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# Lumin T3

Arguably the 'sweet spot' in Lumin's range of network-attached players, the new T3 retains the core features of its costlier models, including full use of the super-slick app  
 Review: **Mark Craven** Lab: **Paul Miller**

The product catalogue of Hong Kong's Lumin, neatly divided between four network players, three network transports, and one-off power amp and streaming amp options, deserves the description 'small but perfectly formed'. That would also be an apt way of looking at its T3, a network player/DAC possessing a neat, easy-to-accommodate design and a feature roster designed to satisfy the needs of the performance-hungry streaming audio enthusiast. In essence, it takes much of what's offered by Lumin's flagship one-box P1 [HFN Jul '22], but trims the spec. (and size) down to a price point of £4195, almost half that of its bigger brother.

For example, where the £8495 P1 offers a variety of legacy inputs, the T3 – like the earlier T2 model that it replaces – is (nearly) streaming audio all the way. Absent are the coaxial/optical, HDMI, AES/EBU and USB-B inputs of the P1, leaving this player's dual mono ES9028PRO DACs to handle digital files shunted to it via UPnP or streaming services, and from USB storage. Also missing are the P1's electrically isolated fibre network connection in addition to the standard RJ45 Ethernet, FPGA-based 'Femto' clocking system, and twin toroidal power supplies. But enough of what the T3 *doesn't* have...

## SMALL WONDER

Offered in black or silver/natural finishes, Lumin's DAC/streamer combines its network audio and DAC stages with a 'precision' analogue output, LeedH digital processing volume control [see PM's boxout, p67], a proprietary app-based control platform, and the company's latest processing engine, which increases both number-crunching power and storage in order to enable 'greater resampling flexibility and futureproofing'.

**RIGHT:** Screened PSU [far right] feeds the T3's mainboard processor [under a heatsink, centre] with Altera Cyclone IV and XMOS USB processors [bottom] and balanced analogue output board [left] with two ES9028PRO DACs [upper left]

Lumin's app (for iOS, Android and MacOS) is essential for operation, providing control over a vast range of processing and playback options. These include renaming the player; managing playlist curation; adjusting the search mode from 'filter' to 'find'; tweaking album artwork presentation; selecting between Full Decode, Core Decode and Passthrough of MQA files; and much more.

The interface is slightly Lilliputian on even a large smartphone display, by virtue of its comprehensive nature, but for the most part it's straightforward to use, and Lumin provides a detailed online manual that explains all its functions. In addition to UPnP playback from network shares, it integrates the Tidal, Qobuz and Spotify streaming services, alongside Tuneln

Internet radio, while Tidal Connect, Spotify Connect, Apple AirPlay and Roon Ready status enable use with other interfaces.

## ROCK SOLID

The T3's 350x60x350mm (whd) CNC'd alloy casework will be familiar to owners of the T2, although there's been an upgrade here too, as Lumin says it has adopted the 'silky surfacing process' of the P1, making this slender player less of a fingerprint magnet. The design catches the eye with

'Forty-one years on, the song still raised goosebumps'

a curved front panel, while the lip that extends over the rear connections is also unusual – this can make it a *bit* fiddly to insert cabling and USB storage, but does allow for a tidy installation once hooked-up. Also, Lumin's display is crisp and bright,





imparting a decent amount of at-a-glance information including track/artist name along with sample rate and bit-depth.

Native file handling reaches DSD512 and 384kHz/32-bit PCM (including FLAC, ALAC, AIFF and WAV formats), and this is joined by user-selectable up- and downsampling covering myriad options to DSD256/384kHz (there is also a native playback mode). Post DAC conversion, the T3 then offers both balanced XLR and unbalanced RCA connections, via a redesigned buffered analogue output stage boasting 'audiograde' capacitors.

Next to these connections are digital outputs on USB-A and BNC (S/PDIF) that allow the T3 to partner an external DAC. The USB port supports native DSD and PCM to 384kHz/32-bit while the BNC output is limited to 192kHz/24-bit and DSD64 (via DoP). But it's likely these ports will go

unused by most owners of the T3, not least because Lumin already sells the £1895 U2 Mini. This is a network transport that features the new processing platform and is aimed at third-party DAC owners.

Setup proves straightforward. In my system, Lumin's app did as advertised and automatically 'found' the Ethernet-connected T3 in short order. Indeed, this DAC/streamer's sheer ease-of-use is well worth highlighting, so while the unit's overall build and smart design already brings with it a healthy dose of 'pride-of-ownership', this feeling only grows when you start to use it. The link between app and hardware is rock-solid (the absence of conventional input switching suggests Lumin's optional £225 IR remote is

**ABOVE:** Available in black or natural finishes the T3's slim but very solid chassis features a deep set display (that can be extinguished). The control/config menu is in Lumin's app

largely redundant here), and the T3 is very responsive to controls. It just 'works' in a manner that isn't always guaranteed when it comes to network audio gear.

### IN PLAIN SIGHT

Up and running, both via streaming services and networked/USB files, the Lumin T3 impresses from the get-go. Its sound is exactly what you want from a digital audio player – sublime levels of clarity and insight with a feeling of transparency. There are

no filter options here to mess with, beyond Lumin's custom resampling, but this reinforces the idea that the T3 is giving you an unblemished performance, its DAC and analogue output simply providing a white-glove service for your music. Audiophile recordings sound

immaculate, while grittier, more 'raw' tracks lose none of their edge.

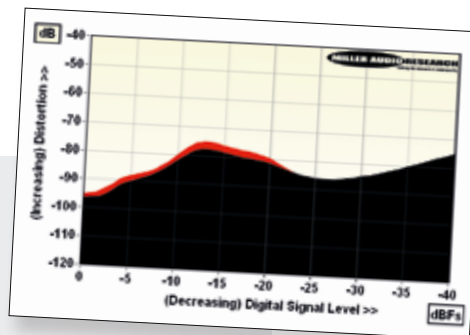
The T3's pristine playback also has you looking at old tracks in a new light. I thought I'd heard it all from Bon Jovi's rock ballad 'Wanted Dead Or Alive' [*Slippery When Wet*; Island Mercury, 96kHz/24-bit], knowing every beat, lyric, and artificial harmonic in Richie Sambora's guitar solo off by heart. Through Lumin's T3, however, the song took on a more polished, more detailed quality than I recall. Keyboards sounded fuller, percussion crisper, guitar riffs more cutting. Follow-up track 'Raise Your Hands' is more up-tempo and chaotic, and the player seemed to shepherd its various elements with precision while unleashing all the energy in the rhythm section and Jon Bon Jovi's vocal yelps.

It's an open sound, even with these dense pieces, but not to the point where the overriding feel or vibe becomes lost. So Ted Nugent's 'Stranglehold' [*Ted Nugent*; Epic, 96kHz/24-bit] sounded as wozy and

## LEEDH PROCESSING

Digital volume controls have generally had a bad press since the arrival of variable-output DACs, but while the technical compromises inherent in the earliest implementations most certainly had a subjective (audible) consequence, that's not always the case with today's advanced processing software. Before we dive a little deeper, I'll clarify that we are talking about digital attenuators here rather than either digital volume with gain or the digitally-governed analogue attenuators used in many of today's amplifiers [see p70]. The earliest digital controls were blunt instruments, lopping full bits of data from each, in those days, 16-bit words to achieve incremental reductions of up to 6dB. The greater the attenuation the greater the error in resolution/linearity and, as this quantisation error was correlated to the signal, it manifested as a further increase in harmonic distortion as the 'volume' was reduced.

Latterly, a form of digital dither was added during D/A conversion to randomise these fixed errors so they appeared as a uniform increase in noise rather than distortion harmonics. Nowadays it's more common for, typically, 24-bit audio data to be processed in 32-bit or 64-bit wordlengths so both the volume coefficient and audio sample may be accommodated with a reduced rounding error. LeedH processing, the brainchild of Gilles Milot ([www.acoustical-beauty.com](http://www.acoustical-beauty.com)) takes a different approach to minimising rounding errors without DSP-heavy overhead. Instead of striving for precise steps in level, LeedH calculates the best volume coefficient to deliver approximate steps in level (for example -1.2dB, -1.8dB, -3.25dB and -4.08dB in place of -1.0dB, -2.0dB, -3.0dB and -4.0dB, respectively) in order to realise the minimum rounding error. Dither is also still applied to decorrelate any residual distortions [inset Graph shows THD vs. level at volume position '60%', or -20dB, with and without LeedH processing (black/red)]. So, while the 'imprecise' volume steps will not be troublesome, there is evidently a small but measurable improvement in distortion. PM



## LUMIN T3



**ABOVE:** Simplicity itself as the diminutive T3 offers a USB-A port and wired Ethernet input (384kHz/32-bit; DSD512) alongside an S/PDIF output on BNC (192kHz/24-bit) and fixed/variable balanced/single-ended preamp outputs on XLRs/RCA's

improvisational as ever, the guitar solo flourishing above the effects-heavy bassline, while the textural juxtaposition between David Bowie's smooth vocals and Freddie Mercury's snarls on Queen's 'Under Pressure' [Hot Space; Virgin/EMI, 44.1kHz/16-bit] ensured the song still raised goosebumps, 41 years on.

Lumin's manual is coy about the subjective impact of its up/downsampling processing, saying 'you may prefer the upsampled audio – try it and see', and working against A/B comparisons is the fact that any change causes the T3 to return to the start of your playlist, which is irksome. Note that Lumin has avoided any asynchronous processing, thus giving its processor less work to do – options with 44.1kHz media, for instance, are 88.2kHz, 176.4kHz, 352.8kHz, etc.

### GRAND PIANO

My experimentation yielded no eureka moment, apart from some aspects of 44.1kHz files arguably gaining a little more 'solidity' when upsampled, such as Johnny Cash's bassy vocals on 'If I Could Read Your Mind' [American V; American Recordings, 44.1kHz/16-bit]. Also, when running the unit straight into a power amp, there was the slight constraining effect of switching off the LeedH volume processing. It's set as a default for a reason.

Other niggles? Files played from USB media remain in the T3's playlist (which doesn't discriminate between source) even after the external SDD/HDD is removed. Learning how to clear the playlist (which can accommodate 2000 tracks) is therefore handy and will avoid any confusion if you try 'playing' a file that's no longer available.

Back to the T3's way with music, and its excellent presentation of instrumental subtleties. Christian Grøvlen's recital of Bach's Chromatic Fantasia and Fugue in D minor [2L DSD256 download] came across with the classical pianist's techniques on full display, sustained notes ringing out, fingers tumbling over keys. Dynamic shifts in his

playing, the resonant tones of the piano, and the physical nature of the instrument itself were all conveyed.

Lumin's DAC snapped this piece into focus, making it sound intimate and lifelike. A similar feeling came via Alice In Chains' 'No Excuses', a highlight of the band's recorded-to-tape semi-acoustic EP *Jar Of Flies* [Columbia, 44.1kHz/16-bit]. The opening bars of popping percussion, captured via a multitude of mics, saw Sean Kinney's drum kit spread out across the soundstage, placing the listener close. Guitar and bass followed, both rich in tone and butter-smooth, and the fulsome nature of the rest of track revealed the T3's talent for marrying its resolving prowess with a weighty and largescale sound.

In a nutshell, Lumin's well designed app encourages long listening sessions – and so does the performance of its hardware. Fed the dramatic, electronic soundscapes of Daft Punk's *Tron Legacy* soundtrack album [Walt Disney Records, 44.1kHz/24-bit], the T3 matched it beat-for-beat, serving up ominous deep throbs, driving drums and stabbing synths. Switch to the title track from The Rolling Stones' *Let It Bleed* [ABKCO Records, 88.2kHz/24-bit], and its detailed but sympathetic payout of this rollicking, piano-laden blues jam will have you shaking your hips and pursing your lips like Mick Jagger. ☺

### HI-FI NEWS VERDICT

More succinctly featured than Lumin's big-boned P1, but adopting much of that unit's technology, the T3 probably represents the sweet spot in the company's network player range. It's a tasty treat too, wrapping up superb sound quality, slick app-based control and wide-ranging playback options in the sort of high-quality, stylish casework you'd expect at the price. Digital audio enthusiasts will enjoy.

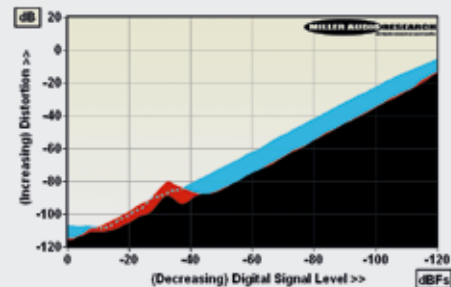
Sound Quality: 88%



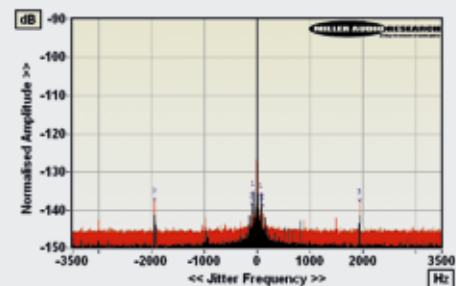
The T3 is currently Lumin's most accessible server solution that combines the 'LeedH Processing' volume algorithm [see boxout, p67] with its comprehensive resampling software and a brace of top-notch ES9028PRO DACs. The performance is very solid – maximum output is a healthy 5.0V from a usefully low 10ohm source impedance (balanced) while the A-wtd S/N ratio is a very wide 118dB, via both network and USB-A inputs. The lowest distortion – just 0.0001-0.00025% (re. 20Hz-20kHz) – is achieved at its peak output [Graph 1, below] rather than in the more common range between –10dBFS to –20dBFS seen with contemporary DACs. Nevertheless we've seen this resilience from Lumin's balanced output stages before [HFN Jul '22].

The ESS DAC offers a range of advanced digital filters [HFN Apr '22] but for the T3 Lumin has chosen the 'slow roll-off/linear phase' option. This trades a merely adequate 24dB stopband rejection and early treble roll-off (–6.3dB/20kHz with CD/48kHz media) for a significant reduction of pre/post 'echoes' in the time domain. Higher sample rates also experience a slightly premature HF roll-off but as this occurs well outside of the audioband (–9.6dB/45kHz and –16dB/90kHz with 96kHz and 192kHz media, respectively) there is no direct subjective impact.

Maximum output is 0.5dB higher with the T3 in native sampling mode but the S/N is reduced by 1.5dB and distortion is higher over the top 40dB of its dynamic range [red trace, Graph 1]. Correlated jitter is broadly unchanged by Lumin's upsampling, remaining a vanishingly low 11-12psec over all sample rates, whether resampling is invoked or not. However, synchronous resampling (48kHz to 192kHz, etc) does result in a decrease in uncorrelated phase noise/background noise [see Graph 2]. PM



**ABOVE:** THD vs. 48kHz/24-bit digital level (1kHz, black; 20kHz, blue; 1kHz Resampling Off, red)



**ABOVE:** High resolution 48kHz/24-bit jitter spectrum via network (resampled to 192kHz, black; native, red)

### HI-FI NEWS SPECIFICATIONS

Maximum output level / Impedance	5.01Vrms / 10ohm
A-wtd S/N ratio (resampling on/off)	118.0dB / 116.5dB
Distortion (1kHz, 0dBFS/–30dBFS)	0.00009% / 0.0025%
Distortion & Noise (20kHz, 0dBFS/–30dBFS)	0.00025% / 0.0036%
Freq. resp. (20Hz-20kHz/40kHz/75kHz)	–0.0 to +3.6dB/–9.6dB/–16dB
Digital jitter (48kHz / 96kHz / 192kHz)	11psec / 11psec / 10psec
Resolution (re. –100dBFS / –110dBFS)	±0.1dB / ±0.2dB
Power consumption	8W (8W 'standby')
Dimensions (WHD) / Weight	350x60x350mm / 6kg