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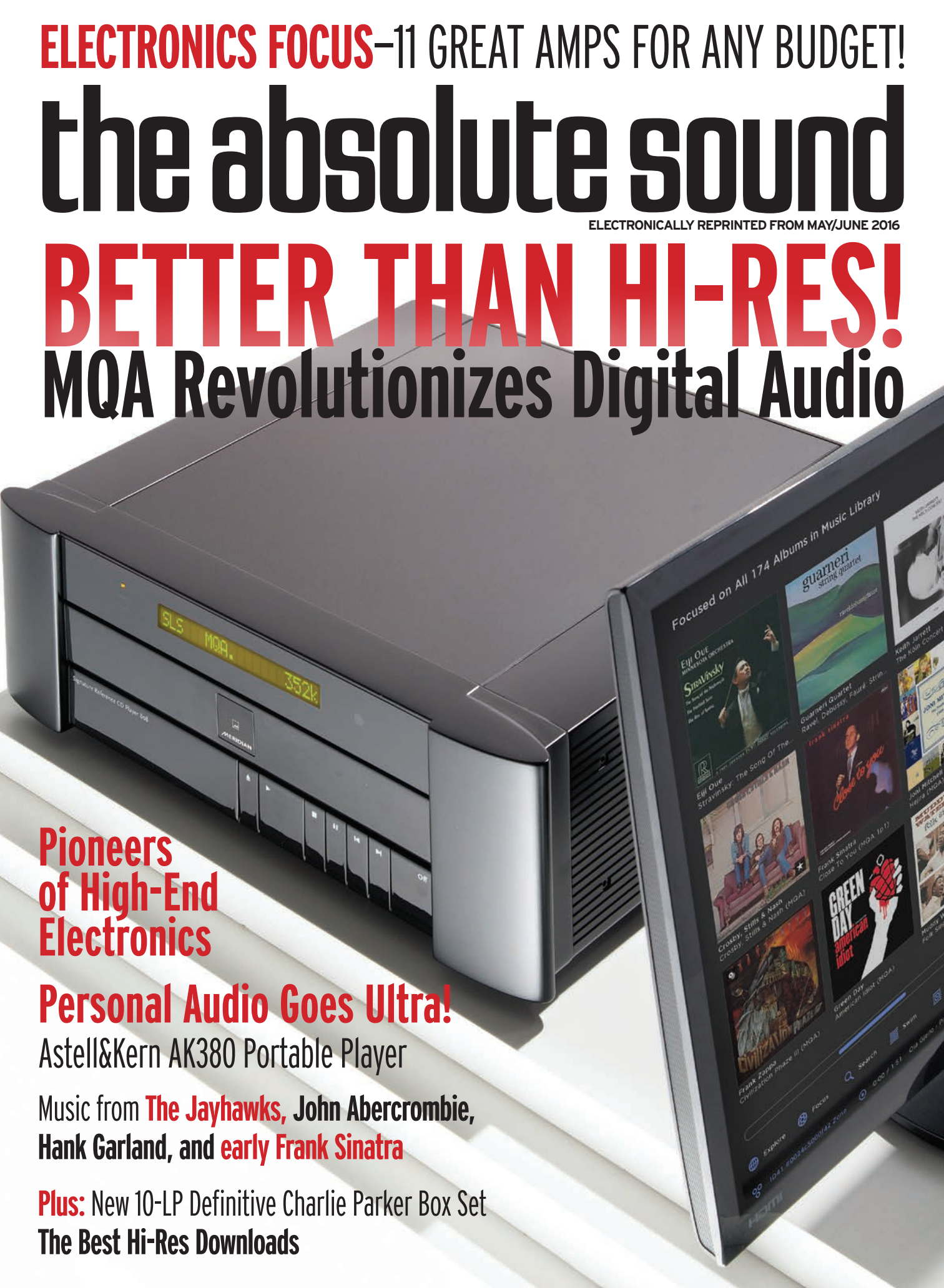
MQA Revolutionizes Digital Audio



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FROM THE Editor

MQA: The View from 30,000 Feet

In this issue's cover story I explain some of the technology behind Master Quality Authenticated (MQA) and describe how it sounds. But I'd like to use this space to step back and take a larger view of the history of digitally recorded music, audio technology, and how MQA fits into that historical context.

To recap, MQA is a technology that simultaneously improves digital sound quality while dramatically lowering the bit-rate. It's an encode-decode system, meaning that for maximum fidelity the music must be encoded with MQA, and played back through a device with MQA decoding. MQA is, however, backward compatible with all existing distribution channels and playback hardware. If you don't have an MQA decoder, you get slightly-better-than-CD sound. If you have an MQA DAC, the file "unfolds" into the high-resolution signal.

It's not quite accurate to call MQA a "technology" because it's more than just a set of hardware and software techniques. Rather, MQA is a nearly-ground-up rethinking of how to best deliver to the listener as close a facsimile as possible of the original musical event. MQA starts with the analog signal in the studio and ends with the analog signal on playback. It ties together every element in that chain into essentially a single analog-to-analog system.

Let's look at a brief history of digital audio and how that development path led us to the current state of affairs. In the late 1970s, the first digital recorders were commercially introduced, and became ubiquitous a decade later. These machines, based on pulse-code modulation and operating at 44.1kHz or 48kHz sampling and 16-bit quantization, were quite crude by today's standards. Nonetheless, digital recorders quickly replaced analog tape machines in the studio. The compact disc, with its 44.1kHz sample rate and 16-bit word length, became the standard for distributing digital audio to consumers. As we all know, the CD took over the world beginning in the mid-1980s.

This switch from purely analog technology to digital had its advantages, but also some significant drawbacks. Once the signal was in the digital domain it could be copied, transmitted, and manipulated with no loss of sound quality. But the penalty for that convenience and power was paid at the interfaces between the analog and digital worlds, specifically the analog-to-digital converter used to make the recording and the digital-to-analog converter that transformed a series of numbers back into music. These two ends of the chain exacted a significant sonic penalty, in part because of the steep low-pass filters required to make digital audio work. The design of these filters came out of the sampling theory first developed in 1927 by Harry Nyquist and advanced in the 1940s by Claude Shannon.

Working within the constraints of the so-called "Nyquist-Shannon" sampling criterion, digital audio improved over the past 30 years with higher sampling rates, greater bit depth, lower jitter, and myriad other techniques that realized significantly better sound. In the mid-1990s, recording professionals began using 96kHz/24-bit recorders, which allowed them to make better sounding 44.1kHz/16-bit compact discs. Nonetheless, the consumer experience was limited to 44.1kHz/16-bit quality. In the late-1990s, two attempts to move beyond the CD, Super Audio Compact Disc (SACD) and DVD-Audio, essentially failed in the wider marketplace (DVD-Audio spectacularly so). More recently, the music-only version of Blu-ray Disc has been met with a tepid response.

And then came the Internet, and with it the ability to distribute digitally encoded music without the need for physical formats. It's impossible to overstate the significance of this development. Physical formats are massively difficult to develop and launch, technically, politically, and commercially. But the Internet allowed music labels (the "content providers" in industry parlance) to distribute high-bit-rate music to consumers in the form of downloads without the constraints imposed by a new physical format.

That development was both a blessing and a curse. The blessing was that here was a cheap and easy way to deliver to consumers the best-available representation of a recording. The curse was that the record companies were delivering to consumers the best-available representation of a recording—a recording that could easily be copied, shared, and even pirated for profit. The record labels' opening of their vaults by selling high-bit-rate downloads would be tantamount to throwing open the doors to an unguarded shopping mall. Once their catalogs were out in the world, the record companies would have nothing left to sell.

The other problem with "high-resolution" digital audio is that it didn't really solve the fundamental problem of why digital sounds the way it does—flat, congested, hard, and glassy. Digital audio requires low-pass "brickwall" filters to prevent a type of distortion called "aliasing." But these filters introduce ringing, or a smearing of musical signals over time. Despite attempts to minimize this distortion through faster and faster sample rates (the filters for which are less sonically detrimental), digital audio was constrained by the very fundamentals of sampling theorem codified more than fifty years ago.

So-called "high-resolution" downloads also exact a

FROM THE Editor

price in massive file sizes. Increasing the sampling rate reduces, but doesn't eliminate, the flaws built into the very foundations of digital audio as it has been implemented. Moreover, very fast sampling is preposterously wasteful; most of those additional bits carry no real information whatsoever. Consider that a 192kHz/24-bit system allocates the bits to encode a 90kHz sinewave at full-scale amplitude, a signal that wouldn't even come close to existing in the real world. High sample rates create a massive container for the music (a 96/24 or 192/24 file) that is largely wasted bits. It's like shipping a paperback book in a box the size of a filing cabinet. Moreover, obtaining these files, and playing them back correctly, requires specialized computer expertise, making them accessible only to the committed.

To summarize, the audible degradation in digital audio is largely caused by filters. The industry then tries to minimize that degradation by very fast sampling and the gentler filters possible with faster sampling, which creates massive files and limits their accessibility to the vast majority of listeners. The record industry is reluctant to release their fast-sampling files for fear that they will eventually have nothing to sell. Consumers who want better-than-CD quality must master computer technology, limiting the widespread accessibility of better sound. Even then, the library of available music is limited, and still doesn't represent the sound in the recording studio. To top it off, the consumer never really knows if the file he's playing back is the same as that created by the artist and engineer. And those enormous files can't be streamed, and won't play in portable applications.

In short, the technology is broken. The business model is broken. The artist is unable to deliver to fans the best possible representation of his or her work. The consumer is denied the best possible listening experience.

We ended up in this predicament because each improvement in digital audio was merely an incremental evolution of conventional ideas and models. No one had gone back to first principles and rethought how best to record and distribute music.

Against this backdrop, Master Quality Authenticated emerged. In a single stroke, MQA solves all these problems, from the technical, to the business model, to the sound quality, to the easy accessibility of that sound quality, and to the communication between artist and listener.

How does it do this? For starters, it turns out that the "laws" of Nyquist-Shannon sampling theorem—which have dictated the design of brickwall filters since digital audio's inception—are not quite ironclad. Since Shannon, sampling theory has advanced considerably, driven by research in other fields such as medical imaging and astronomy that face challenges parallel to those of audio. Also, sounds that are important to humans have very specific statistics including a 1/f tendency (the power spectral density is inversely proportional to frequency; i.e. the higher frequencies have less energy), in part resulting from how sound behaves in air, a factor not considered by the classic sampling criteria. Consequently, Nyquist-Shannon isn't the limiting factor it once was, but it took some minds from the audio world (MQA inventors Bob Stuart and Peter Craven) to recognize that fact and apply these advanced new techniques to music reproduction. MQA incorporates this latest sophisticated thinking into a different sampling design, reducing the filters' "temporal blur" and with it the degradation that has plagued digital audio since its inception.

In addition to delivering unprecedented sound quality, MQA offers record companies a compelling solution to delivering to consumers the best possible sound while still protecting their archives. When you play an MQA file through an MQA decoder, you *hear* the high-resolution studio master, yet you never actually *possess* the high-resolution studio master. That high-resolution signal exists only at the decoder output, in analog form but matches very closely the analog in the studio. Of course, you can store an MQA-encoded file (it's formatted as a 44.1 or 48kHz/24-bit FLAC file) with all the high-resolution information embedded in it, but to access that hi-res information you must play it back. It must be noted here that MQA has no form of copy protection or digital-rights management (DRM) whatsoever. Contrary to what some Internet posters think, MQA is not an evil scheme to institute DRM.

A much more efficient coding technique captures all the musical information while not trying to encode signals that don't exist in the real world. This approach results in much smaller file sizes with no loss in sound quality. In addition, a clever technique encapsulates the high-resolution portion of the signal and hides it under the noise floor. This information "unfolds" on playback, with awareness of the playback platform, into the signal's original resolution, all the way up to 352kHz/24-bit.

Another benefit to record companies and consumers is that one MQA file serves all listeners, and will play anywhere. Record companies must now create and offer MP3, AAC, Red Book, 96/24, and many other versions of the same music. The same MQA file will go to everyone.

Finally, MQA provides a direct link between artist and listener in the form of the authentication feature—the light on the decoder that confirms that the file being decoded is the file created in the studio. The mastering engineer can monitor the signal through the entire encode-decode chain, and hear exactly what the listener will hear. Conversely, the listener hears exactly what the engineer created.

The surprising advances and innovative thinking that MQA has introduced will forever change the way we and future generations consider digital audio, even if MQA never becomes a large-scale commercial reality. But I'm betting that it will.

Robert Harley

Digital Emerges from the Dark Ages

Master Quality Authenticated (MQA) Is Here

The Long-Awaited Digital System Debuts

By Robert Harley · Photography by Dennis Burnett


Focused on All 174 Albums in Music Library
MERIDIAN
Albums Sorted by Play Count
Eiji Oue
Stravinsky: The Song Of The...
Guarneri Quartet
Ravel, Debussy, Fauré: Strin...
Keith Jarrett
The Köln Concert (MQA 1p1)
Miles Davis
Kind Of Blue (MQA)
The Modern Jazz Quartet
Blues on Bach (MQA)
Norwegian Radio Orchestra
Astrognosia & Aesop (MQA)
Ray Charles & Milt Jackson
Soul Brothers (MQA 1p1)
Bengt Hanssen
Pianostykker fra en bygård
Crosby, Stills & Nash
Crosby, Stills & Nash (MQA)
Frank Sinatra
Close To You (MQA 1p1)
Joni Mitchell
Hejira (MQA)
Judy Collins
Strangers Again (MQA)
Lhasa
La Llorona (MQA)
Philadelphia Orchestra, Chri...
Mahler: Symphony No. 2 in...
Amy Duncan
Undercurrents (MQA)
Dorothea Röschmann, Mitsu...
Schumann: Liederkreis, Frau...
Frank Zappa
Civilization Phaze III (MQA)
Green Day
American Idiot (MQA)
Muddy Waters
Folk Singer (MQA)
Wallace Roney, Bob Belden,...
In an Ambient Way (MQA)
will.i.am
Various (MQA)
Björk
Vulnicura (MQA 1p1)
Becky Pizzarelli (featuring J...
Three For All (MQA)
Daft Punk
Random Access Memories (...
Explore
Focus
Search
Swim
Queue: 1:51 Remaining
ID41 #0024c5000f42 Zone
0:00 / 1:51
Ola Gjeilo - Piano Improvisations
Heart to Heart

Master Quality Authenticated

IT'S not often that an audio technology comes along that has the potential to revolutionize the music industry as well as greatly improve sound quality for all listeners. But I believe that Master Quality Authenticated (MQA) may do just that.

MQA is a digital encoding and decoding system that delivers better-than-hi-res sound quality with a bit rate low enough for streaming. It's also backward-compatible with all existing music-distribution infrastructures and consumer hardware. MQA files are formatted as standard LPCM files (FLAC, AIFF, WAV, etc.); if you don't have an MQA DAC, the file will play on any DAC with slightly-better-than-CD sound quality. If you do have an MQA-capable DAC, the file will "unfold" the high-resolution information and deliver the resolution of the original studio master.

A number of high-end and mass-market audio companies have announced that they will offer DACs with MQA decoding, and the streaming service Tidal is very close to offering MQA files. Although the major music labels have not announced their intentions regarding MQA, indications are that they are engaging with the technology. (Visit theabsolutesound.com for the latest updates and announcements regarding the release of music in MQA.)

MQA was developed by Bob Stuart of Meridian Audio in collaboration with British mathematician Peter Craven, but the technology has since been spun-off into MQA Ltd, a separate company. I first heard MQA at CES two years ago in a before-hours, closed-door session, when the technology was an unnamed work-in-progress. Knowing nothing about the development effort or its goals, I sat down and was startled by what I heard. There was a complete absence of the artifacts that have always been part and parcel of digital audio—synthetic timbres, glare, lack of dimensionality, and a treble that is simultaneously bright and airless. I thought that I must be listening to some breakthrough super-high-resolution format with an enormous bit rate. After about 20 minutes of listening, Bob said with a sly smile, "We're listening to 1.3 megabits per second." I was astounded; that's less than the 1.4Mbs rate of 44.1kHz/16-bit PCM, and about one-seventh the bit rate of 192kHz/24-bit. Yet the sound was better than I'd heard from even the highest bit-rate PCM or DSD, never mind from CD.

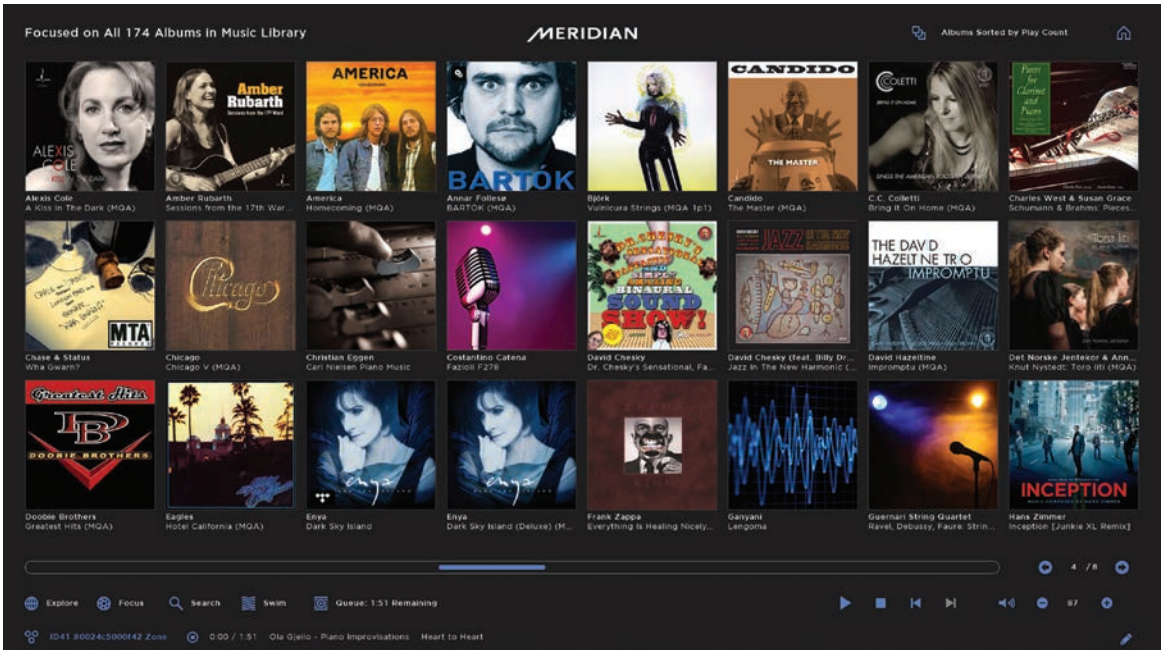
Since then I've heard MQA in a number of demonstrations, but never at my leisure in my own reference system—until now. Meridian supplied me with its new 808v6 Signature Reference CD player/DAC with MQA decoding (see accompanying review), and MQA sent me a NAS drive loaded with full albums and many single-track samples from other titles. I was also able to stream MQA files from Tidal (through a special Sooloos account), and to play MQA-encoded music that had been stored on CD.

Listening to MQA

I had previously heard MQA only through Meridian's Digital Active loudspeakers, save for a short demo through Vandersteen Model 7s at the last Rocky Mountain Audio Fest, and through Wilson speakers and Dan D'Agostino electronics at the most recent CES. I was eager to hear MQA at length through the microscope of my reference system, which includes Magico Q7 Mk.II loudspeakers driven by Constellation Hercules II monoblock power amplifiers wired with top-of-the-line MIT Oracle cable. The Q7s were augmented with the EnigmAcoustics Sopranino electrostatic supertweeters, which extend the high-frequency response to 40kHz. AC power to the system is supplied by four dedicated 20A lines, and is conditioned extensively with Shunyata's Triton 2 and Typhon conditioners, and Shunyata Sigma power cords. All sources and amplification are supported by Critical Mass Systems Maxxum racks and amplifier stands. Acoustic treatment is provided by Stillpoints Aperture panels and ASC Tube Traps. I connected the Constellation amplifiers directly to the Meridian 808v6's variable-level balanced outputs, removing the preamplifier from the signal path. The MQA source was a Meridian Sooloos system running on an HP touchscreen PC that was network-connected to a Qnap NAS drive storing the MQA files as well as to the Meridian 808v6. I also evaluated MQA by listening to it on my work PC via Foobar music-playback software and Meridian's $299 Explorer^2 DAC driving my desktop speakers (Audience ClairAudient 1+1 V2+) as well as Audeze LCD-4 and PSB M4U 2 headphones. The headphones were driven directly by the Explorer^2, or by the Moon by Simaudio 430HA headphone amplifier.

It's difficult to describe the sound of MQA, not because what it does is subtle, but rather because the improvement is so profound. No matter what I write, it won't fully convey the experience of listening to MQA.

I've been describing the sound of audio components as a full-time occupation for nearly 27 years, writing that this amplifier, or DAC, or other product delivered greater soundstage depth, or more accurate timbre, or increased transient fidelity. MQA also does all that, but on a scale that dwarfs all other differences I've heard between components within a product category or between digital formats. Moreover, the gestalt of listening to MQA is fundamentally different than, for example, listening to different examples of DACs, or even comparing CD-quality audio to so-called "high-resolution" digital audio with high sample rates and long word lengths. MQA is so much better sounding than any other



digital that it's like hitting the "reset" button on an entire branch of audio technology.

On a macro level, the most significant sonic improvements rendered by MQA are in the spatial aspects of music (soundstaging, depth, bloom, air around images), timbre and tone color, resolution of fine detail, and transient fidelity. These specific sonic improvements translate directly into a sense of ease, naturalness, and musical communication that eludes even 192kHz/24-bit "high-resolution" files.

Starting with soundstaging, MQA completely eliminates the flatness, congestion, and homogenization of conventional digital. We've all lived with this distortion on standard-resolution (CD quality) digital, and heard it to a lesser degree on high-bit-rate recordings. But MQA is simply a game-changer in this regard, even compared with 192kHz/24-bit. By comparison with MQA, conventional digital miniaturizes the acoustic space, shortens reverberation time, truncates instrumental decays, fuses instrumental images together, and destroys the dimensionality that fosters the impression of hearing individual objects in space. On every single MQA recording I auditioned (hundreds of tracks from dozens of albums), I was struck by the completely natural and organic spatial presentation. Even close-miked studio recordings benefited, with greater separation of instruments and less of a homogenized, closed-down feeling.

But the more space and depth on the recording, the more that MQA reveals that space. Fortunately, one of the most spacious orchestral recordings I know happened to be on the Sooloos server in MQA—the spectacular Keith Johnson recording of *The Firebird* on Reference Recordings (with *The Rite of Spring* and *Song of the Nightingale*). I have the CD version, along with an excerpt from the 176.4kHz/24-bit file, which is a bit-for-bit copy of the bitstream created by the A/D converter when the recording was made. Note that the original 176.4kHz file has a bit-rate of 8.5Mbs, and the MQA version a bit-rate of 1.4Mbs. The MQA rendering of this recording was simply astounding, even in comparison with the high-bit-rate version. The back of the hall behind the musicians seems to expand rearward, and with it, the spaces between the rows of musicians, like pleats in a cloth unfolding. Instruments in the back of the hall were not just portrayed as several feet behind the speakers, but as dozens of yards behind the loudspeaker plane. The reviewer's cliché of the wall behind the speakers vanishing took on a entirely new meaning with MQA. Moreover, the sense of transparent air between the front and back of the soundstage was palpable, charged, and vibrant, just as you hear when listening in a concert hall. The listening room walls disappeared, replaced by the hall's expansive acoustic.

MQA eliminates the flatness of conventional digital.

Within this vast space, individual instruments, and sections of them were clearly delineated from each other. MQA had greater clarity and vividness, largely because of the greater timbral fidelity (which we'll get to in a minute) but also from the palpable bloom around tightly focused images. The sound was the opposite of thick, congested, and confused. Moreover, the bloom seemed to extend in three dimensions, the sounds of instruments radiating in all directions, further increasing the sense of 3-D body and tangibility to images. By contrast, conventional digital sounds flat and two-dimensional. Moreover, MQA had a tremendous sense of what Jonathan Valin calls "action"; the sense of sound expanding outward from an instrument in response to the dynamic

Master Quality Authenticated

envelope created by that instrument. This was particularly apparent on the *Rite*, with its sometimes violent attacks by the horn section.

It wasn't just the outward bloom of instrumental attacks that was three-dimensional, but also their decays. Reverberation tails were more closely associated, in space and in timbre, with the instrumental images that created them. These qualities imbued both instrumental and vocal images with a palpability and presence that was almost spooky. I could cite many examples, but listen to how Eric Clapton's guitar amplifier on "Three O'Clock Blues" from *Riding with the King* isn't just another sound within the sonic tapestry, but a distinct presence, with a compact image surrounded by the studio's space and air. The sound conjured up a vivid impression of the amplifier in the studio, with Clapton standing next to it. I compared the sound of this track streamed from Tidal in CD quality against the MQA file; that *frisson* of realism was simply missing from the CD-quality version. This track is notable for another phenomenon of MQA that I'll describe later but mention here: the startling immediacy of instrumental or vocal entrances. Clapton's vocal just pops out of the studio acoustic with a spatial and timbral realism that is startling.

All these qualities culminated in *The Rite of Spring*, perhaps the great Keith Johnson's best-sounding orchestral recording. The MQA version of the *Rite*, played through the Meridian 808v6, Constellation monoblocks, and Magico Q7 Mk.II speakers at concert-hall levels, was the single most realistic reproduction of an orchestra I've heard in my life, from any format and on any playback system. I'd never before felt this composition's raw, primal power to nearly this degree. It was beyond thrilling.

I should mention here that my system is extremely resolving of spatial cues. I regularly use the EnigmAcoustics Sopranino self-biasing electrostatic supertweeter atop the Magico Q7 Mk.II for its ability to expand the sense of space and increase the resolution of low-level detail without changing the tonal balance. With MQA recordings, the Sopranino rendered an even greater contribution to the system's ability to accurately present spatial cues. In addition, the dedicated AC lines, extensive Shunyata power conditioning, and incomparable Critical Mass Systems racks all worked together to fully reveal the low-level spatial cues of which MQA is capable. These cues are fragile, and easily lost in the playback chain. MQA can deliver the spatial cues; it's up to the playback system to resolve them. This isn't to say that you need a mega-system to hear these qualities, only that MQA didn't appear to be the limiting factor when providing the source to a state-of-the-art playback system. I heard exactly the same qualities from MQA when listening through headphones or to my desktop system with the $299 Explorer² DAC.

As with soundstaging, MQA's rendering of timbre is unlike any other digital. MQA's most salient timbral quality is a lack of hardness and glare overlaying instrumental textures. Digital has always imparted a synthetic character to timbres that dilutes realism, decreases engagement, and fosters rapid listening fatigue. I've written in the past that analog's distortions are easier to overlook than are digital's distortions because digital's distortions are woven into the music's fabric while analog's distortions seem to exist separately from it. That observation referred to digital's pervasive glare and lack of tone-color richness. Conventional digital renders instruments as bright and glassy, while at the same time the overall presentation lacks air and treble extension. Today's very best digital recording and playback systems have minimized this phenomenon but have not eliminated it. This fact is made obvious by comparing MQA and conventional-digital recordings of the same title. The removal of this synthetic overlay, coupled with MQA's extraordinary resolution, allowed the beauty of the instrument's texture to be fully revealed. Comparing standard digital with the same recording in MQA was like looking at a very old painting or fresco that had been blackened by centuries of neglect before and after a meticulous restoration. And to top it all off, the MQA file is, astonishingly, much smaller than the original.

This was the single most realistic reproduction of an orchestra I've heard.

No matter what the instrument, the tone color was dense, rich, and saturated. I'm not sure if this improvement was the result of greater resolution of timbral information, or if MQA's ability to remove glare and hardness simply unmasked the instrument's natural tone color. Whatever the cause, I had the ability to hear, with vivid clarity, the mechanism by which the instrument makes sound. From air moving past a vibrating reed, to a string plucked or bowed over a resonant wooden body, to percussion being struck, there was a lifelike realism to the sound. This realism of timbre, coupled with the image focus and bloom already mentioned, gave instruments and voices palpability and vivid immediacy. In fact, this palpability and vividness was so pronounced that instrumental entrances were startling in the way they suddenly appeared in space. This was one of the first characteristics of MQA I noted in my initial audition more than two years ago. A curious effect of this quality was that I found myself visualizing the instruments, and the acoustic spaces they were in, without any conscious effort.

Removing the distortion overlaying timbres made for a decidedly relaxed and non-fatiguing experience. The sound's ease opened up my ears to be more receptive to the music's expression, as though I no longer had to hear through the sound to get to the music's meaning.

MQA is the most significant audio technology of my lifetime.

MQA's unparalleled timbral and transient fidelity was apparent on every instrument, but I'm going to single out three that sounded much more lifelike than their conventional-digital facsimiles—piano, the human voice, and cymbals. With piano, the MQA reproduction was completely lacking the glassy hardness that often accompanies the attack of notes, particularly in the higher registers. The texture of decaying chords was simply unparalleled, with a richness of tone color and harmonic complexity that has eluded any previous recording technology. In addition, left- and right-hand lines were much better differentiated, each note clearly heard on its own. The sound of the hammers hitting the strings was exactly as you hear it in life; conventional digital by contrast renders this component of the sound as a pale synthetic imitation. MQA conveyed much more of the pianist's "touch," and consequently, of human musical expression. Just compare Keith Jarrett's *The Köln Concert* in CD-quality and MQA versions; with MQA I could *feel* that expression so much more deeply. And then there's the spectacular sense of the instrument surrounded by, but distinct from, the acoustic space. Listen, for example to Costantino Catena playing Debussy [Fazioli] for an idea of the gorgeous harmonic richness and accurate dynamic and timbral portrayal of hammers hitting strings, and of the lush space that MQA is capable of conveying.

The human voice as rendered by MQA is particularly compelling. I was repeatedly startled by vocal entrances, as when a singer comes in for the first time after an instrumental introduction. The voice seems to suddenly appear from nowhere, with a compact image completely separate from the rest of the instruments and surrounded by air and bloom. More importantly, voices had a human quality, which had the effect of making the singer's job of "selling the lyric" that much easier. The realistic and natural rendering of timbre fostered an intimacy with the vocalist that engages the heart in the song's expression. I've been listening to Joni Mitchell's *Hejira* since its release but listening to the MQA version made me consider this well-worn record anew. Sonically, the most amazing vocal sound in the library that MQA sent to me was undoubtedly Frank Sinatra's 1957 *Close to You*. The idea that a hi-fi system is really a time machine struck home when listening to this record; Sinatra was palpably, believably right there, now, not in a studio nearly 60 years ago.

The third instrument that I'll single out for discussion is percussion, particularly cymbals. The very fine texture of the stick hitting the cymbal (I'm talking about gently played ride cymbal rather than a

hard-struck crash cymbal) was exquisitely resolved, and the following shimmer and decay was infused with density of detail and purity of timbre. These initial transients sound dull and muted on CD by contrast, and the shimmer lacks any textural nuance. It was as though a thick blanket had been removed, opening up the sound both tonally and spatially. The cymbals seemed to float in space, their decay hanging in air, just as we hear from the best analog. The texture of cymbals was much more organic; digital has always had a tendency to make cymbals sound like bursts from an aerosol spray can. All transient information was better portrayed by MQA, with a suddeness of attack but without etch, and a sense of an object striking another object, rich with all the timbral and spatial cues that tell you about the objects' material composition, size, and shape.

I suspect that I've chosen these three instruments as exemplars of MQA's qualities because they have always been the most colored by the distortion mechanisms that plague conventional digital. But I should stress that these examples extend to all the other instruments as well.

These impressions were garnered listening to full 44.1kHz or 48kHz/24-bit FLAC files, which had a bit-rate of about 1.3–1.5Mbs. As described in the technology sidebar, the 24-bit MQA files can be truncated to 16 bits to work with Apple AirPlay and other systems that are limited to 16 bits. Internet streaming services can truncate the 24-bit MQA file in increments of 2 bits if the service detects that your Internet connection lacks the bandwidth to stream 24-bit files. The file will still "unwrap" when it encounters the decoder, but not as well. In that situation, the information in the octave above 20kHz become progressively lossy rather than lossless.

How does MQA sound in its lowest-quality version, as 16-bit files? MQA sent me some CDs that had been truncated to 16-bits, which had a bit-rate of about 650kbs (half the bit rate of Red Book CD). Playing these CDs in the Meridian 808v6, I was surprised by how good they sounded given such a low bit-rate. Instrumental textures weren't as smooth and the treble didn't have the liquidity of 24-bit MQA, but the sound was still better than CD. Incidentally, when playing these special discs the 808v6's display showed the original sampling rate of the source used to create the MQA file. It will take some getting used to the idea that a 650kbs file, played on a CD player, can unfold to 88.2, 176.4 or 352kHz sampling rate on playback.

Conclusion

If MQA realized the sonic gains I've described, but did so with massive and impractical file sizes that only committed audiophiles could access at great effort, it would be judged a triumph. But, miraculously, MQA delivers this unprecedented sound quality at a bit rate of 0.8–1.3Mbs—less than that of CD. *Everyone* will have easy and convenient access to this level of source quality, not just audiophiles. That, in my view, is a game-changer for the music and audio industries. Moreover, MQA's ability to remove distortions from existing digital masters is an unprecedented development in the history of audio.

I've dissected MQA's sonic qualities to convey specifically how it improves upon existing technology. That's what reviewers are supposed to do. But missing from this analysis is the profound degree of musical communication, intimacy, and expression that MQA delivers. Music just sounds "right" with MQA, with an ease, naturalness, and engagement that makes conventional digital sound like a pale imitation of the music. It conveys so much more of the musicians' expression and artistry.

MQA is the most significant audio technology of my lifetime. The only question remaining is when the record companies will release their catalogs in MQA so that all listeners can finally enjoy music as it was intended to be heard.

MQA Technology at a Glance

described in some detail how MQA works in Issue 253 (also available on theabsolutesound.com), but will offer a short primer here, as well as a few new, recently revealed details.

MQA is a very sophisticated and clever process that is based on recent advances in neuroscience (particularly new brain-imaging techniques) that suggest humans are highly sensitive to distortion in the time domain—including the distortions that digital filters (essential to making digital audio work) add when they "ring" in response to musical signals. In effect, this ringing causes the musical signal to spread out, or smear, in time, with, usually, some of the smeared energy occurring *before* the musical signal. This so-called "pre-ringing" never occurs in nature, and is particularly detrimental to sound quality. The problem is compounded with cascaded digital filters, as in the recording and playback chains; each filter's smearing is cumulative. MQA calls this time smearing "temporal blur." Here's an analogy: Every single musical transient is like a hammer hitting a bell (the digital filter), setting it ringing.

Note that the filters required for high-sample rate digital audio, such as 192kHz, introduce less temporal blur than the filters required for 44.1kHz sample rate, which is the primary reason why high-sample-rate digital sounds better than lower sampling rates. Nonetheless, even the filters for 192kHz introduce audible blur (Fig.1).

Temporal blur can be expressed in milliseconds or microseconds—the time over which transient musical energy is smeared. MQA contends that if they had to quantify the performance of a digital-audio system with only a single metric, that metric wouldn't be frequency response (sample rate) or dynamic range (word length), but rather resolution in the time domain—how much temporal blur the system introduces.

CD-quality audio typically has temporal blur of 5ms. Audio sampled at 192kHz has temporal blur of about 500us, or one tenth the blur of CD. MQA has discovered techniques to reduce temporal blur to 10us throughout the entire digital encoding and decoding chain. MQA realizes this improvement in part with more a sophisticated approach to sampling and filtering, and by matching the encoder in the studio to the decoder in the consumer's DAC.

The design of these filters has been informed by the classic sampling theorem, developed in 1927 by telegraph engineer Harry Nyquist and advanced in 1949 by mathematician Claude Shannon and others. (It's sometimes called the "Nyquist-Shannon sampling theorem.") The audio engineering community accepted this thinking, and the filter designs that resulted, as inviolable givens. But it turns out that although Nyquist-Shannon is efficient for communication systems, the criteria are different for high-quality audio.

Sampling theory was developed in conjunction with information theory, which assumed that the signals being sampled were entirely unpredictable. But musical signals, much like visual images and other natural phenomena, are highly predictable (they have a "finite rate of innovation"), which is why lossless compression schemes such as FLAC work, delivering bit-for-bit accuracy at half the bit-rate. Researchers have advanced sampling theory beyond Nyquist-Shannon, and applied those advances to fields such as astronomy and medical imaging. There's a direct parallel between resolving time information in musical signals and distinguishing between closely spaced objects in astronomy and medical imaging. Bob Stuart and Peter Craven applied this new sampling approach to digital audio, guided by the latest neuroscientific research into human hearing.

For example, you may know that the "Nyquist frequency" is the highest frequency that can be correctly sampled for a given sample rate, and is half that sample rate. That's why 44.1kHz has an audio bandwidth of 20kHz—just under half the sampling frequency. But cutting-edge medical-imaging technology, by exploiting the signal statistics, can resolve up to *three times* the Nyquist frequency, allowing much finer resolution of visual detail. Other advances in sampling theory further improve the temporal resolution of musical signals. (For more technical detail, search on Google for "Sampling—50 Years After Shannon" by Michael Unser and "Sparse Sampling: Theory and Applications" by Pier Luigi Dragotti.)

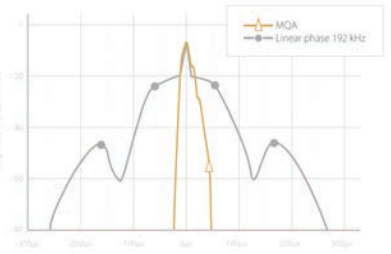


Fig.1 Temporal blur of MQA (narrow) and PCM (wide).

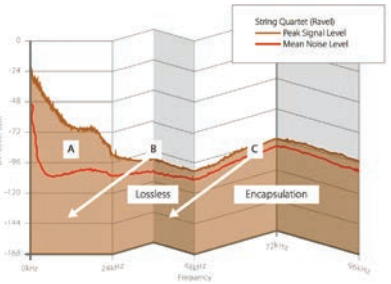


Fig.2 MQA encodes spectral information above 24kHz (B and C) and buries it beneath the noise floor.

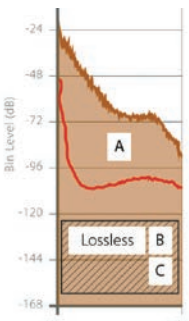


Fig.3 The encapsulated MQA signal at 48kHz/24-bit with spectral information above 24kHz hidden beneath the noise floor (shown as the red line).

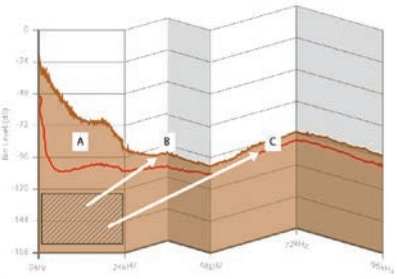


Fig.4 On playback the MQA decoder "unfolds" the spectral information above 24kHz, restoring the sample rate of the original source.

These new sampling techniques allow an entirely different approach to filtering digital audio, which in part contribute to MQA's ability to reduce the filters' deleterious effects on music.

Now we get to the question of how

these advances are realized at such low bit rates. As explained in my article in Issue 253, MQA "encapsulates" spectral information above 20kHz by "folding" it back into the 44.1kHz or 48kHz stream and burying it beneath the noise floor (Figs.2 and 3). If you don't have an MQA decoder, the DAC sees this 48kHz/24-bit FLAC file and plays it just as it would any other FLAC file, ignoring the buried information. But if the file finds an MQA decoder, that decoder will "unwrap" the buried information and restore the sample rate and bit depth of the original signal (Fig.4). On the Meridian 808v6, the sampling frequency indicated in the display changes with the recording, indicating the sampling frequency of the original master. (Encapsulation is more complicated that this. Interested readers are referred to Issue 253.)

MQA ties together the entire digital encoding and decoding chain into what is essentially a single system, with a method of authenticating the signal from end to end. When you see the MQA indicator on your DAC illuminate, you know that you are getting the version of the music created by the engineer, with no time smearing, and with no question about the file's provenance or corruption through the distribution channel. There are currently two levels of authentication, MQA and MQA Studio. MQA Studio indicates that the file provenance is assured by the artist or label.

This end-to-end connection of the A/D and D/A converters allows both ends of the chain to work together for optimum sound quality. For example, metadata carried in the MQA file includes information about the many parameters selected by the encoder. The MQA decoder can then, for example, apply a specific reconstruction filter on playback that has a complementary impulse response, improving the overall analog-to-analog performance. The MQA decoder also knows what DAC it is driving, and outputs different data depending on the DAC to compensate for that DAC's particular characteristics. That's why the "unfolded" file isn't available on a digital output; the decoder and DAC are irrevocably bound together.

So far I've described MQA distributed through a channel that can support a 44.1 or 48kHz/24-bit FLAC file. But what about playback systems that support only 16-bit data paths, such as Apple AirPlay, Bluetooth, or many automotive-audio systems? Or slower Internet connections? MQA has anticipated these conditions by making the technology hierarchically scalable. The streaming service knows what device it is streaming to and can truncate the 24-bit MQA file to 16 bits. Some high-resolution information is lost, but the listener still receives considerably more than CD-quality audio. When a streaming service detects that your Internet connection can't support the full 48kHz/24-bit signal, it can reduce the word length in increments of two bits at a time—22 bits, 20 bits, 18 bits, or 16 bits. Each reduction causes signals above 24kHz to be progressively more lossy, with some reduction in quality with each reduction. Note, however, that what the listener isn't getting with these truncated files is something he never had in the first place.

MQA doesn't tinker at the margins of digital audio with incremental improvements, but rather rethinks the entire encoding and decoding chain while maintaining compatibility with existing infrastructure and file formats.

FAQ about MQA

How can I get MQA?
As of this writing, MQA is available through the streaming service onkyomusic.com and via download from the Norwegian label 2L (shop.klicktrack.com/2l), which is offering 130 titles at the time of this writing. The streaming service Tidal is poised to begin streaming MQA files, perhaps even by the time you read this. It remains to be seen if other streaming and download services, such as Spotify and iTunes, will offer MQA-encoded music. Streaming MQA in its highest quality requires that the streaming service offer 1.4Mbs streaming rate, which is higher than Spotify's and iTunes' current bit rates.

Will my existing music server handle MQA files?
Yes. MQA-encoded music is packaged as a standard FLAC file. I've seen imbedded Tidal applications within server music-management software; an easy software update will bring MQA-encoded Tidal streams to your server. To decode properly, however, the server must be bit-perfect (i.e., it doesn't corrupt the data).

Can my existing DAC be upgraded to decode MQA files?
It depends on the DAC. Software-based DACs (those that run on general-purpose DSP chips) could be made MQA-compatible through a software update, if the DAC manufacturer chooses to become an MQA licensee. DACs made in the future will have MQA decoding built into the DAC chip itself.

What happens if I play MQA-encoded files through a DAC that doesn't have an MQA decoder?
MQA is backward-compatible with all existing music-distribution infrastructures and consumer-playback hardware. If you don't have an MQA-capable DAC, the MQA file plays just like any other file, but with somewhat better sound quality than CD.

Does this mean that I have to buy my music library all over again?
No. With a service like Tidal, you'll have access to a library of MQA-encoded music. Just how much MQA-encoded music will become available is an open question. Watch theabsolutesound.com for updates on music availability.

When will more DACs with MQA launch?
In January 2016, MQA made available a "developer board" to help DAC manufacturers design MQA decoding into their products. Expect to see a proliferation of MQA-compatible DACs at all price points by mid-summer.

How many MQA titles will be available initially?
We'll have to wait until Tidal "throws the switch" on MQA to find out. However, Tidal stated last April that the company was working "furiously" to be ready to stream its vast music library in MQA.

Will MQA become ubiquitous?
Only time will tell, but MQA has many factors that suggest it will become the standard for music distribution. First, a single file works for all listeners, greatly simplifying life for the record companies. Second, it's backward-compatible; listeners don't need to make a conscious decision to buy into a new format. Third, it removes the question of provenance; the MQA light on the DAC indicates that the file has been signed off by the engineer or record company. Fourth, I believe that artists and producers will demand distribution in MQA once they hear how it conveys to fans more of their artistry. Fifth, MQA offers a protection to the record companies that allows them to deliver master-quality sound without actually distributing their masters.

Isn't MQA just another "lossy" compression system that ignores real musical information in an attempt to lower the bit rate?
MQA is the antithesis of lossy compression. It simply is a more efficient encoding system, coupled with significant advances in improving digital sound quality.

How Can MQA Improve the Sound of Original Masters?

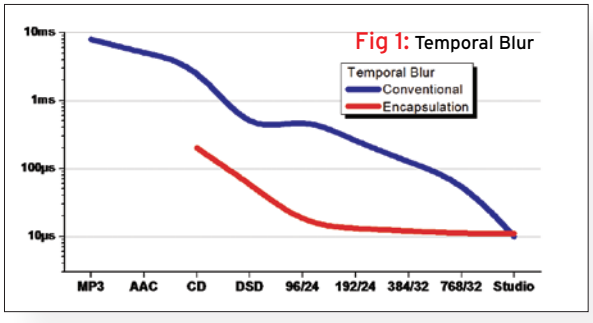
There's been some skepticism, and even hostility, toward MQA by posters on Internet forums, much of it engendered by MQA's claim that the technology can deliver sound that's *better* than the original master. Such a feat is impossible, according to the posters, and the claim constitutes *prima facia* evidence that MQA is a fraud. These armchair critics, it should be noted, have probably not read the Audio Engineering Society paper or the patent applications, nor have they listened to MQA for themselves.

But the question remains; just *how* is it possible that MQA can improve upon master recordings? Isn't delivering to the listener the master recording high-end audio's Holy Grail?

Before tackling that thorny question, we must first reconsider what we mean by the "master." In everyday language, the "master" is the physical media (such as analog tape) or digital file that first captured the musical performance or the "final" mix of that performance. But it's more correct to think of the "master" as one step further back in the chain—the signal fed *into* the analog tape recorder or analog-to-digital converter. Correctly storing, distributing, and recreating *that* signal is the true Holy Grail, not preserving the signal after it's been corrupted by a storage medium.

An MQA file created from a digital "master" contains extensive metadata, and uses information about the A/D converter used to create the MQA master. The MQA encoder can then remove the specific distortions introduced by that converter. It's different for every A/D (record companies keep detailed production notes about such things). Where the A/D converter is unknown, a generic algorithm analyzes the file and then removes typical artifacts. Specifically, MQA removes the "temporal blur" caused by filter ringing. (See the overview of how MQA works elsewhere in this article, as well as my in-depth technical feature on how MQA works in Issue 253.) This is one reason why MQA can sound better than the master, and take the listener one step further back in the chain to the signal *before* the master recording.

As I recounted in the March issue's From the Editor, at the most recent CES I heard an original 88.2kHz/24-bit recording made by Peter McGrath (a live performance of *Tosca*), along with an MQA version of that recording. The original had a bit-rate of 4.23Mbs. The MQA file had a bit rate of 1.3Mbs. The MQA version was so much better than the original in every possible way—timbre, dimensionality, ability to differentiate individual instruments, the realism of the applause, and most importantly, in musical communication. Peter was sitting next to me and was equally stunned by this seemingly impossible feat.



After receiving the Meridian 808v6 and MQA-encoded files, I made quite a few comparisons of digital recordings with their MQA counterparts by listening to the non-MQA versions from my library on the Aurender W20, from CD, or streamed from Tidal, all through the same DAC. On every paired comparison, the MQA was decidedly better sounding, in some cases dramatically so. One problem, however, with these comparisons is that the provenance of the conventional digital version is unknown; the MQA file could have been created from an entirely different mastering. That wasn't the case with the Peter McGrath recording; we were listening to his original file created during the recording.

To further explore the claim that MQA can actually improve upon the original, I asked MQA to encode a file of a recording I had made live to DAT back in 1988. I ripped the file from the CD release (as WAV) and sent it to MQA with the information about the A/D converter (a Sony PCM-2500 professional DAT recorder). The recording was made at 44.1kHz/16-bit, which was the highest resolution available at the time. MQA returned the file to me, and I compared it with the original. I should mention that I've heard this recording of a straight-ahead jazz quintet hundreds of times on many systems over the past 28 years.

The MQA version was improved, and in myriad ways. On a macro level, MQA seemed to "de-homogenize" the soundstage, presenting each instrument in its own specific location, surrounded by air and bloom. In addition, the soundstage also had more air and dimensionality. The original sounded flatter and less dimensional. Timbres were more realistic; the flugelhorn had greater body, denser and richer tone color, and wasn't overlaid by a synthetic patina. The attack of drumsticks on cymbals was transformed by MQA; they now had the same transient life and immediacy they'd had in the studio. By comparison, the cymbal strikes on the original file were dulled and heavy rather than crisp and clean. This sonic improvement had the musical effect of heightening rhythmic intensity. Another significant sonic quality that affected musical perception was the MQA version's greater resolution of individual instrumental lines. Although, as mentioned, I've listened to this recording hundreds of times, listening to the MQA version I heard, for the first time, exactly what the pianist was playing during the flugelhorn and tenor sax solos.

A more dramatic example of MQA's ability to improve upon 44.1kHz digital recordings is Zappa's orchestral album *The Yellow Shark*. Compared to my CD version, the MQA presented much more complexity of instrumentation. This "de-homogenizing" mentioned earlier really benefited this densely orchestrated music. It was like really hearing the compositions for the first time as each instrument's contribu-

tion was fully revealed. For one example, some pieces are scored for a celesta, whose delicate but significant part tended to be fused into the music's fabric on the CD, but was clearly resolved spatially, timbrally, and musically on the MQA version.

Recording professionals are hearing the same things. Alan Silverman, engineer of the new Judy Collins record *Strangers Again*, said this about the track "When I Go" (with Willie Nelson): "I've just compared the MQA playback with my original 88.2k 24-bit master and find the MQA to be mystifyingly more satisfying, and not by just a subtle shade. Listening to Willie and Judy, their voices sound much more real, at the same time, they have a textural filigree and detail of tone that I am not hearing in the original master! The same holds for the banjo and the subtle electric guitar in the right channel. I am delighted and extremely enthusiastic about the MQA process."

Removing digital artifacts is miraculous.

Morten Lindberg of the Norwegian label 2L, which has had 23 Grammy nominations since 2006, 16 of them for Best Engineering, said, "I have spent many hours with Bob Stuart, listening to original recordings and [am] constantly amazed by the incredible sense of space and clarity brought by MQA." About his title *Magnificat*, Lindberg said, "The MQA sounds great! You can hear positive 'sweetening' of the top-end on both the strings and especially the sibilants of the soloist. MQA smoothes the recording—it was like removing the veil of a net curtain. This is what MQA does." I should note that *Magnificat* was nominated for a Grammy award this year for Best Engineering, and was originally recorded at 352kHz/32-bit. Lindberg was comparing his 27Mbs master to the 1.4Mbs MQA file.

This ability to scrub away digital artifacts and restore natural timbre, air and bloom, dynamic attack, and differentiation of individual instruments is nothing short of miraculous. I had long ago resigned myself to the fact that any recording that had ever been subjected to 44.1kHz/16-bit encoding was irreparably damaged. So much music was recorded at 44.1kHz or 48kHz in the 1980s and 1990s, before recorders with high sample rates and longer word lengths became available to professionals. Of course, the end result of MQA is much better if the original recording started off with a high sample rate, or was recorded on analog tape.

Some ill-informed critics have suggested that any music that had ever been on analog tape and converted to MQA doesn't deserve to be called "high-resolution" on the assumption that analog tape is a low-resolution medium. That view is blatantly false. Many of the MQA files I've been listening to were transferred from the original analog masters, some from the 1950s and 1960s, and I can tell you that they are every bit as high in resolution as any recording made with modern digital technology. Just listen to the MQA version of "With Every Breath I Take" from Frank Sinatra's *Close to You* and then suggest that the sound is in any way "low-resolution."


Music Library
MERIDIAN
Albums Sorted by Play Count
Keith Jarrett
The Köln Concert (MQA 1p1)
Miles Davis
Kind Of Blue (MQA)
The Modern Jazz Quartet
Blues on Bach (MQA)
Norwegian Racio Orchestra
Astrognosia & Aesop (MQA)
Ray Charles & Milt Jackson
Soul Brothers (MQA 1p1)
Bengt Hanssen
Pianostykker fra en bygård
Joni Mitchell
Hejira (MQA)
Judy Collins
Strangers Again (MQA)
Lhasa
La Llorona (MQA)
Philadelphia Orchestra, Chri...
Mahler: Symphony No. 2 in...
Amy Duncan
Undercurrents (MQA)
Dorothee Röschmann, Mitsu...
Schumann: Liederkreis, Frau...
Muddy Waters
Folk Singer (MQA)
Wallace Roney, Bob Belden,...
In an Ambient Way (MQA)
will.i.am
Various (MQA)
Björk
Vulnicura (MQA 1p1)
Bucky Pizzarelli (featuring J...
Three For All (MQA)
Daft Punk
Random Access Memories (...
Swim
Queue: 1:51 Remaining
Ola Gjeilo - Piano Improvisations
Heart to Heart
2 /8
87

Meridian 808v6 Signature Reference CD Player/DAC with MQA Decoding

Milestone

By Robert Harley

Meridian 808v6 CD Player/ DAC with MQA

WAY back in 1983, a small audio company from Huntingdon, England, created the world's first "audiophile" CD player by modifying a Philips machine. That company was Meridian Audio, and the product became the Meridian MCD. Meridian co-founder Bob Stuart took a look inside that first CD player and discovered many things that could be improved.

Thirty-three years later, Bob Stuart and Meridian Audio are still pursuing improvements in digital sound, but on a scale and with a technological sophistication that would have been inconceivable to the young engineer.

The culmination of everything Meridian has learned about digital-audio playback is realized in the new 808v6 Signature Reference Compact Disc Player reviewed here. Even considered as only a CD player, the 808v6's technology and performance would be beyond the ken of even the most advanced, mid-1980s engineering mind. It's interesting that in this age of streaming and downloads, some companies have abandoned the CD format as yesterday's news, while others have embraced it by introducing advanced new disc players (Meridian, Esoteric, dCS, for examples).

But the $22,000 808v6 is so much more than a CD player—it is the first disc player and DAC to offer decoding of Master Quality Authenticated (MQA) sources. As described in the accompanying feature, MQA delivers better-than-hi-res sound with a bit rate low enough to stream. This extremely sophisticated new technology was conceptualized and created by Bob Stuart with British mathematician Peter Craven. The 808v6 is thus not just the most sophisticated CD player in Meridian's history, but also the progenitor of an entirely new class of digital-playback systems based on the revolutionary MQA. The 808v6 is an even more significant milestone than was the MCD.

Let's first consider the 808v6's features and operation. The 808v6 looks and functions just like previous generations of this player have, with a large black chassis (colors are optional), generous-sized transport controls, card-cage construction with removable interface boards, extensive input and output options, and Meridian's two-handed MRC remote control. A flip-down panel opens to reveal additional controls, including volume setting, mute, and scan forward/backward. Since this is the "Signature" edition, the inside of the flip-down panel includes the signatures of Meridian founders Bob Stuart and Allen Boothroyd.

The 808v6 has six analog inputs (all on RCA jacks) along with source-switching and a volume control, making it a fully functional preamplifier as well as a disc player. (The volume control can by bypassed, with the output at a fixed level.) The gain of each analog input can be set independently. These inputs are named on the front panel with common source names, such as Disc, Radio, SLS (Sooloos), USB, etc. Digital inputs include two coaxial, two optical, USB, and Ethernet. This last input makes the 808v6 compatible with networked audio systems, including the Meridian Sooloos music server. In a nice touch, the remote control's track forward and back buttons, along with other transport functions, allow you to navigate a Sooloos playlist from the remote as well as from the Sooloos touchscreen. The 808v6 will output high-resolution PCM on a proprietary encrypted format, called Meridian High Resolution (MHR), for driving Meridian's digital active loudspeakers. Both balanced and unbalanced analog output jacks are provided. The substantial and handsome gloss-black case (colors are available at additional charge) has remained unchanged throughout the 808's long history. (I reviewed the 808v2 in the August 2009 issue.)

The 808v6 is, like its predecessors, based on a CD-ROM drive for greater data integrity and reliability. Data from the disc are read into a buffer, and then clocked out with a high-precision clock. If uncorrectable disc errors are encountered, the drive can simply read that disc section repeatedly until the data are correct. In daily operation, the disc drive is smooth and quiet.

The 808v6 is, not surprisingly, software intensive. Filtering is performed on a general-purpose DSP chip. The filter is Meridian's "apodizing" type, which removes "pre-ringing" from the signal. Meridian's apodizing filter, first introduced in the 808v2, shifts the ringing energy so that it occurs after the transient rather than before *and* after the transient. This greatly improves the sound. The filter upsamples incoming data to 176.4kHz/24-bit. The powerful DSP chip is also put to work as bass and treble controls, accessible from the remote control. Unlike most manufacturers, Meridian doesn't tout the internal parts used in its products, suggesting that to do so would be like an automobile manufacturing promoting a car on the basis of its tires. They suggest that product design is more than a sum-of-the-parts list. Nonetheless, the 808v6 uses the Analog Devices AD1852 delta-sigma DAC. The output stage is entirely new for the v6. Earlier versions of the 808 featured a differential output stage to accommodate the differential DAC, and to drive the balanced output jacks. The new analog stage is a dual-differential circuit (the DACs are now in a dual-differential configuration), which reduces intrinsic noise by 3dB. The new analog stage also has wider bandwidth to take advantage of the improved time-domain performance realized by MQA.

The digital inputs have been upgraded in the new v6. The coaxial and USB inputs can accommodate up to 192kHz/24-bit data, and the player supports DoP (DSD


SLS MQA. 352k
MERIDIAN
Signature Reference CD Player 808

Meridian 808v6 CD Player/ DAC with MQA

over PCM) protocols. Meridian has long been at the forefront of reducing jitter, and the 808v6 features the company's most elaborate clocking and buffering system (with buffering and reclocking on the disc drive) on the control card, and on the digital inputs. A final FIFO (first-in, first-out) buffer before the DAC reduces any remaining jitter components and shifts the jitter frequency to below 0.5Hz. Each of these buffer/reclocking stages decorrelates jitter from the signal (jitter correlated with the audio signal is more sonically detrimental than decorrelated jitter).

The big news, of course, is that the 808v6 will decode MQA files. The player's large front-panel alphanumeric display indicates "MQA" when the 808v6 receives an encoded file. The display also shows the sample rate of the original source file that was used to make the MQA file. As explained in the accompanying article, MQA can encapsulate a wide range of sampling frequencies into a 44.1kHz or 48kHz file. The information above 20kHz is "unfolded" during playback to restore the original bandwidth of the signal used to make the MQA file. During my time with the 808v6 I saw the display indicate sampling frequencies of 44kHz, 48kHz, 88kHz, 96kHz, 176.4kHz 192kHz, and 384kHz. Again, these rates reflect the sampling frequency of the original signal encapsulated in the MQA file, and "unfolded" in playback to the signal's native rate. The display letters "MQA" indicate that the file has been "authenticated," meaning that the file is the same as that created by the engineer. A period after "MQA" signifies MQA "Studio" mode, indicating that the file being decoded has been approved by the artist or label.

My separate discussion of MQA accompanying this review includes an extensive sonic evaluation of the 808v6 playing back MQA files, so I won't reiterate those impressions here. Rather I will describe how the 808v6 sounds as a CD player and DAC with conventional (non-MQA) sources.

As with its superb predecessors, the 808v6 is in the upper echelon on the best-sounding digital playback devices extant. Its overall character was immediate and present, with a palpability that positioned lead vocals and lead instruments toward the front of the soundstage. The perspective was one of sitting close to the performers rather than hearing them from a distance. This quality fostered an intimacy with small-scale music and vocals, such as the Norah Jones album *Come Away With Me*. Gary Burton's vibes on his albums *Guided Tour* and *Common Ground* were right upfront, with vivid bell-like clarity. The Meridian is no shrinking violet, imbuing the music with a bold immediacy. By contrast, the Berkeley Alpha DAC Reference (my reference) was less upfront, with a farther-back-in-the-hall perspective. Which spatial perspective you prefer will be a matter of taste, as well as of how that perspective complements the rest of your system.

The 808v6 is one of the best-sounding digital playback devices.

Transparency and resolution were in world-class territory. The 808v6's immediacy had the effect of fostering a sense of nothing between you and the music, particularly with vocals. There was no veiling or opacity diminishing the impression of hearing deep into the acoustic space. Instruments toward the back of the hall maintained their clarity and timbre, and fine detail was well portrayed. The 808v6 also excelled at differentiating instruments from one another, a quality I enjoyed when listening to the modern big-band music of Gordon Goodwin, with its intricate arrangements. In these aspects I thought that the Berkeley DAC was a notch better, providing a deeper view into the soundstage and greater separation of instruments.

These comparisons were made, however, with both DACs driven via their USB interfaces (the outboard Berkeley Alpha USB, with the Berkeley DAC). But the Meridian sounds considerably better when connected via Ethernet rather than USB. (The Berkeley lacks a network connection, making comparisons in this mode impossible.) Compared with the USB connection, the 808v6 fed from Sooloos via Ethernet had smoother textures, particularly in the treble. The top end was cleaner and more refined. Detail resolution also increased, as did the sense of air and bloom around images. The Ethernet connection sounded more relaxed and natural, with more liquid midrange timbres. Even via USB, the 808v6 delivers world-class sound, but

for the ultimate in performance Ethernet is the way to go. The Sooloos system, which connects to the 808v6 only by Ethernet, and which I had not used in many years, was superb functionally and sonically. The price has also come down considerably since the earlier versions.

The 808v6's bass was truly outstanding, with tremendous heft, weight, and dynamic impact. The generous bass fullness gave orchestral music a solid foundation and a great sense of power—the doublebass section of the orchestra had visceral body and authority. Rock was well served by the Merdian's dynamic and powerful low end, giving kickdrum a little more depth and impact than I'm used to hearing from my system. Bass lines were readily discernable. The Berkeley DAC was, by contrast, a little lighter in tonal balance, leaner and tighter, with less bottom-end fullness.

Conclusion

The 808v6 is a landmark product in that it introduces an entirely new digital technology, Master Quality Authenticated. That this new technology can be incorporated into an existing product (previous versions of the 808), yet elevate the sound quality to this degree, is remarkable. As a conventional CD player and DAC, the 808v6 is among the best digital front ends I've heard when driven via Ethernet. I have no experience with other MQA decoders to put the 808v6's MQA performance into perspective, but I can tell you that this Meridian playing MQA files sounds nothing like any digital anyone has ever heard.

If time travel were possible, I'd love to take the 808v6 back to 1983 and show it to the Bob Stuart who modified that first Philips player. The juxtaposition of these two machines is Bob Stuart's lifelong commitment to music and audio writ large.

SPECS & PRICING

Disc drive: CD-ROM
Analog outputs: Balanced on XLR jacks, unbalanced on RCA jacks
Digital outputs: Coaxial, Meridian SpeakerLink (optional MHR encryption on digital outputs at high sample rates)
Analog inputs: Six unbalanced
Digital inputs: Two coaxial, one Meridian SpeakerLink, two TosLink optical, one network (Ethernet) for connection to Meridian Sooloos, one USB (all inputs with nameable legends); coaxial and USB inputs compatible with up to 192kHz/24-bit; optical inputs compatible with up to 96kHz/24-bit
Digital filter: Meridian apodizing filter with upsampling and resolution enhancement
Decoding: MQA decoding and rendering
Dimensions: 18.9" x 6.9" x 16.2"
Weight: 38 lbs.
Price: $22,000 ($1100 additional for custom colors)

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PE29 6YE
England
meridian-audio.com

MERIDIAN AMERICA INC.
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Lithia Springs, GA 30122
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ASSOCIATED EQUIPMENT
Loudspeakers: Magico Q7 Mk.II, EnigmAcoustics Sopranino self-biasing electrostatic supertweeters
Headphones: Audeze LCD-4 driven by Moon by Simaudio 430HA headphone amplifier, Nordost Heimdall 2 balanced cable
Amplification: Constellation Audio Altair II preamplifier and Hercules II monoblock power amplifiers
Digital sources: Meridian Sooloos, Aurender W20 music servers
Support: Critical Mass Systems Maxxum equipment racks (x2), Maxxum amplifier stands (x2)
Cables: MIT Oracle MA-X SHD
Interconnects: MIT Oracle, AudioQuest WEL Signature and Wild
Digital interconnects: Audience Au24 USB, AudioQuest Wild Digital AES/EBU
AC: Four dedicated AC lines; Shunyata Triton 2, Triton DP, Typhon (x3) conditioners, Shunyata Sigma power cords
Acoustics: ASC 16" Full-Round Tube Traps, ASC Tower Trap, Stillpoints Aperture Panels
Accessories: Shunyata cable lifters, Stillpoints Ultra2 and Ultra6 isolation

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Master Quality Authenticated

Meridian Explorer² MQA DAC

Lowering the Price of Admission

The $22k price tag for the 808v6 is far beyond the means of all but a few listeners, but Meridian's $299 MQA-capable Explorer² makes MQA accessible to just about anyone. In fact, most people will experience MQA for the first time through the Explorer². I requested a review sample of this popular "pocket DAC" that has been on the market for some time (without MQA capability). A software update in early February added MQA decoding.

This small oval tube of a DAC is designed for personal listening, but with both line output and a headphone jack, can be used in a home system. The Explorer² has one mini-USB input at one end of the oval tube, and stereo 1/8" line-out and headphone-out jacks at the other end. One of the three LEDs indicates whether Explorer² is decoding a standard file (white), an MQA file (green), or an MQA Studio file (blue). The two other LEDs indicate sampling rates of 88k/96k and 176k/192k, respectively. Mac users can plug-and-play; Windows users need to download a driver from Meridian.

Inside the extruded aluminum case is an asynchronous USB interface, analog volume control, and Meridian's apodizing digital filter. The filter and MQA decoding run on an XMOS DSP chip with 1000MIPS of horsepower. For comparison, Meridian's 808v2 CD player that introduced Meridian's apodizing digital filter made do with 150MIPS of DSP power. The Explorer²'s filter upsamples incoming data to 176.4kHz, but passes 192kHz data natively to the TI PCM5102 DAC. Output impedance is 0.47 ohms.

I listened to the Explorer² primarily in my desktop system with the Audience 1+1 V2+ single-driver speakers, Audeze LCD-4 and PSM M4U 2 headphones (driven directly by the Explorer²), and the headphones powered by the Moon by Simaudio 430HA headphone amplifier with the Explorer²'s line output driving the headphone amp via Audience Au24 1/8"-to-RCA cable. I also listened to the Explorer² in my main system, fed by an Aurender W20 playing MQA-encoded files as well as conventional PCM files. Note that the Explorer² won't work with a Sooloos system, which doesn't support the USB interface (Sooloos is network-connected only).

Playing standard (non-MQA) files, the Explorer² proved itself to be a good $299 portable DAC. The treble was fairly clean, dynamics were wide, and the sound was reasonably resolved and transparent. It's a huge upgrade from the computer's audio output, boasting much smoother treble and more liquid midrange. The Explorer² was significantly more dimensional and spacious, with better differentiation among instruments. By comparison, the computer's audio output was grainy and flat. The Explorer² brought the sound quality up to an audiophile level. I would characterize it as a solid and competent performer in the category when compared with other products in the very competitive low-priced portable DAC category.

But the Explorer² morphed into an entirely different animal when decoding MQA files. The disparity in sound quality between standard files and MQA files was large, and far greater through the Explorer² than between those same files decoded by the Meridian 808v6. Meridian's flagship CD player/DAC's performance on standard material was significantly better than the Explorer² (as would be expected between a company's $299 entry-level product and $22k flagship), but less dramatically better when playing MQA files. The MQA decoder knows what DAC chip it is driving and can correct for certain DAC shortcomings. The Explorer²'s less-expensive DAC chip apparently benefited to a greater degree from this aspect of MQA than did the superior DAC chip in the 808v6.

When decoding MQA files on my desktop system, through headphones, or even at the front of a world-class reference system, the Explorer² sounded stunningly great. It delivers, to a surprising degree, the MQA experience I described elsewhere in this issue. Playing MQA files, the Explorer² has that sense of realism and presence that defines MQA. This was largely because of the increased dimensionality, along with the removal of the glassy hardness overlaying instrumental and vocal timbres. Even at the front of a massively resolving system of Constellation electronics and Magico Q7 Mk.II speakers, the MQA experience was unmistakable. Of course, it didn't have the sonic performance as Meridian's flagship 808v6, but it came closer than one would expect considering the 74x price disparity.

As I listened to MQA files through the Explorer² and PSB M4U 2 headphones ($299 and $395 respectively) on my PC, it struck me just how good this combination sounded for not a lot of money. This level of sound quality at this price would have been unimaginable not that long ago.

The Explorer² is great way for you to experience MQA for yourself, in a desktop, portable, or even home system. It's a good-sounding DAC with conventional digital files, but spectacular when decoding MQA. It's not the ultimate realization of MQA, but it delivers the technology's musical essence at an eminently reasonable price. tas

SPECS & PRICING

Inputs: Mini-USB
Outputs: Line out on 1/8" stereo jack, headphone out on 1/8" stereo jack
Output impedance: 0.47 ohms
Dimensions: 4" x 1.25" x 0.7"
Weight: 1.76 oz.
Price: $299