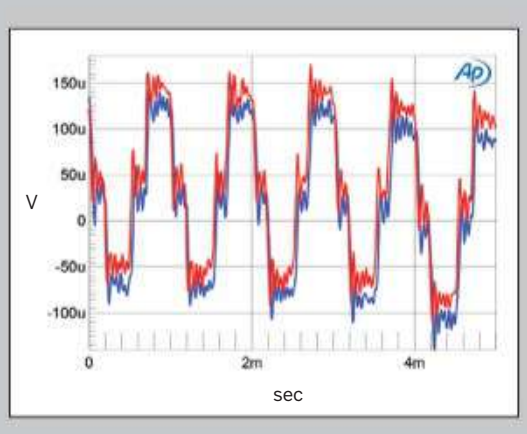

Fig.10 HiFi Rose RS250, MPFR filter, waveform of undithered 1kHz sinewave at –90.31dBFS, 16-bit data (left channel blue, right red).

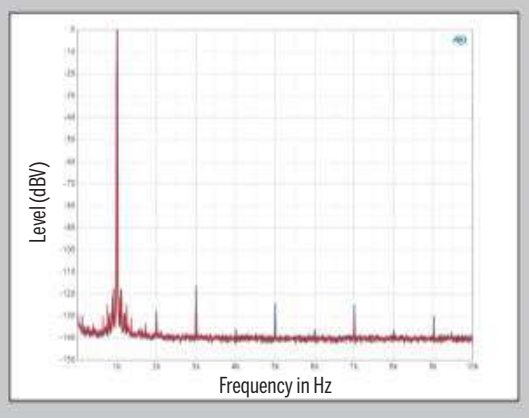

Fig.11 HiFi Rose RS250, 24-bit USB data, spectrum of 1kHz sinewave, DC–1kHz, at 0dBFS into 100k ohms (left channel blue, right red; linear frequency scale).

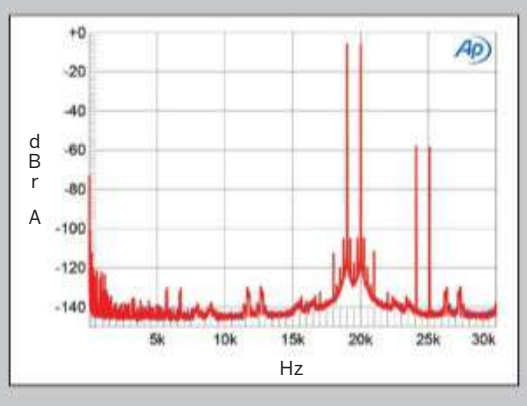

Fig.12 HiFi Rose RS250, MPFR filter, 24-bit TosLink data, HF intermodulation spectrum, DC–30kHz, 19+20kHz at 0dBFS into 100k ohms, 44.1kHz data (left channel blue, right red; linear frequency scale).

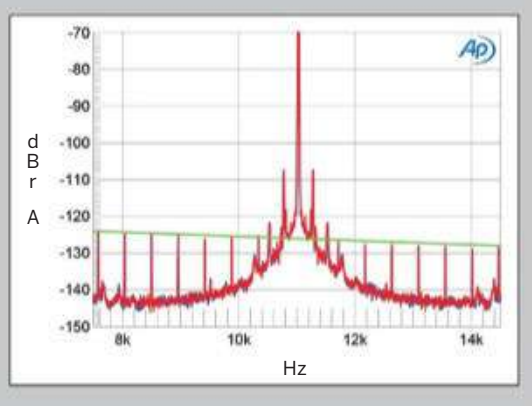

Fig.13 HiFi Rose RS250, high-resolution jitter spectrum of analog output signal, 11.025kHz at –6dBFS, sampled at 44.1kHz with LSB toggled at 229Hz: 16-bit TosLink data from MacBook Pro (left channel blue, right red). Center frequency of trace, 11.025kHz; frequency range, ±3.5kHz.

Ryan had recorded for each of the pieces so that I could let Sasha know which ones I preferred. The RS250's transparency was an invaluable help in this task, allowing me to both confirm the problems I had noted at the session and identify the passages that worked best.

For light relief after heavy musical lifting, I played some Daft Punk, specifically "Lose Yourself to Dance" from *Random Access Memories* (24/88.2 ALAC, Columbia/HDtracks), followed by "Oxytocin" from Billie Eilish's new album *Happier Than Ever* (24/44.1 FLAC, Qobuz/Darkroom-Interscope), which I wanted to hear after reading Michael Fremer's and Malachi Lui's review on our AnalogPlanet website.[6] Both tracks feature some heavy bass—Nathan East's bass guitar on "Dance" and (presumably) Finneas's synth on "Oxytocin." Playback levels were around 91dB (C-weighted) with slow ballistics; even with the GoldenEar BRX standmounts I was using by this time, the floorstanding Synchrony T600s with which I had started my auditioning of the HiFi Rose having been returned to PSB, the RS250's low frequencies drove the music along powerfully—though Daft Punk could teach Finneas a thing or two about preserving dynamic range in a mix.

How did the RS250 handle DSD files? I cued up the Dave Brubeck Quartet's "Take Five" from *Time Out* (DSD64 file, Columbia/Analogue Productions) in Roon. The album's cover appeared on the RS250's display, along with the information that the file was "DSD 1 bit 2822.4Khz [sic] 2ch." Joe Morello's kick and snare drum appropriately lit up the studio's acoustic, and his cymbals had plenty of top-octave air. The soundstage was shallower than what I hear with the considerably more expensive MBL N31, however, but the sound of Paul Desmond's alto saxophone had a touch more bite.

A couple of weeks into my time with the RS250, I started to experience some stuttering with network playback with Roon. While I rebooted my router,[7] I activated the USB-connected RS250 as Roon's endpoint. Hmmm. The sound with the USB input did not sound as fleshed-out as with the

6 See analogplanet.com/content/happier-ever-billie-eilishs-brilliantly-dark-fame-diary.

7 Restarting the router didn't fix the problem, although things got better on their own the following day.

measurements, continued

quency spectrum, was clearly visible when I examined the RS250's rejection of word-clock jitter. Fig.13 shows the spectrum of the RS250's output when it was fed high-level, optical 16-bit J-Test data. (The USB and network inputs behaved identically.) Almost all the odd-order harmonics of the undithered low-frequency, LSB-level squarewave lie at the correct levels, indicated by the sloping green line. However, the closest pair of sidebands surrounding the high-level tone at one-quarter the sample rate are boosted in level, as is the noisefloor. Peculiarly, this sideband pair is also present with 24-bit J-Test data (fig.14). This jitter-related behavior is only present with the RS250's analog outputs. Feeding its USB output to a high-performance D/A processor while it received 16-bit J-Test data from Roon over the network resulted in a jitter-free spectrum (fig.15).

Turning to the RS250's analog inputs, the input impedance was relatively low, at 3.3k ohms, which will be a problem with source components having tubed output stages. The analog inputs offered a wide frequency response, with the output down by 3dB at 72kHz. The maximum gain at the headphone output was –12.6dB, ie, an input of 1V resulted in an output of 234mV, while the maximum gain at the analog outputs was 0.325dB. An input of 1V was indicated as "–4dB" on the front-panel VU meters, and the input clipped at 2.2V input (fig.16). Both outputs preserved absolute polarity with analog input signals. The distortion via the analog inputs was slightly higher than it had been with the digital inputs (fig.17) but was still very low in absolute terms.

Other than the somewhat disappointing results with J-Test data,[2] HiFi Rose's RS250 did well on the test bench.—**John Atkinson**

2 The HiFi Rose RS150, reviewed in our sister magazine *Hi-Fi News & Record Review*, behaved similarly when tested for jitter rejection. See hifinews.com/content/hifi-rose-rs150-network-attached-dac-lab-report.

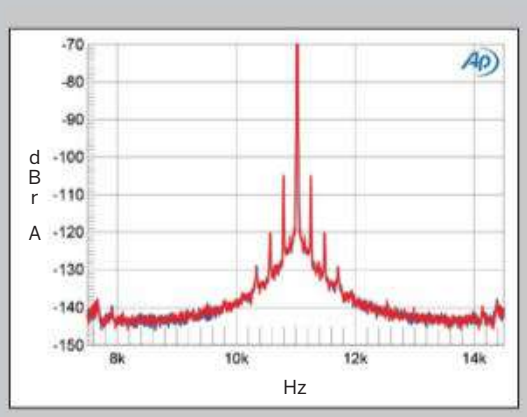

Fig.14 HiFi Rose RS250, high-resolution jitter spectrum of analog output signal, 11.025kHz at –6dBFS, sampled at 44.1kHz with LSB toggled at 229Hz: 24-bit Ethernet data (left channel blue, right red). Center frequency of trace, 11.025kHz; frequency range, ±3.5kHz.

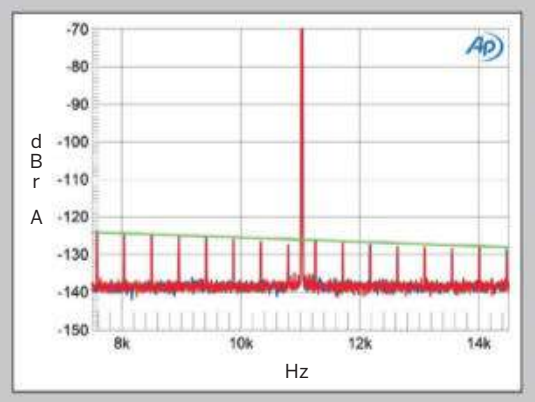

Fig.15 Ayre QB-9 Twenty, high-resolution jitter spectrum of analog output signal, 11.025kHz at –6dBFS, sampled at 44.1kHz with LSB toggled at 229Hz: 16-bit USB data sourced from the HiFi Rose RS250 (left channel blue, right red). Center frequency of trace, 11.025kHz; frequency range, ±3.5kHz.

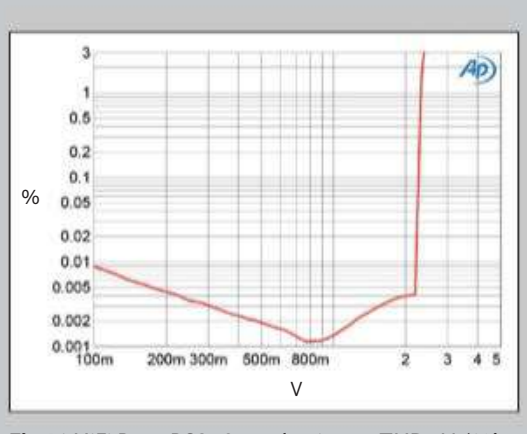

Fig.16 HiFi Rose RS250, analog input, THD+N (%) vs input level in V.

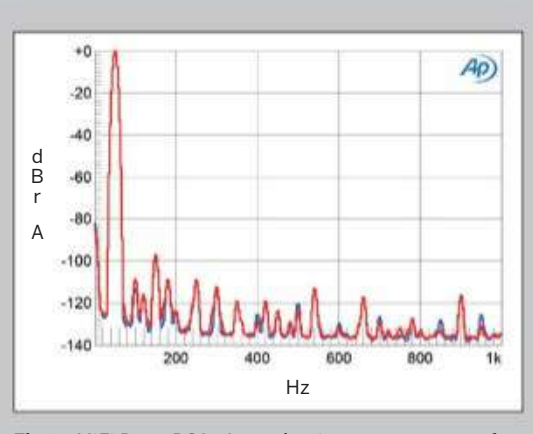

Fig.17 HiFi Rose RS250, analog input, spectrum of 50Hz sinewave, DC–1kHz, at 1V into 100k ohms (left channel blue, right red; linear frequency scale).

network connection or with files played back from the USB stick. Could this have been because only one reconstruction filter is available with this input: the "Minimum phase Fast Roll-off"? (See the "Measurements" sidebar.) Had I become used to the sound of the "Corrected minimum phase Fast Roll-off" filter?

I returned to the Jerome Harris track, this time streamed by Roon over my network. After switching off resampling and listening with the CMPFR filter, I switched to the MPFR filter. There was a tad more attack to the sounds of the vibes and bass guitar, but the difference between the filters was smaller than I had experienced between the same track sent by Roon to the RS250's USB and network inputs. Not by much, I admit, but enough that I preferred the network connection.

I then tried the "Apodizing Fast Roll-off" and "Minimum phase Slow Roll-off" filters, but in the end I returned to the CMPFR filter as my first choice for the ease to its sound.

Headphone listening

Plugging a pair of headphones into the front-panel jack mutes the analog outputs and activates the volume control if the RS250 had previously been set to one of the fixed output levels. There wasn't quite enough output voltage to drive the low-sensitivity Sennheiser HD-650 headphones to satisfying levels, even with the RS250's volume control set to its maximum of 99. However, there was enough *current* to successfully drive the low-*impedance* Audeze LCD-X and AudioQuest NightHawk headphones with the volume control set to 83 or so.

I cued up the Ginger Baker Trio's arrangement of Thelonious Monk's "Straight No Chaser" from the beautifully recorded 1994 album *Going Back Home* (16/44.1 Atlantic 82652-2), produced by erstwhile *Stereophile* writer Chip Stern. Baker's drums had excellent definition and good soundstage depth, though the kickdrum and Charlie Haden's double bass sounded a little softer than I am used to.

The incomparable Bill Frisell's contributions on guitar reminded me that I hadn't played his *East/West* album for too long a time, especially his arrangement of "Shenandoah" (16/44.1k FLAC file ripped from CD, Nonesuch) where he accompanies himself with looped guitar lines. There's a wonderful moment 2:35 in after a contemplative intro, when the drums and bass start to play and Frisell hits a power chord and turns up his guitar's volume. With the RS250-driven Audezes, this sent a chill down my spine. But the double bass still sounded a touch soft.

Over the years, I have made a number of binaural recordings, ranging from airplane shows and Formula One car races to a Grateful Dead concert at London's Rainbow Theatre in 1981. (Yes, I was a "taper"—using a pair of small omni mikes hanging in front of my ears and a battery-powered cassette recorder.) I was recording the sound of the Dead through their PA system, but they were meticulous in getting good sound. They also didn't play too loud. The various conversations and other noises from the crowd were clearly audible over the sound of the band—as they are in this recording. Indeed, at one point in "Friend of the Devil" a guy behind me clipped the recorder's input with a wild "whoo!" just as Jerry Garcia started his solo. I never could get my binaural recordings to project in front of my head. But to the sides and behind, the HiFi Rose and the LCD-Xes transported me back 30 years, depositing me in the middle of that audience.

ASSOCIATED EQUIPMENT

Digital sources Roon Nucleus+ music server; MBL N31 CD player/DAC; Ayre Acoustics QB-9 Twenty D/A processor.
Power amplifiers Parasound Halo JC 1+ monoblocks.
Loudspeakers GoldenEar BRX, PSB Synchrony T600.
Headphones Audeze LCD-X, Sennheiser HD-650, AudioQuest NightHawk.
Cables Digital: AudioQuest Vodka (Ethernet), AudioQuest OptiLink 5 (TosLink). Interconnect: AudioQuest Wild Blue (balanced) & Fire (single-ended). Speaker: AudioQuest Robin Hood. Headphone: Nordost Heimdall with Audeze LCD-X. AC: AudioQuest Dragon Source & High Current, manufacturers' own.
Accessories Sanus 29" loudspeaker stands; Target TT-5 equipment racks; Ayre Acoustics Myrtle Blocks; ASC Tube Traps, RPG Abffusor panels; AudioQuest 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.
Room 20' (left side), 25' (right side) × 16' × 8'. —John Atkinson

With the LCD-Xes, overall clarity was good, though the highs seemed a tad soft. I realized that the RS250 was resampling this 16/44.1 ALAC file to 176.4kHz, the setting I had last used with loudspeakers, so I switched to the original sample rate. The highs now seemed a little clearer but were also a little too bright.

Watching

Audio auditioning done with, I clicked on the Connect app's RoseTube icon, which took me not only to a selection of YouTube videos but also to a search button. Narcissist that I am, I searched for videos of my own recordings and found "In Paradisum" by the Portland State Chamber Choir, a track from our June 2020 Recording of the Month (Naxos 8574124).[8] Philip Jack's abstract images were displayed on the RS250's screen. The presentation was not quite as transparent as it had been when I played the CD with the MBL N31 and sent the bits to the RS250's TosLink input—I don't know what bitrate YouTube serves the audio with this video—but the solo cello was palpably presented, its stably positioned image surrounded by the choir's mostly wordless vocalizing.

Summing up

I wasn't sure what to expect from the HiFi Rose RS250, an extraordinarily versatile, affordable product from a new company. However, the sound quality of the HiFi Rose RS250 suggests that nothing had been compromised in packing so many features into its small chassis. In addition to its obvious application as a versatile music (or multimedia) server, the RS250 can serve another function: If you own a legacy D/A processor that you love the sound of but which only has S/PDIF inputs, the RS250 can act as a network bridge. Similarly, for LP playback, you could connect your phono preamp to the RS250's analog inputs.

Highly recommended both as a streaming DAC and as an all-in-one hub for a high-end audio system. ■

8 See youtube.com/watch?v=6NLBcvwWVec&t=1s.