LARRY GREENHILL

Bryston BDA-3

D/A PROCESSOR

The BDA-3 functioned like a digital Rosetta Stone.

In the February 2010 issue of *Stereophile*, I reviewed Bryston's first standalone digital-to-analog converter, the BDA-1 ($1995).[1] Five years later, Bryston released the BDA-2, which replaced the BDA-1's 24-bit/192kHz Crystal CS-4398 DAC with a pair of AKM DAC chips in balanced mode. In a February 2016 Follow-Up[2] I reported that the BDA-2 deepened and widened the BDA-1's soundstage, among other performance gains.

Yet the BDA-2 could not decode digital files encoded in DSD, a high-resolution digital format that has won interest because it offers music recorded with excellent clarity, realism, and dynamic range. I first heard a knockout DSD recording in one of Sony's exhibit rooms at the 2013 Consumer Electronics Show. Engineer Cookie Marenco, the founder of Blue Coast Records, played a multichannel DSD recording of Mahler's Symphony 1 using a Sonoma Workstation, an EMM multichannel DAC and controller, five Pass Laboratories amplifiers, and five Sony SS-AR2 speakers. I was stunned by the music's realism, extraordinary

1 See www.stereophile.com/digitalprocessors/bryston_bda-1_da_converter.
2 *Stereophile*, February 2016, Vol.39 No.2, p.137.

SPECIFICATIONS

Description Digital-to-analog processor with remote control of upsampling and some digital inputs. Digital inputs: 2 asynchronous USB 2.0 Type B; 4 HDMI (all HDMI 1.4a compliant; input 4 also HDCP 2.2 compliant), 2 S/PDIF electrical (1 BNC/coaxial wire, 1 RCA); 1 optical (TosLink); 1 AES/EBU (XLR). Digital input sample rates accepted: 32, 44.1, 48, 88.2, 96, 176.2, 192, 352, 384kHz PCM (S/PDIF, AES/EBU); DSD64 (HDMI, USB), DSD128 to DSD256 (USB only). USB audio drivers for computer sources: Microsoft Windows USB Audio Driver v3.23.0 required; no driver required for Macintosh or Linux. Control inputs: IR, 3 two-way interfaces (Ethernet, USB, RS-232), power/standby trigger input (3.5mm) carrying 3–12V AC or DC. Analog outputs: 1 pair each balanced (XLR), unbalanced (RCA). Digital outputs: 2 USB 2.0 Type B, 1 HDMI. Maximum outputs: 4.0V balanced, 2.0V RMS unbalanced. Input impedance: AES/EBU (110 ohms); S/PDIF 1 (75 ohms coaxial RCA), S/PDIF 2 (75 ohms coaxial BNC). Output impedance: not specified. Upsampling: 44.1 and 88.2 to 176.4kHz; 48 and 96 to 192kHz. DAC filter settings: Super Slow Rolloff, Short Delay Slow Rolloff, Slow Rolloff, Short Delay Sharp Rolloff, Sharp Rolloff. Frequency response: 20Hz–20kHz, ±0.1dB. THD+noise at 1kHz: 0.002%. IMD (CCIF): 0.0003%, 19+20kHz. Channel separation: not specified. Output noise: –140dB balanced, 20Hz– 20kHz, ref. 1V. Signal/noise: 140dB. Dynamic range at –60dBfs: not specified. Jitter: not specified. Power consumption: 10VA.
Dimensions 17" (431.8mm) or 19" (482.6mm) W (depending on faceplate chosen) by 3.63" (92.2mm) or 2.76" (70mm) H (with/without feet) by 11.12" (282.45mm) D. Weight: 8.5 lbs (3.9kg).
Finishes Black, silver.
Serial number of unit reviewed: 000289.
Price $3495; add $250 for BR-2 remote control. Approximate number of dealers: 295. Warranty: 5 years parts & labor, digital circuits.
Manufacturer Bryston Limited, PO Box 2170, 677 Neal Drive, Peterborough, Ontario K9J 6X7, Canada.
Tel: (800) 632-8217, (705) 742-5325.
Fax: (705) 742-0882.
US: Bryston Service USA, 30 Coventry Street, Newport, VT 05855.
Tel: (802) 334-1201.
Fax: (802) 334-6658.
Web: www.bryston.com.

dynamic range, and wide, deep soundstage. I couldn't tell if the stunning clarity, ambience, and dynamics I was hearing were due to the high resolution of DSD or the fact that I was hearing a multichannel mix (or both). To find out, I dragged *Stereophile*'s multichannel expert, Kal Rubinson, back to Sony's suite, but if he came up with an answer to my question, I never learned it. That said, he raved about the demo in his May 2013 column,[3] calling it "a system of bracing simplicity" that "possessed, simultaneously, clarity, coherence, and spaciousness."

Which brings me to Bryston's new DAC, the BDA-3 ($3495), which can process both PCM and DSD files. When I heard that it also has HDMI inputs—the only interface standard that can transfer DSD data from SACDs—I hurriedly requested a review sample.

DSD from SACD

In 2015, as I reviewed the Mark Levinson No.585 integrated amplifier,[4] my Las Vegas DSD epiphany was confirmed. The No.585's internal DAC was able to process DSD files to produce the same richness and coherence of musical detail I'd heard at the 2013 CES. But the No.585 lacked the HDMI input needed to accept DSD files from SACDs.

Michael Fremer experienced the same frustration while reviewing Simaudio's Moon Evolution 780D DAC ($15,000), which also lacks an HDMI input.[5] Surveying his "wall full of SACDs," he lamented, "it's beyond frustrating to know that all that hi-rez music is still locked out, unable to be decoded by this well-built, well-engineered, superb-sounding, and otherwise versatile DAC." While the 780D's USB 2.0 Type B input was compatible with three DSD sample rates, it could not accept DSD from SACDs.

Why does the SACD format require an HDMI connection? Sony, which partnered with Philips to develop the Super Audio Compact Disc and now licenses the format to other manufacturers to make SACD drives, designed its firmware to prevent DSD hi-rez data from being copied via any connector that could be connected to a digital recorder of any kind. Only connection via the High Definition Multimedia Interface (HDMI) was permitted, because of its handshaking capability and its then-exclusive use with video monitors. The BDA-3 not only has an HDMI input—it has four. All I needed was an SACD player with an HDMI output. So, for this review, I bought an Oppo BDP-103 universal BD/DVD/SACD/CD player.

Description

While its controls and aluminum case resemble those of Bryston's earlier DACs, the BDA-3 has three visible differences: its front panel is $\frac{5}{8}$" taller; its connectors include four HDMI inputs and one HDMI output; and its front-panel display includes an extra column of LEDs to indicate DSD signal rates. The first two stacks of LEDs display the eight PCM sampling rates the BDA-3 can process, while the third column shows the sampling rates for DSD64 (2.8224MHz), DSD128 (5.6448MHz), and DSD256 (11.2896MHz). These LEDs glow green if the incoming DSD signal is formatted as DSD-over-PCM (DoP), amber if native DSD. A user-controlled upsampling feature can increase PCM data rate in multiples of 44.1 or 48kHz but does not alter DSD data. (Upsampling cannot be applied to

3 See www.stereophile.com/content/music-round-60.

4 See the December 2015 issue: www.stereophile.com/content/mark-levinson-no585-integrated-amplifier.

5 See the August 2016 issue: www.stereophile.com/content/moon-simaudio-evolution-780d-da-processor.

MEASUREMENTS

I measured the Bryston BDA-3 with my Audio Precision SYS2722 system (see the January 2008 "As We See It," http://tinyurl.com/4ffpve4). As well as the Audio Precision's digital outputs, I used WAV and AIFF test-tone files sourced via USB from my MacBook Pro running on battery power with Pure Music 3.0. Apple's USB Prober utility identified the Bryston DAC as "BDA3 Audio 2.0" from "Bryston," and revealed that its USB port operated in the optimal isochronous asynchronous mode. Apple's AudioMIDI utility revealed that, via USB, the BDA-3 accepted 24-bit integer data sampled at all rates from 44.1 to 384kHz. I didn't test the BDA-3 with HDMI, DSD, or Ethernet data.

The maximum output levels at 1kHz were as specified, at 4.05V balanced and 2.05V unbalanced. Both outputs preserved absolute polarity (*ie*, were non-inverting). The unbalanced output impedance was low, at 72 ohms at high and middle frequencies, increasing inconsequentially to 82 ohms in the low bass. The balanced output impedances were twice those values, as expected.

The impulse response with data sampled at 44.1kHz (fig.1) revealed that the digital reconstruction filter used by LG was a minimum-phase type, with all ringing occurring after the single sample at 0dBFS. Wideband analysis of the BDA-3's output while it reproduced 44.1kHz-sampled white noise at –4dBFS[1] indicated that this filter rolled off steeply above 20kHz, with the ultrasonic image at 25kHz of a full-scale 19.1kHz tone suppressed by more than 100dB (fig.2). Note that the distortion harmonics of that tone all lie at –104dB or lower (0.0006%). This DAC is superbly linear.

Fig.3, taken with data sampled at

1 My thanks to Jürgen Reis of MBL for suggesting this test to me.

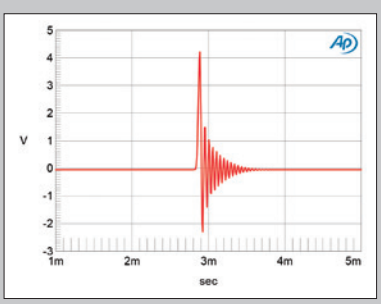

Fig.1 Bryston BDA-3, impulse response (one sample at 0dBFS, 44.1kHz sampling, 4ms time window).

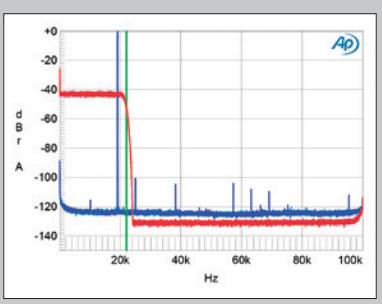

Fig.2 Bryston BDA-3, wideband spectrum of white noise at –4dBFS (left channel red, right magenta) and 19.1kHz tone at 0dBFS (left blue, right cyan), with data sampled at 44.1kHz (20dB/vertical div.).

USB or HDMI inputs.)

In all, the BDA-3 has 10 digital inputs: four HDMI, two USB 2.0 Type 2 asynchronous, one AES/EBU, one optical (TosLink), and two S/PDIF (one RCA, one BNC). This leaves room for an IEC-320 C14 socket for the detachable power cord, a trigger input for power/standby, three two-way control interfaces (RS232, Ethernet, USB Type B), an HDMI output for video throughput, and two pairs of analog outputs (RCA and XLR).

The BDA-3's various digital inputs support different file formats and sample rates. The S/PDIF and AES/EBU inputs handle PCM files up to 24-bit/192kHz, but not DSD; the optical input, PCM up to 24/96; and the HDMI inputs, PCM formats up to 24/192 and DSD64 from SACD. The BDA-3's asynchronous USB 2.0 Type B inputs are the most flexible, being compatible with PCM digital sample rates up to 32/384 and all three DSD resolutions, but not DSD from SACD. The BDA-3 does not support MQA, or multichannel Dolby Digital or DTS.

Processing Technology

To reduce jitter, the BDA-3 strips the embedded clock signal from the incoming digital datastream and reclocks it with its own high-precision master clock. PCM and DSD formats are handled by separate circuit paths—no internal DSD-to-PCM conversion is done before the datastream reaches the DACs. The BDA-3's two 32-bit AKM DACs process DSD both natively and in DoP. Once converted to analog, the signal is amplified by Bryston's "proprietary discrete class-A op-amps," which drive the BDA-3's audio outputs.

Internal Construction

Lifting off the BDA-3's top panel reveals, behind the left side of the front panel, a toroidal transformer and a power supply said by Bryston to be highly regulated. A ribbon cable connects the front-panel controls to the larger of two printed circuit boards (PCBs) for input switching inputs. Also on this PCB are multistage voltage regulation and the power supply's electrolytic capacitors. Above this main PCB and attached to the rear panel are two daughterboards: the top one contains the circuitry for the four HDMI input and one HDMI output connectors, the bottom one the circuitry for the two asynchronous USB 2.0 Type B connectors. To the right, another smaller PCB contains the twin DACs and the class-A, balanced analog outputs. The BDA-3's input receiver, sample-rate converter, DAC, and output stage are independently regulated to prevent interaction and thus any resulting jitter. Traces appear carefully routed to reduce the risk of capacitive coupling and further reduce noise and distortion, especially for the low-voltage analog signals leaving the DAC.

The main PCB is made of double-sided epoxy glass with clearly printed component markings. The surface-mount components populating the PCBs include high-quality, 0.1%-tolerance metal-film resistors and polystyrene capacitors. Soldered and other gas-tight mechanical connections are used for the signal paths. All electrical inputs are galvanically isolated to minimize the noise from source components. The BDA-3's parts quality and assembly are topnotch—it should run smoothly for a lifetime. Bryston offers a five-year warranty for the BDA-3, including parts and labor.

Setup

Installing the Bryston BDA-3 in my system involved only finding a place for it on a shelf and plugging in various interconnects. I ran balanced and unbalanced interconnects from

measurements, continued

44.1, 96, and 192kHz, is a more orthodox means of showing the Bryston's frequency response. With each sample rate, the BDA-3's output conforms to the same gentle rolloff above 10kHz, with the response down by just 0.25dB at 20kHz, but then a sharp rolloff just below half of each rate. With USB data sampled at 384kHz, the output was down by 6dB at the same 80kHz as with 192kHz data, but continued the gentle rolloff to reach –13dB at 120kHz. Channel separation was superb, at 125dB at 1kHz, and still 113dB at the top of the audioband.

Fig.4 shows spectral analysis of the BDA-3's noise floor with a 24-bit, 1kHz tone at 0dBFS (blue and red traces) and –60dBFS (green, gray). Other than a vanishingly small amount of 120Hz hum (at –147dB!), the spectra are free from spuriae. Note that, as the Bryston has such a low level of self-noise, I have increased the vertical scale in this graph from my usual –150 to –160dBFS, and have also done so for the spectra of the Bryston's output as it reproduced a dithered 1kHz tone with 16- and 24-bit AES/EBU data (fig.5). (The result was the same with

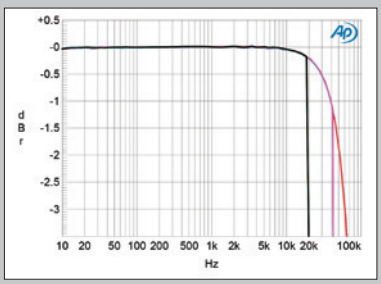

Fig.3 Bryston BDA-3, frequency response at –12dBFS into 100k ohms with data sampled at: 44.1kHz (left channel green, right gray), 96kHz (left cyan, right magenta), 192kHz (left blue, right red), 384kHz (left green, right gray) (0.5dB/vertical div.).

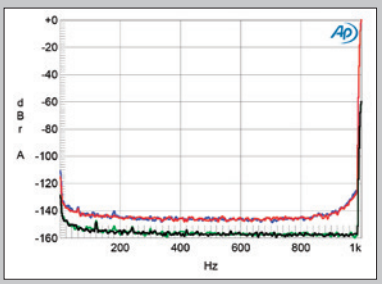

Fig.4 Bryston BDA-3, spectrum with noise and spuriae of dithered 24-bit 1kHz tone at 0dBFS (left channel blue, right red) and –60dBFS (left green, right gray) (20dB/vertical div.).

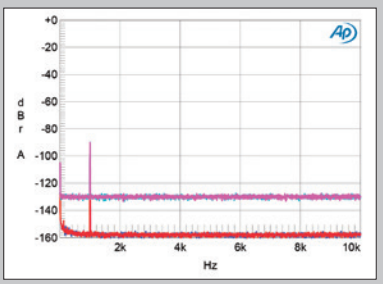

Fig.5 Bryston BDA-3, spectrum with noise and spuriae of dithered 1kHz tone at –90dBFS with: 16-bit data (left channel cyan, right magenta), 24-bit data (left blue, right red) (20dB/vertical div.).

the BDA-3's analog outputs to my Mark Levinson No.526 preamplifier. To play digital discs, I connected to the BDA-3's corresponding inputs a Wireworld Starlight coaxial cable, run from my Bryston BCD-1 CD player's[6] S/PDIF output; a Bryston AES/EBU cable, from my Bryston BDP-2 media player; and an HDMI cable, from my new Oppo BDP-103 disc player's HDMI 2 output. This enabled me to switch the No.526 preamp between the BCD-1's Crystal CS-43398 DAC and the output of the BDA-3's AKM DACs. I ran a USB link from my Lenovo P50 laptop to one of the BDA-3's USB 2.0 Type B connectors, to be able to stream DSD and PCM files from the laptop using JRiver Media Center 22.

The BDA-3's manual describes additional setup steps, including the installation in my laptop of Bryston's Windows USB driver, as well as how to configure the JRiver Media and Foobar 2000 player softwares. The manual is clearly written, with big diagrams. Other installation challenges can be addressed by e-mailing or calling Bryston support.

The real work of setting up the BDA-3 involved not the DAC itself, but correctly configuring the digital source components feeding it—the laptop, SACD player, and digital media player. For the better part of three days, I consulted with experts at Bryston and Oppo so that I could correctly manipulate the setup menus of the three sources (see sidebar, "Setting Up Digital Source Components to Output DSD to the BDA-3").

Jjhcdb vksjh dbv ksjch skj sd ds kwej vbwkej vbwkjev bewkv bwk dfjnv.

With all source components properly configured, the BDA-3 functioned like a digital Rosetta Stone that I could control from my listening seat with Bryston's BR-2 remote control (a $250 option). Except for a nine-second delay when switching between USB inputs, switching among inputs was instantaneous. Unfortunately, the BR-2 dos not allow selection of the USB 2 input or any HDMI input.

A quick check confirmed that the BDA-3 was processing DSD and PCM files of different sample rates with ease, lighting up the correct columns of LEDs on its front panel. To do this, I downloaded songs by Blue Coast Records artists Meghan Andrews and Marco Ferrero that had been recorded at different DSD sample rates, including "99"

6 See my review of the Bryston BCD-1 in the February 2009 issue: www.stereophile.com/cdplayers/bryston_bcd-1_cd_player/index.html.

measurements, continued

USB data.) The increase in bit depth drops the noise floor by almost 30dB, meaning that the BDA-3 offers close to 21-bit resolution—one of the best I have encountered. Note also that the spectra are free from any harmonic distortion.

With its very low noise and correspondingly high resolution, the Bryston's reproduction of an undithered 16-bit/1kHz tone at exactly –90.31dBFS was essentially perfect (fig.6): The three DC voltage levels described by the data and the minimum-phase behavior of the reconstruction filter are clearly visible. With undithered 24-bit data, the result was an almost noise-free sinewave (not shown), despite the very low signal level.

Fig.2, taken into a high 100k ohms, has already indicated that the BDA-3 offered a very low level of harmonic distortion; repeating the analysis with a full-scale low-frequency tone into a punishing 600 ohms confirmed that indication (fig.7). In fact, though the third harmonic is the highest in level, it still lies at just –100dB (0.001%).

All of the measurements so far were taken without upsampling. Repeating them with AES/EBU data and upsampling selected produced no differences. (The upsampling wasn't operative with USB data.) However, when I used an equal mix of 19 and 20kHz tones, sampled at 44.1kHz and

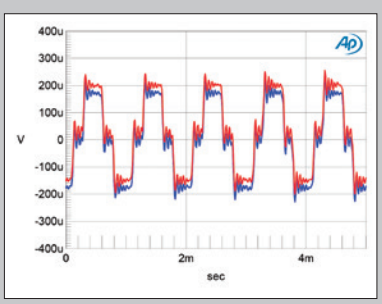

Fig.6 Bryston BDA-3, waveform of undithered 1kHz sinewave at –90.31dBFS, 16-bit data (left channel blue, right red).

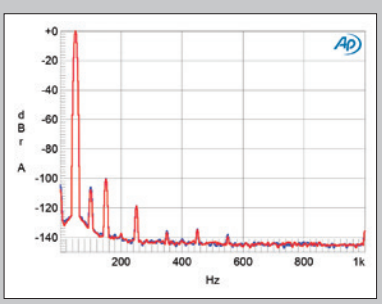

Fig.7 Bryston BDA-3, spectrum of 50Hz sinewave, DC–1kHz, at 0dBFS into 600 ohms (left channel blue, right red; linear frequency scale).

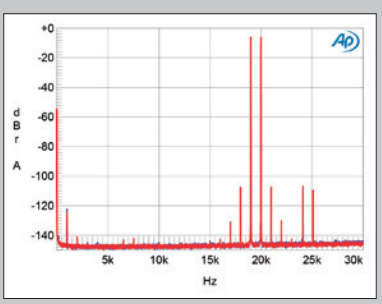

Fig.8 Bryston BDA-3, HF intermodulation spectrum, DC–30kHz, 19+20kHz at 0dBFS into 100k ohms, 44.1kHz data (left channel blue, right red; linear frequency scale).

(DSD64), "Just Let Go" (DSD128), and "Johnny Colorado" (DSD256).[7] From 2L Records' HiRes Download Test Bench I downloaded DSD and PCM files, at various sample rates, of Tone Wik and Barokkanerne's performance, on period instruments, of Vivaldi's Cantata RV 679, "Che giova, il sospirar, povera core," for soprano, violin, and harpsicord.[8] I also compared the DSD128 version of this recording through two different inputs of the BDA-3, AES/EBU and USB 2.0 Type B, and heard no difference in sound quality.

Listening

With my three source components successfully streaming DSD, I sat down to do some serious listening. I was eager to hear my SACDs decoded by a standalone, high-performance DAC rather than by my SACD player's own DAC. Mind you, these SACDs already sounded quite good through the DAC of my eight-year-old Sony SCD-C555ES SACD player.

On DSD from SACD, the BDA-3's spatial performance was sensational, with wider, deeper soundstages than heard from my SACD player on its own. The enhanced three-dimensionality resulted in more precise positionings of instruments, voices, and sound effects in space, as I heard in the opening of "Breathe (in the Air)," from Pink Floyd's *Dark Side of the Moon* (SACD/CD, Capitol CDP 5 82136 2), which filled my room with dive-bombing airplanes, sinister laughter, and the sounds of someone running across the room. Soundstages were widest and deepest in Duruflé's *Ubi Caritas*, from the collection *Sacred Feast*, with Paul Halley directing the unaccompanied choral group Gaudeamus (SACD/CD, DMP SACD-09). In addition, SACDs played through the Oppo BDP-103 and BDA-3 sounded more relaxed and smooth, and more involving than I could recall them sounding before.

Playing CDs, I enjoyed how the BDA-3's imaging abilities captured the ambiences of recording venues—*eg*, that of *Gnomus*, from Jean Guillou's performance of his own transcription for organ of Mussorgsky's *Pictures at an Exhibition* (CD, Dorian DOR-90117). The BCD-3 also conveyed the ambiences of more intimate recording venues, enabling it to separate tenor Gary Ruschman's voice from those of the other singers in John Atkinson's recording of Eric Whitacre's "Lux Aurumque," from Cantus's *While You Are Alive* (CD, Cantus CTS-1208). Similarly, the DAC enhanced the space around the drum kit at the end of "Nardis," from Patricia Barber's *Café Blue* (CD, Premonition/Blue Note 21810-2), placing Barber's voice center stage, her piano to the right, the drum kit to the left, and the double bass just behind the drums.

The BDA-3's dynamic range was fantastic. It easily rendered the in-your-face dynamics of David Bowie's whisper-to-scream "Putting Out Fire," from the *Cat People* soundtrack (CD, MCA MCAD-1498); the eerie synthesizer in Don Dorsey's "Ascent," from Erich Kunzel and the Cincinnati Pops' *Time Warp* (CD, Telarc CD-80106); the rapid-fire piano scales that burst out of black silence in "The Handoff," from James Horner's *Sneakers* soundtrack (CD, Columbia CK 53146); the rim shots and drum beats mixed with shouts from the audience during Brady Blade's drum solo in "The Maker," from Emmylou Harris's *Spyboy* (CD, Eminent EM-25001-2); the deep, propulsive kick drum that opens and drives "Dreams," from Fleetwood Mac's The Dance (CD, Reprise 46702-2); and the red-hot rim shots

7 See http://bluecoastrecords.downloadsnow.net/special-event-43.
8 See www.2l.no/hires/index.html.

measurements, continued

with the peak level of the waveform reaching 0dBFS, the aliasing images of the two tones at 24.1 and 25.1kHz, which had been present without upsampling (fig.8), disappeared as expected when upsampling was selected (fig.9). And unlike with the upsampling function in Bryston's earlier BDA-1,[2] the noise floor remained clean. Either way, actual intermodulation distortion was vanishingly low in level.

Tested for its rejection of word-clock jitter using an AES/EBU connection and 16-bit J-Test data, the BDA-3's output was free from data-related spuriae, and all the odd-order harmonics of the low-frequency squarewave were at the correct levels (fig.10, green trace). With 24-bit data, the harmonics disappeared as expected and the noise floor was free from spuriae of any kind (fig.11).

With its extremely low levels of noise, harmonic and intermodulation distortion, and its superb resolution, the Bryston BDA-3 offers measured performance that is as good as digital can get.—**John Atkinson**

2 See www.stereophile.com/content/bryston-bda-1-da-converter-measurements.

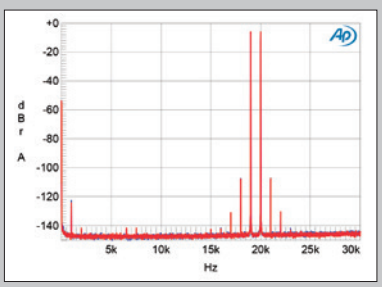

Fig.9 Bryston BDA-3 with upsampling, HF intermodulation spectrum, DC–30kHz, 19+20kHz at 0dBFS into 100k ohms, 44.1kHz data (left channel blue, right red; linear frequency scale).

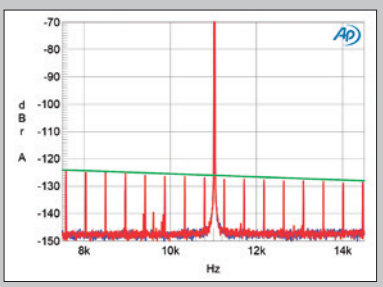

Fig.10 Bryston BDA-3, high-resolution jitter spectrum of analog output signal, 11.025kHz at –6dBFS, sampled at 44.1kHz with LSB toggled at 229Hz: 16-bit AES/EBU data (left channel blue, right red). Center frequency of trace, 11.025kHz; frequency range, 43.5kHz.

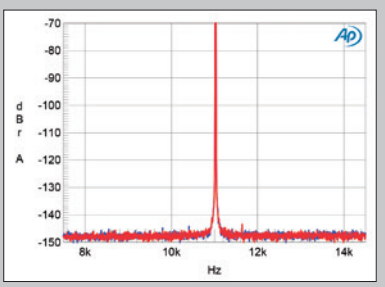

Fig.11 Bryston BDA-3, high-resolution jitter spectrum of analog output signal, 11.025kHz at –6dBFS, sampled at 44.1kHz with LSB toggled at 229Hz: 24-bit AES/EBU data (left channel blue, right red). Center frequency of trace, 11.025kHz; frequency range, 43.5kHz.

from drummer Mark Flynn that open "Blizzard Limbs," from Attention Screen's *Live at Merkin Hall* (CD, Stereophile STPH018-2). And I delighted again in hearing the pounding bass synth that runs through "Assault on Ryan's House," from Horner's score for *Patriot Games* (CD, RCA 66051-2). I was stunned by a number of passages in Stravinsky's *The Rite of Spring*, with Esa-Pekka Salonen conducting the Los Angeles Philharmonic (SACD/CD, Deutsche Grammophon 02899 477 5198-2), a recording that captures the full dynamics of the orchestra's pulsating timpani and thunderous bass drum.

The BDA-3's highs were clean, open, effortless, grainless, and extended. Zofia Kilanowisz's lucid soprano in Górecki's Symphony 3, *Symphony of Sorrowful Songs*, with the composer conducting the National Polish Radio Symphony Orchestra (SACD/CD, Polskie Radio PRSACD2), was entrancing and crystal-clear. Billy Drummond's wire-brushed ride cymbal at the beginning of "The Mooche," from the Jerome Harris Quintet's *Rendezvous* (CD, Stereophile STPH013-2), came across well, its characteristic metallic sound easy to identify. The BDA-3's excellent treble response let Meghan Andrews's eerie, feather-light soprano generate an unusually sad, lonely, but hopeful effect in her DSD128 recording of "Just Let Go" (Blue Coast Records download). Emmylou Harris's effortless and delicate unaccompanied soprano in "Calling My Children Back Home," from *Spyboy*, was distinct from Buddy Miller's soft tenor.

The BDA-3's reproduction of the midrange was equally effortless and clean, with superb rendition of instrumental colors. The timbres of the guitar and alto saxophone in the L.A. Four's *Going Home* (Japanese CD, Ai Music 3 2JD-10043) were natural and just right. So, too, was the Bryston's reproduction of the rich timbre of the solo bassoon that opens Herbert Owen Reed's *La Fiesta Mexicana*, from Howard Dunn and the Dallas Wind Symphony's *Fiesta!* (CD, Reference RR-38CD). Buddy Miller's mando guitar accompaniment to Emmylou Harris's "Prayer in Open D," also from *Spyboy*, was energized by the detailed rendering of its timbre.

Male voices benefited from the BDA-3's clean processing, which produced a relaxed smoothness with no sign of stress or edge. James Taylor's voice in "Line 'Em Up," from his *Hourglass* (SACD, Columbia ACS 67912), was smooth, effortless, fluid, and sweet in a way I hadn't heard before. From the same album, Taylor's "Enough to Be on Your Way" elicited a deep, heavy feeling of sadness and anger not heard in earlier auditions. The BDA-3 easily resolved the layers of texture in the resonant voices of the Turtle Creek Chorale, a men's chorus led by Timothy Seelig, in their performance of John Rutter's "Lord make me an instrument of thy peace," on *Requiem* (CD, Reference RR-57).

When it came to low frequencies, the BDA-3 easily integrated deep bass notes with the sounds of other orches-

ASSOCIATED EQUIPMENT

Analog Sources Linn Sondek LP12 turntable with Lingo power supply, Linn Ittok tonearm, Spectral cartridge; Day-Sequerra 25-year Anniversary FM Reference tuner.
Digital Sources Bryston BCD-1 CD player & BDP-2 media player with IAD sound board; Oppo BPD-103 universal Blu-ray player; Sony SCD-C555ES SACD/CD player; Lenovo P50 computer running Windows 10 Professional (64-bit), Bryston USB driver, JRiver Media Center 22.
Preamplifiers Bryston B-26, Mark Levinson No.526.
Power Amplifiers Mark [redacted]son No.334 (stereo) & No.536 (monoblocks).
Loudspeakers Revel Ultima Salon2, JL Audio Fathom f212v2s subwoofers (2).
Cables Digital: Wireworld Starlight (coaxial). Interconnect: Bryston (balanced), Mark Levinson Silver & Red Rose Silver One, Pure Silver, Totem Acoustic Sinew (single-ended). Speaker: Coincident Speaker Technology CST 1, Pure Silver R50 (biwire double ribbon), QED X-Tube 400, Ultralink Excelsior 6N OFHC.
Accessories JL Audio CR-1 electronic crossover; Torus Power Isolation Unit Tot Max power conditioner (120V, 10A max, 2400VA, 6 outlets); Studio Six iTestMic for Apple iPhone6 & Apple iPad; Studio 6 Pro Mike1 Audio Analyzer. Listening room: 26' L by 13' W by 12' H with semi-cathedral ceiling, moderately furnished with sound-absorbing furniture. Large bay window in left wall covered with Hunter Douglas Duette Honeycomb fabric shades. Rear of room opens into 25' by 15' kitchen through 8' by 4' doorway.—**Larry Greenhill**

SETTING UP DIGITAL SOURCE COMPONENTS TO OUTPUT DSD

For this review, I depended on my digital source components to stream DSD files to drive Bryston's BDA-3 DAC. To make this possible, I first had to reconfigure each component's setup menu.

Before the Bryston BDP-2 media player could stream DSD files, its firmware needed to be updated. That done, I accessed the BDP-2's Web user interface, selected Audio Devices, and checked the option "BDA-3 Audio 2.0-USB Audio." The BDP-2 could then stream DSD64 and DSD128 files, but not DSD256. An e-mail to Bryston Service USA revealed that the BDP-2's Linux operating system is incompatible with DSD256.

My Lenovo P50 laptop also needed reconfiguring. First, I had to install the latest version of Bryston's USB Audio ASIO driver. Second, my laptop's installed version of JRiver's Media Center 22 software for streaming digital files needed new setup options, including checking the DSD option, then checking "Bitstreaming: YES (DSD)" on the USB Audio Driver page. That done, the laptop could stream DSD64, 128, and 256 through a USB 2.0 Type B cable.

My Oppo BDP-103 BD/SACD/CD player had to be set up to output DSD64 from SACDs. To view the Oppo's internal setup, I attached a small TV monitor to the diagnostic video output connector on its rear panel. Using the remote handset, I then selected "SACD Priority" and "stereo output," to override the player's default multichannel/PCM factory settings. Then I connected an HDMI cable to the Oppo's HDMI Out 2 jack—not its HDMI Out 1 jack, which is not wired to pass along DSD. Only when all that was done would the Oppo output the DSD64 file of "Breathe," from the SACD of Pink Floyd's Dark Side of the Moon.—**Larry Greenhill**

tral instruments, musically and spatially. In Eiji Oue and the Minnesota Orchestra's 24/176 PCM recording of Stravinsky's *Rite of Spring* (CD, Reference RR-70CD), I could easily hear subtle changes in the pitches of timpani notes. The BDA-3's great pitch definition made it easy to follow organist Olivier Latry's pedal notes in the first movement of Saint-Saëns's Symphony 3, with Christoph Eschenbach and the Philadelphia Orchestra (SACD/CD, Ondine ODE 1094-5). And the Bryston fully reproduced the intense, raw, pulsing, raspy bass of David Hudson's didgeridoo in "Rainforest Wonder," from his *Didgeridoo Spirit* (Indigenous Australia, IA2003D).

Synthesized bass was cleanly and convincingly reproduced by the BDA-3 in all its grab-you-by-the-collar intensity. The deepest synth growls and pulses in "Attempt on the Royals," from Horner's *Patriot Games*, shook my listening room with its torturous mix of deep pulses, chimes, gongs, blocks, and snare drum. The BDA-3's reproduction of the heartbeat that opens and builds, in Pink Floyd's "Breathe," to a massive and subterranean climax was bewildering and thrilling. Similarly, the staccato deep-bass synth in "Something's Wrong," from Randy Edelman's score for the film *My Cousin Vinny* (CD, Varèse Sarabande VSD-5364), stunned me with its solid, gut-pounding impact

Organ music never sounded better than through the Bryston BDA-3. John Atkinson's 24/88.2 AIFF file of organist Jonas Nordwall playing the Toccata of Widor's Organ Symphony 5 delivered massive pedal notes with excellent pitch definition. Organist John Busby's performance of Herbert Howells's *Master Tallis's Testament*, from the compilation *Pipes Rhode Island* (CD, Riago 101), pressurized my room and rattled the metal radiator covers. The deep pedal notes in *Gnomus*, from Guillou's transcription of *Pictures at an Exhibition*, were focused and deep, rumbling the floor beneath my feet. And I was impressed with how the BDA-3 was able to retain the air around Nancy Keith's lovely soprano in *Piè Jesu*, from Rutter's *Requiem*, while simultaneously conveying the full weight of the massive, almost infrasonic pedal notes of the pipe organ.

Conclusions

While it was frustrating not to be able to play MQA files through the Bryston BDA-3, that didn't keep it from being the most versatile and best-sounding DAC I've heard in my listening room. It delivered superbly effortless, delicate, subtly revealing, tube-like analog output from a variety of digital file formats and sample rates, including DSD64 datastreams from SACDs. Although pricey at $3495, it's less expensive than some high-end, standalone DACs that can't process as many types of digital files.

The BDA-3 arrives from the factory ready to play more varied digital file formats than your digital source components are surely set up to deliver. For that reason, demand that any dealer or custom installer who sells you a BDA-3 be prepared to set up the rest of your system to be compatible with all of the formats and sample speeds your new Bryston can handle.

This versatility makes it an ideal reviewer's tool for evaluating other high-end gear. For that reason alone, I had no choice but to buy the review sample, and I recommend that the BDA-3 be listed in Class A+ of *Stereophile*'s "Recommended Components." ■