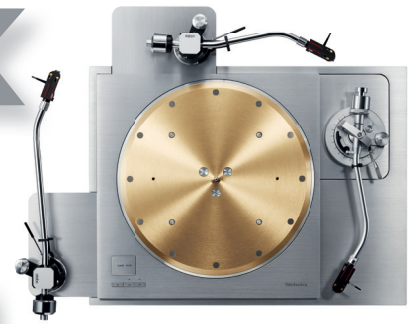


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EQUIPMENT REVIEW

Warwick Acoustics APERIO electrostatic headphone

by Chris Martens

It seems as if it was just yesterday that I received a review sample of Warwick Acoustics' Sonoma Model One (M1) electrostatic headphone system (£4,995, or \$4,995 US). I reviewed the system favourably for *Hi-Fi+*, while my colleague Steven Stone praised it in our sister publication, *The Absolute Sound*. Steven's and my comments closely paralleled one another; we both appreciated the Sonoma system for its accurate, natural, and uncoloured tonal balance, its uncommonly fast transient speeds, its overall subtlety and nuance, its wide-range frequency response, and for its versatility.

Given how good the Sonoma M1 system was and is, the last thing I expected was Warwick Acoustics' decision to create an even *higher performance* electrostatic headphone system—one whose capabilities promise to surpass those of the Sonoma system in every way. That super-system is here and is called the APERIO electrostatic headphone system (APERIO, says Warwick Acoustics, derives from a Latin word that means to “uncover, open, or reveal”). Naturally, such an all-out attempt to redefine the state-of-the-art in headphone performance does not come cheaply and accordingly Warwick Acoustics will be selling the APERIO system at £20,000 (or

\$24,000 US). However, the APERIO system aims to deliver sound quality rivalling (or surpassing) that of loudspeaker-based systems selling in the six- and even seven-figure range.

As a declaration of its intent, Warwick Acoustics states, “The APERIO is designed for the demanding professional audio market, as a reference studio monitor headphone system for High-Resolution Audio production, mastering, mixing, and recording applications,” but also for “ultra-high-end home consumer applications.” With these ends in mind, Warwick Acoustics has followed what it terms a 'Complete System Design' approach, meaning that the system's analogue and digital front ends, its powerful electrostatic amplifier, and its intensely revealing headphones were designed from the ground up to complement one another in every way.

The first indication of how different the APERIO system is to the Sonoma M1 system comes when the system arrives in a beefy watertight, crushproof, and dustproof polypropylene travel case. The next comes when you first see the APERIO's preamp/amp/DAC and realise that it is roughly three times wider than the Sonoma M1's amp/DAC. The reason for the size increase is that the APERIO preamp/amp/DAC supports a much wider range of digital and analogue inputs than the Sonoma amp/DAC did and features circuitry specifically optimised for each input type. Further, the APERIO amp also provides considerably more power output and a more elaborate and robust power supply than the Sonoma M1 amp/DAC did, and it is fully capable of serving as a preamplifier in high-end audio systems.

In the analogue domain the APERIO provides single-ended and balanced analogue inputs and outputs, with High/Low gain switches for both analogue inputs. Digitally, the APERIO offers a very flexible set of inputs including USB, coaxial S/PDIF, AES3, and a fully DLNA compliant Ethernet interface. In turn, the APERIO DAC section, which is based on dual 32-bit, 8-channel DACs arranged in a dual mono configuration, can decode PCM files with sample rates to 384kHz and DSD files (native or DoP) up to DSD256. One crucial point, says Warwick Acoustics, is that, “all audio signals are kept in their native domain and format: analogue always





remains analogue; DSD stays DSD until its final conversion to analogue; PCM samples are never converted."

Warwick Acoustics uses the highest quality parts throughout the APERIO, leading to some impressive performance specifications. The APERIO's costly clocking circuitry, for example, provides very low jitter (82 fSec RMS @ 100 MHz) and an extremely low noise floor (-168 dBc/Hz). Warwick Acoustics notes that any DSP performed on PCM audio data is "double precision, 64-bit, fixed point, at native sample rates—equal to the best Digital Audio Workstations (DAWs)." The APERIO's dual DAC/dual mono architecture yields a signal-to-noise ratio of 131 dB. Separate EMI-shielded chambers enclose the DAC sections for each channel and are fed by quiet, noise-isolated power regulators.

The APERIO amp/DAC uses separate, domain-specific volume level controls. A fully differential, analogue attenuator, based on parallel, laser-trimmed, resistance ladder networks, is used for analogue and DSD signals. In turn, a DSP-based digital attenuator is used for PCM signals. Warwick Acoustics claims the attenuators are "calibrated and closely matched".

The APERIO's amplifier section uses eight discrete 1000V MOSFET devices per channel in a fully balanced configuration that is based on "a proprietary topology based on single-ended Class A operation." The upshot is an amplifier that delivers a noise-free 1800 V DC bias voltage for "charging the (APERIO's) BD-HPEL transducers" and serves up 15 Wpc of power output with very low distortion and noise.

Finally, Warwick Acoustics has gone to great lengths to maximize the performance of the APERIO's power supply and power regulation sections, its PCB layout and construction, the design and construction of its noise-isolating chassis, and its heat management system, which features four very low-noise cooling fans. In short, Warwick Acoustics has explored virtually every design and construction detail to give the system state-of-the-art performance.

At the same time, the APERIO electrostatic headphone offers plenty of innovations of its own. The original Sonoma M1 headphone used a proprietary, single-ended electrostatic driver featuring the firm's patented HPEL (High-Precision Electrostatic Laminate) technology. In contrast, Warwick Acoustics has used Multi-Physics Finite Element Analysis modelling to create all-new BD-HPEL (Balanced Drive High-Precision Electrostatic Laminate) drivers for the APERIO headphone. The BD-HPEL drivers are a symmetrically-driven (not single-ended) variation on the drivers used in the original Sonoma headphone.

Much has changed, though, in the course of driver development. First, the APERIO diaphragm now uses a complex multilayer film comprised of outer layers of 7µm-thick BOPP (bi-axially oriented polypropylene) that enclose and protect a thin 24 Kt gold inner layer held in place by an acrylic adhesive. Next, the new double-sided driver uses a fascinating sandwich-like structure featuring extremely rigid glass-filled polypropylene sulfide outer frames. Working from the outside in, the next layers in the 'sandwich' include outer gaskets, ▶

"The APERIO is the finest headphone system I have ever had in my home, and also the finest I have ever heard (including some that cost far more than the APERIO does)."



- ▶ followed by gold-plated OFHC stators, polypropylene spacers, and—at the centre of the structure—the multilayer gold diaphragm. Warwick Acoustics has created an automated, high-precision diaphragm tensioning system that ensures tensioning consistency to “within a fraction of a Newton” and that, says Warwick Acoustics, ensures diaphragm tension is “differentially equalized in all axes across the film surface.”

The APERIO headphone ear cups are, as in the Sonoma M1, made of light, rigid injection-moulded magnesium, while ear cushions feature a combination of open and closed-cell foam interiors with smooth Cabretta leather outer surfaces, perforated Cabretta leather touch surfaces, and an open-weave fabric on the inner ring surrounding the ear. The headphone's weight is a very reasonable 405 grams and Warwick Acoustics has lavished great care on its overall fit, finish, electrical integrity, and especially on ergonomics (most notably, on clamping pressures).

I ran the APERIO system with an AURALiC ARIES wireless bridge linked to a music library containing a mix of CD-quality, and high-res PCM, DSD, and DXD music material. The simple result was one of the most breath-taking headphone listening experiences I have ever enjoyed—one that in some respects was like listening to a Sonoma M1 system that had been working out in a gym, taken martial art classes, and worked to earn advanced degrees in particle physics and music philosophy. In other words, the APERIO can do everything the Sonoma M1 system could do and more, and do it with competence, sonic athleticism, depth, and refinement.

The system's voicing comes as close to the ideal of neutrality as anything I have ever heard (including some exceedingly expensive speaker-based systems). Extension at high and low frequency extremes is exemplary, with the APERIO showing much stronger capabilities than the Sonoma M1 system on loud, low frequency passages and on fast-rising bass transient sounds. For example, I noted that the APERIO handled the mysterious, evocative, and high-amplitude low frequency sections of Nils Frahm's 'Chant' [*Solo*, Erased Tapes, 16/44.1] with equal parts of power, clarity, and grace.

Resolution, transient accuracy, and almost blinding tonal purity are three of the APERIO's strengths. On Hilary Hahn's performance on the first movement from the Meyer Violin Concerto [DGG, 16/44.1] the APERIO beautifully revealed Hahn's amazing fingering dexterity and bowing technique along and her distinctive string tone, which combines elements of sweetness, incisiveness, and—above all—clarity of musical intent. And there it is: the APERIO is about more than sound quality, per se, but about uncovering the very human emotions and communicative intentions underlying the sound.

Dynamic swagger and agility? Most definitely. Put on 'Tom Sawyer' from Rush's *Moving Pictures* [Mercury, 16/44.1] and note how the APERIO renders the ultra-crisp and super-punchy attack of Neil Peart's drums, the aggressive yet well-controlled and richly textured snarl of Geddy Lee's bass, or the live-wire intensity of Alex Lifeson's guitar lines. There is vigour and energy everywhere, but also subtlety and—after a fashion—delicacy shown in the masterful way the musicians modulate dynamics to create dramatic mini-crescendos and decrescendos throughout the song. The APERIO can handle high-energy rock music and other forms of power music with a dynamic athleticism that the Sonoma system could never have matched. Quite honestly the APERIO system can play (much) louder than I personally can bear to listen—meaning one will never complain of the APERIO 'running out of steam'.

Spaciousness and soundstaging? Oh my, yes. I got a glimpse of what APERIO could do when I put on an old and well-loved audio chestnut: namely, the title track from Andreas Vollenweider's *Caverna Magica* [Savoy, 16/44.1]. 'Caverna Magica' has long been famous for the way it produces enchanting 3D soundstages through most audio systems, but through the APERIO system I found there was suddenly

Summary

Voicing: Neutral



(All ratings relative to comparably priced electrostatic headphone systems.)

Resolution/Focus:



Dynamics/Expression:



Sound staging/Imaging:



Freedom of noise:



Features and versatility:



Value:



Pros

- Neutral, uncoloured voicing
- Incredible resolution, detail, and focus
- Dynamic expression, agility, and athleticism; this is one electrostatic that can really boogie or reveal the majesty of large-scale orchestral works
- Amazingly spacious, 3D sound as recordings permit
- Amp/DAC module can serve as a preamplifier, too.

Cons

- Price: Though reasonable for the quality on offer, the price will put the APERIO system beyond reach for many music lovers
- What "Cons"?

not just a little but a lot more magic in the 'Magica'. In fact, the APERIO took the song's 3D presentation to a whole new level, creating a huge, resonant, cave-like environment, which Vollenwieder's sumptuous-sounding harp filled beautifully. My point in this observation is to say that whenever there are useful spatial cues in music, the APERIO will find them and put them to great use.

I like to try to offer critical commentary where appropriate, but there really is nothing I can fault in the APERIO's sonic performance. The only drawback I encountered—and it is one common to most electrostatic headphone systems I have heard—is that if I moved my head suddenly while listening, pressure levels within the ear cups would change momentarily, causing a soft 'clicking sound' from the diaphragms. That aside, the APERIO listening experience was an unalloyed joy.

The APERIO is the finest headphone system I have ever had in my home, and also the finest I have ever heard (including some that cost far more than the APERIO does). If you seek a highly capable and profoundly revealing music exploration tool, the APERIO is the system for you. +

TECHNICAL SPECIFICATIONS

The APERIO headphone

Type: Circumaural, open-back, electrostatic headphone

Drivers: Full-range, low mass, balanced-drive high-precision electrostatic laminate (BD-HPEL) electrostatic drivers

Effective driver area: 3570 mm²

Frequency response: 10 Hz–60 kHz

Weight: 405 grams (excluding cables)

The APERIO preamp/amp/DAC module

Type: Class A solid-state, balanced output electrostatic headphone amplifier, preamplifier, and DAC

Analogue Inputs: One balanced stereo input (via XLR jacks), one single-ended stereo input (via RCA jack), with High/Low gain switches for both inputs

Analogue Outputs: One balanced stereo output (via XLR jacks), one single-ended stereo output (via RCA jacks). Both outputs deliver high current and switch-selectable +5 dB gain

Digital Inputs: USB digital input, one coaxial S/PDIF digital input, one AES3 input (via XLR jack), and one Network/Ethernet input (via RJ45 jack)

Outputs: One electrostatic/bias voltage output jack

DAC: Dual mono, 32-bit/384 kHz DACs with balanced outputs for PCM and DSD

DSP: For PCM only, 64-bit (double-precision) fixed-point processing at native sample rates

Digital audio formats supported:

USB: All PCM inputs up to 32-bit/384 kHz and DSD native or DoP inputs up to DSD256

Coaxial S/PDIF: All PCM inputs up to 24-bit/192 kHz

AES3: All PCM inputs up to 24-bit/192 kHz

Network/Ethernet: All PCM inputs up to 32-bit/384 kHz and DSD native or DoP inputs up to DSD256.

Frequency response: Bandwidth > 65 kHz

Distortion + Noise: < 0.001%

Dimensions (H×W×D): 68 × 413 × 351mm

Weight: 7.4 kg (not including power supply)

System Price: £20,000 (UK), \$24,000 (US)

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