THE DUAL
DAC

PerfectWave DirectStream DAC

Three letters make the audio world sit up and take notice—DSD. With their new 'DirectStream DAC', PS Audio introduces a D/A converter that not only creates analog from digital, but first converts all data streams into the SACD format

Has the world really gone mad? While SACD has had a miserable existence with us, it has for some time now excited the international audiophile community as the data format known as 'Direct Stream Digital', or 'DSD' for short. And this has especially been true for high resolution music downloads for PC processing and network storage. Important albums from the past are now on servers, available at your beck and call.

The fact that a respected label like Opus3 is offering its present analog tape catalog exclusively in DSD, or even as a 'double DSD'—with a double bandwidth of 5.5 MHz—is further fueling the hype. Compared to high bit PCM, such as 24-bit / 192 kHz, listeners describe a special naturalness, a homogeneity, rhythm, and flow with DSD Bitstream processing when it's done at a minimum of 2.8 MHz.

It seems almost like a marketing coup that Boulder, Colorado based audio

specialist, PS Audio, has just introduced an expensive 'DirectStream DAC', at just under € 6,000*, clearly riding the DSD wave. It is the replacement for the company's successful 'PerfectWave DAC'.

Data transfer in the DSD format

It's not at all uncommon for current D/A converters, especially high end models, to process DSD data. Thanks to the work of a group of DSD enthusiasts within the digital audio community, there has been a concerted 'DoP' ('DSD over PCM') movement since 2012. One of the results of this effort has been the manipulation of PCM circuits so that they transmit DSD data streams without prior conversion to PCM. This of course keeps costs down.

But the new DirectStream DAC from

PS Audio, which is equally as unique and innovative, is different. Its special feature is that it converts all incoming digital formats to Bitstream. This is done at 10x the normal DSD sampling rate, i.e., 28 megahertz, since this is the first common sampling rate multiple in the range of 44.1/48-, 88.2/96-, or 176.4/192 kHz that doesn't require interpolation in the upsampling.

This, of course, wouldn't be possible with conventional chips. Which is why scientist and audiophile, Ted Smith, whose background is in the specialist digital field, fundamentally conceived and designed the DSD DAC from ground up utilizing the user-programmable Spartan 6 FPGA (Field-Programmable Gate Array) chip from Xilinx. It took seven years and hundreds of hours of listening to determine the correct algorithms for the transfer process. PS Audio president, Paul McGowan, says of Ted Smith's work and development that at first he followed it casually, but then decided after understanding its potential to turn Ted's DSD DAC design into a finished product—a

development project that turned out to be the longest in PS Audio's history.

To its credit, the final product features a highly accurate central clock for clocking its extremely low jitter—Americans tend to be very nervous about 'time error' due to interference—and it processes virtually every one of today's digital formats. From MP3 to PCM high bit-rate files up to 24-bit/192 kHz; and DSD data files at rates of 2.8 and 5.6 MHz ('DSD128').

As for PCM sources, upsampling takes place on a 50-bit basis, so the fine steps span a wide range of volume control. The DSD DAC controls the output stages directly; and very importantly, attenuation is done without degrading resolution. It is only after the conversion to DSD128 that attenuation takes place, and where a steep 24 dB low-pass filter is implemented to roll off frequencies above 80 kHz. This, according to Smith, is because a higher threshold would generate the dreaded clocking error, and in turn jitter.

Part of the low-pass filtering is performed by a broadband, balanced transformer at the RCA and XLR outputs, which also works in conjunction with the high-current, exciting, very fast amplifier. Because the DSD DAC adds a passive

output stage, decoupling the electronics and in practice providing a low output impedance, long cable runs can be used to the pre or power amplifier—an added benefit.

Touch display and IR transmitter

You could easily fill pages with descriptions of the innovation and brains jammed into the DSD DAC. For convenience, it can be controlled by a full-function remote control, which conveniently provides a button for each digital input and a variety of other inputs, as well as options such as a three position switch for adjusting display brightness (which itself is a very functional touch screen). When the remote's batteries are low, you can easily control the DAC via this touch screen. For an extra € 895* you can integrate the DAC into your home network via a 'bridge'. For our evaluation, we 'fed' the unit via the USB input, designed for computer interface, and the coaxial and XLR inputs.

If you work with a Windows PC, you can download the appropriate American

KEYWORD

Bitstream processing: Unlike PCM formats in which data is bundled into packets, DSD runs in a constant, unstructured datastream, where all bits are equivalent.

▲ This programmable chip contains elaborate algorithms for the conversion of PCM to DSD, puzzled out after extensive computation and listening
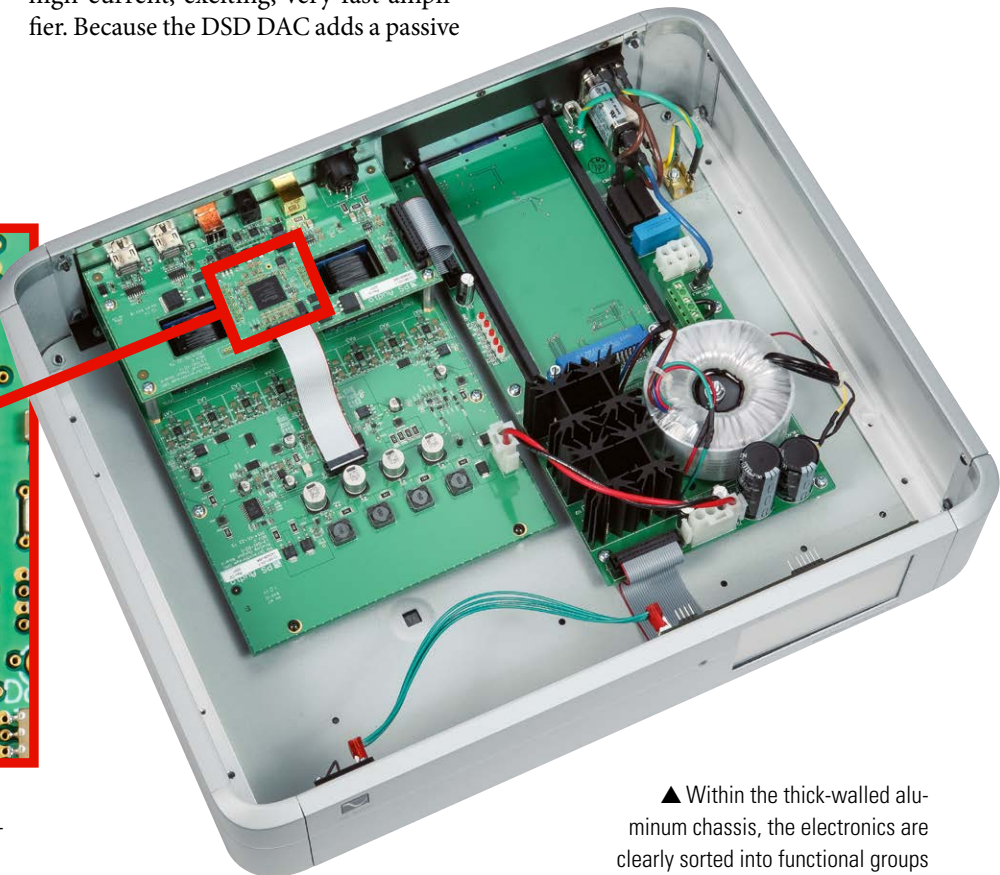
▲ Within the thick-walled aluminum chassis, the electronics are clearly sorted into functional groups

*All prices listed are German retail prices incl. VAT valid at the time of evaluation.

TEST-COMPONENTS

STREAMER/PLAYER: T+A MP3000HV

CD-Drive: Musical Fidelity M1 CDT

D/A Converters: Accustic Arts TUBE-DACII, MBL 1511F, T+A MP3000HV

PRE/POWER AMP: Accustic Arts TUBE-PREAMPII-MK2/AMPII-MK2

LOUDSPEAKERS: DALI Epicon 6, Dynaudio Contour S5.4, Verity Audio Leonore

CABLES: HMS Gran Finale Jub. (NF, LS (Bi-Wire), Audioquest Diamond (Digital USB), Purist Audio Design Aqueous Aureus (Digital koax)

USB drivers for the DirectStream DAC from the PS Audio website. We used an ASUS laptop, including 'Foobar', plus WASAPI drivers for PCM file playback. An Apple PowerBook played these and additional DSD formats with single or even double bandwidth via the appropriate 'Audirvana' software.

The manufacturer claims that the new DSD DAC 'reveals all the information that for years has been missing in our digital audio media'. Quite a claim. Actually what became immediately apparent was how precise and richly detailed—in typical PS Audio fashion—this D/A converter sounded. And by this we don't mean just a coarser microstructure. This device basically has unprecedented depth; it renders the intrinsic character of instruments clearly, and presents its sophistication as a matter of course.

However, the DSD DAC's performance doesn't really come off as spectacular or triumphant, despite all of its sophistication. It's really the unit's straightforward simplicity that stands out, and it does so because it arises from perfection. Compared to our top references in the D/A converter category, we were amazed at how clean and focused the unit was. Where others slightly clouded individual notes, the DSD DAC not only didn't give in to that inaccuracy, it revealed even more tiny facets of the music that created the impression of undisguised clarity and genuine authenticity to the listener. As if it simply peeled one more layer off the onion.

Tailor-made for high-bit audio

These kinds of experiences don't require high-bit rate sources. Even moderately recorded CDs can take advantage of the DAC's precision from Boulder. The tracks from the various STEREO Listening CDs, which we've heard numbers of times, were reproduced with exemplary finesse and photo-like razor sharpness. As a result of its radical resolution and definition, the DSD DAC is extremely well suited for the information and data flow of modern high-bit media.

'We'll Be Together Again' by the Jimmy Cobb Quartet from the STEREO Listening Test-Edition III, which we played in different resolutions, proved the DSD DAC's ability to unravel sonic images without dissecting them, and to deliver music that's both homogeneous and cohesive. Everything else would also have destroyed the enchanting mood of Ella Fitzgerald and Louis Armstrong's 'Moonlight in Vermont', which was a 2.8 MHz DSD file. In addition, the converter had no problem reproducing the differences between the PCM standards with respect to room size or fine detail.

At the conclusion of our listening sessions and comparisons, one thing was clear—the PS Audio DirectStream DAC is one of the best products of its kind. What will please owners of the PerfectWave DAC is that for €3,000* there's a complete upgrade kit! *Matthias Böde*

PS AUDIO DSD DAC

Price: approx. €5,995*
Size: 44x10x42 cm (WxHxD)
Warranty: 3 years
Contact: PS Audio, Boulder
Tel: +1 720 406 8946
www.psaudio.com

PS Audio's DirectStream DAC is not just another high quality D/A converter. Its singular concept gives it a special status. Whether with PCM or DSD files, it renders an immensely detailed, very genuine sonic image.

MEASUREMENT RESULTS

Jitter spectrum at the analog output
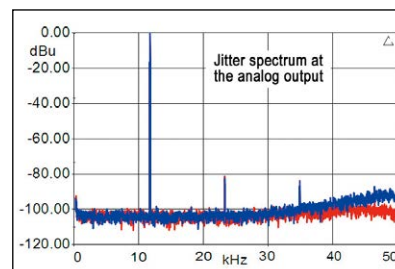
Maximum frequency deviation	under 0.1 dB
Square wave/impulse behavior balanced	ok
Signal to noise ratio	95 dB
Quantization noise (24 Bit)	94 dB
Quantization noise (16 Bit)	92.6 dB
Distortion -60dBFS | -9dBFS / 400Hz	1.6 | 0.01 %
Converter linearity at -90 dB	0.2 dB
Output impedance (RCA/XLR)	125/290 Ohms
Output voltage 0 dB (XLR)	2.8 V
Power consumption Off | standby | idle	0 | 17| 20 W

LAB COMMENTARY: The DirectStream DAC exhibits no weaknesses on the bench, although the SNR did not turn out to be ultimately high. While potentially a negative, it didn't seem to make its presence felt. Because of the low output impedance transformer, a power amp can de driven directly with long cable lengths.

AC phasing on test unit

FEATURES

Inputs: coaxial, optical, AES/EBU, USB, and 2xI²S for PS Audio's PWT drive, SD card slot for firmware updates. Outputs: one balanced (XLR) and one unbalanced (RCA) Accessories: power cord, remote control

STEREO-TEST

SOUND QUALITY   **100%**

PRICE/PERFORMANCE

★★★★★

OUTSTANDING

▲ Comprehensive range of digital inputs. The slot for SD cards is for updates

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