AUDIO FILE

hi-fi news OUTSTANDING PRODUCT

Aqua La Scala MkIII

Off-the-shelf chipsets are firmly off the menu for Italy's Aqua as the brand evolves its unique take on the NOS 'ladder DAC' concept... now with a FET/tube output stage
Review: **Andrew Everard** Lab: **Paul Miller**

This DAC, to reveal its full name, is the La Scala MkIII Optologic, the third generation of a design from the Milan-based company whose name has nothing to do with water, but instead stands for 'Acoustic Quality'. Said to be 'more than a simple upgrade of our La Scala DAC', this latest version sells for £7850 in grey Nextel powder-coated aluminium casework with either a black or silver finished aluminium fascia. That places it well below the £14,980 Formula xHD flagship DAC [*HFN* Apr '20], joining the £8960 La Diva M2 CD transport, and the LinQ network bridge [*HFN* Sep '20], which starts from £6350 depending on configuration, in the compact Aqua range.

Like the other models in the portfolio, the latest La Scala is both designed and built by hand in Italy, and distinctive though the La Scala may be, its style shared with the other models in the range, there's even more to set it apart under the bonnet. Here there's a raft of in-house technology, right down to the design of the digital-to-analogue conversion itself.

PACKED DAC

As PM explores in his boxout [p67], the company has taken a proprietary route for its choice of DAC, rather than the simpler option of using an off-the-shelf chipset and working around it with various digital filtering options, a custom analogue output stage and so on. This is just one reason why the La Scala MkIII is very busy on the inside [see pic, right] – not for Aqua the kind of 'fresh air engineering' seen in many of its digital rivals' products.

And where does Aqua's 'Optologic' bit come into play? Well, this refers to the use of galvanic and optical isolation between the DAC's analogue and digital sections, using opto-couplers, notably between the FPGA that handles data formatting, and

the NOS (non-oversampling) conversion circuitry. Much of the design here is carried over from the previous generation of the La Scala, including the use of a pair of ECC81 triodes in the tube/FET hybrid output stage, somewhat counter-intuitively mounted just behind the front panel.

A very faint glow of valves might *just* be seen behind a slot in the model's fascia to the right of the two rotary controls – for power on/off and input selection – but you'll have to stare hard. Beside this window on the La Scala's internal workings is a small toggle switch to invert the absolute phase of the analogue output, should you so wish.

BOARD MEETING

What is new here is what Aqua calls its PIBU (PIlot BUffer) module in the output stage, allowing the complete removal of any capacitors in the signal path

> 'With overtones of muscled-up Europop, it's pretty sensational'

and delivering a claimed higher output current. The digital drivers between the FPGA and ladder DAC have also been enhanced. The beauty of Aqua's very modular design means existing La Scala models can be easily upgraded to the current specification. A return of the unit is required, though – this is not a simple software/firmware burn and will involve some board-swapping.

As in the MkII version, separate power supplies are used for the digital and analogue sections, with twin C-core transformers on the right of the interior (when viewed from the rear), while the simplicity of the controls on the front – the power switch being just that, and not an on/standby selector – is reflected in the almost sparse layout of the rear panel [see p69].

The DAC's BNC, RCA and AES/EBU electrical inputs, in addition to AT&T/ST

optical fibre, all support 192kHz/24-bit and DSD64. A USB-B input and Aqua's proprietary AQLink, using I²S and on an RJ45 port, can handle LPCM up to 384kHz/24-bit and DSD128. The La Diva M2 CD transport and the LinQ network bridge offer matching AQLink connections. Output is available on either unbalanced RCAs, or transformer-balanced XLRs, at a fixed level [see PM's Lab Report, p69].

If there's any criticism of the DAC's build and functions, it's that the selector on the front panel is labelled in Roman (not Milanese!) numerals, rather than what the inputs actually are (coax, USB, *etc*). But I suppose this will soon become intuitive after a period of using the La Scala DAC, and otherwise an immense part of its appeal lies in its simplicity. Aside from the need to download a driver should you

want to use its USB input with a Windows computer – none is needed with Mac or Linux machines – Aqua's DAC is entirely plug and play. There's no faffing about with digital filter settings (there is no upsampling or digital filtering here, the company relying instead on an analogue filter after the conversion) or any other parameters. All that's needed is a digital source and a preamp/integrated amp, then switch on and enjoy.

ORGANIC SOUNDS

And you *are* going to enjoy! This is a DAC with a smooth, slightly lush and generous presentation, which is not only in contrast

ABOVE: The La Scala MkIII uses alloy casework with a Nextel finish, hosting rotaries for power and digital input selection. The triode tubes are not especially visible through the slot on the right of the fascia (next to a phase invert toggle)

with the bright, hyper-detailed and 'audiophile' sound of some rival designs, but also superbly easy to relax into. Don't mistake that broad-brush description for a suggestion that the La Scala MkIII is overly soft or uninteresting, either. Instead, it always sounds natural and organic, bringing out instruments and voices in a wonderfully unforced fashion, without trading away any emotion or involvement.

What's more, it does all the 'hi-fi' stuff deceptively well, with more than enough definition to make clear a large, expansive soundstage or a tight, intimate recording of a solo instrumental recital. The way it handles vocals is a delight, and there's plenty of space and ambience when required. It's as adept with the resonance of an upright bass as it is with the gentle tap and sizzle of a cymbal. However, what sets it apart is that it does what it does with the same lack of fuss you find in its operation. There's nothing flashy or showy here, but rather a confidence and maturity that's hard not to like.

MIDNIGHT MASS

Playing Anna Lapwood's version of Hans Zimmer's 'Time', from the composer's soundtrack for *Inception* [Firedove; Sony Classical 19802809272], the La Scala MkIII brought out all the power of the Steinmeyer organ, and the way it shifted and energised the air in the generous space of Trondheim's Nidaros Cathedral during the musician's now celebrated midnight sessions. The gentler notes just hung in the air while the dynamics of the piece all but shook the place.

Meanwhile, her arrangement of Bob Dylan's 'To Make You Feel My Love', performed by her choir of Pembroke College, Oxford, swelled from a hushed whisper to the great chords of the organ before giving way to a gentle solo voice in wonderfully dramatic fashion. Here the ➡

RIGHT: Two transformers [right] feed separate regulated PSUs [centre top] supplying the (digital) XMOS USB input board and Xilinx DSP [bottom], and (analogue) discrete ladder DACs [bottom left] and FET/tube output [top left]

AQUA'S LADDER

The 'concept DAC' at the heart of the La Scala was debuted in Aqua's Formula xHD [*HFN* Apr '20]. Here a discrete precision-matched resistor ladder network is used to convert 'bits' into sequential steps of current – these are the rows of the smallest surface-mount chip components seen in the inset picture [below]. In this FPGA-based R-2R DAC the LSB (Least Significant Bit) is represented by the smallest current source, with each subsequent 'bit' twice the output of the last (a ratio of 1:65,536 over 16-bits). In practice, Aqua's latest (MkIII) DAC PCB [see inside picture, p66] employs 92 chip resistors sequenced through a bank of eight 8-bit shift registers per channel [see inset picture].

These networks run at native sampling rates, *ie*, with no up- or oversampling or digital filtering, so there's no pre- or post-transient ringing and minimal time domain distortion [see inset Graph, above]. On the other hand, no filtering means no attenuation of aliasing distortions (mirror-images of the audio signals 'reflected' back from the sample rate frequency). Subjectively, this is a bigger issue with lower (44.1kHz/48kHz) sample rates [see Lab Report, p69] where the frequency response also rolls away through the treble from –0.7dB/10kHz to –2.3dB/20kHz [black trace, inset Graph]. Higher sample rates push aliasing out to higher frequencies – a good thing – where the response extends to –0.3dB/20kHz and –7.0dB/45kHz with 96kHz files [blue trace] and +0.2dB/20kHz, –4.5dB/45kHz and –21dB/90kHz with 192kHz media [red trace]. PM
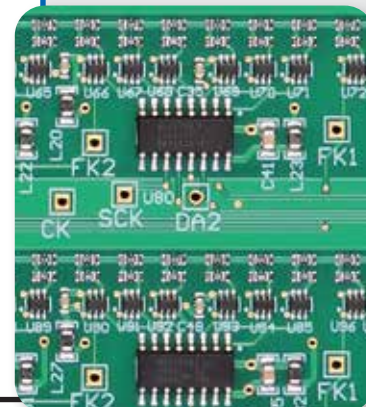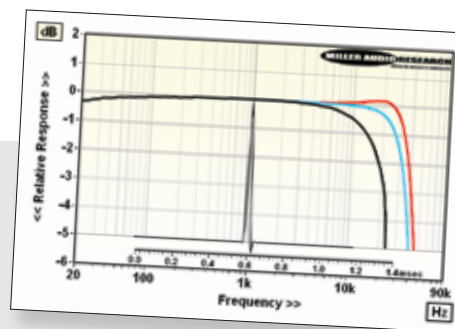
ABOVE: The La Scala MkIII's digital inputs are S/PDIF (RCA and BNC), AES/EBU (XLR), USB-B for computer connection and I²S 'AQLink' (RJ45). Fixed analogue outputs are offered on single-ended (RCA) and balanced (transformer-coupled XLR) connections

La Scala MkIII handled both voices and instrument splendidly, with warmth and clarity. Even Lapwood's arrangement of Robbie Williams and Guy Chambers' million-selling single 'Angels' sounded magnificent, the chords reverberating into a huge wash of sound before subsiding into a flute-like conclusion.

Lovely, too, was the way the La Scala MkIII, fed as throughout my listening with the digital output of a Mac mini computer, delivered the fine focus of Fabio Mittino and Bert Lams' *De Hartmann: A Life In Music* album [Pentatone PTC 5187499]. The two performers' Gibson archtop guitars are both distinctive and wrap around each other in an entirely persuasive acoustic, close-focused yet given plenty of space to breathe. It's an exemplary recording, and perfectly suited to the warmth and definition the La Scala MkIII delivers.

SWEPT AWAY
This generosity of sound, backed up by plenty of insight, is also well-suited to orchestral music, as was clear with the recent John Eliot Gardiner set of the complete Brahms Symphonies with the Royal Concertgebouw Orchestra [Deutsche Grammophon 4863519]. With the dramatic opening of the fourth movement of the first symphony, where there are accelerating pizzicato strings and big, powerful chords, the La Scala MkIII relished the growing scope of the music – and the weight of the orchestral sound – while sweeping the listener along to the conclusion of the piece. The technical niceties of what the La Scala MkIII DAC is doing are soon taken for granted as the flow of the music is given the greatest prominence.

It's not just finely honed classical recordings that show off this product at its best, though this is perhaps not the DAC I'd choose if my listening was dedicated purely to pop and rock music, where a little more sharpness and bite might not go amiss. That said, with the epic drive of Lady Gaga's 'Abracadabra', from her recent *Mayhem* album [Interscope/Streamline 602475451044], it kept the pounding rhythm section tight yet full of heft, while bringing out all the character of the singer's voice. In fact, the whole album, with its overtones of muscled-up Europop, sounded pretty sensational here.

CHARM SCHOOL
With other material, there was excellent focus on the title track from The Lumineers' *Automatic* album [Dualtone 803020278820], with a beautiful balance between Wesley Schultz's voice and the piano of Jeremiah Fraites. Meanwhile, given the open, energetic Steven Wilson remix of 'Roundabout', from the 2024 reissue of Yes's *Fragile* [Atlantic/Rhino R2 726068], the DAC's combination of warmth and speed was deployed to great effect.

The band's rhythms were driven smartly while the internal details of the mix remained open for inspection. Aqua's La Scala MkIII may seem polite and even slightly soft on first acquaintance, but its charms soon become apparent, rewarding you for your patience. ⏻


While the La Scala MkIII's novel R-2R DAC concept is an evolution of that seen in Aqua's Formula xHD [*HFN* Apr '20], and while both models feature a transformer-coupled balanced XLR output, it's the MkIII's *triode* tube buffer that adds its own 'presence' to the DAC's analogue distortion and noise. The 3.7V output is similar to the Formula xHD's 3.5V but the 114ohm (20Hz-1kHz) output impedance is higher and increases still further to 549ohm/20kHz. The latter's 113dB A-wtd S/N ratio drops down to 100dB in the tube-based model too, while peak level distortion is moderate at ~0.25% through mid and treble but increases to 0.95% at 20Hz. However, THD is now dominated by a 2nd harmonic, rather than higher harmonics, and remains very much more steady with frequency above 300Hz [see Graph 1]. THD is lowest at 0.011-0.015% (re. 20Hz-20kHz) over the top 30dB of its dynamic range while low-level linearity, necessarily influenced by noise, is good to ±0.7dB over a 100dB range.

While side-stepping time-domain distortions, the drawback of a filterless DAC [see boxout, p67] is the presence of digital 'images' directly outside the audioband – just –1.6dB/26kHz with 48kHz media. This causes moderate IMD within the audioband when treble levels are high (–75dB re. 20kHz/–10dBFs), but is almost entirely absent with 96kHz, and higher, sample rates. While the responses roll away earlier than anticipated with high sample rate files (–3dB/30kHz) – no bad thing – it's the digital jitter that, arguably, reveals the 'uniqueness' of Aqua's R-2R DAC's operation. While the jitter pattern looks complex [see Graph 2], and moderate at <1000psec depending on sample rate, this is resolved into data- and PSU-induced sidebands leaving the main signal free of any very low-rate/phase-related broadening. **PM**
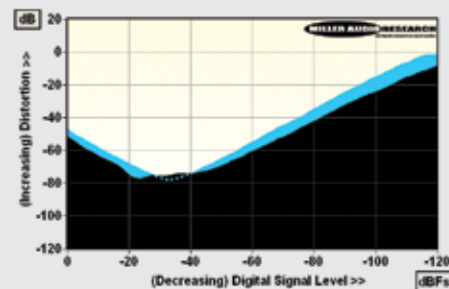
ABOVE: Distortion versus 48kHz/24-bit digital signal level over a 120dB range (black, 1kHz; blue, 20kHz)
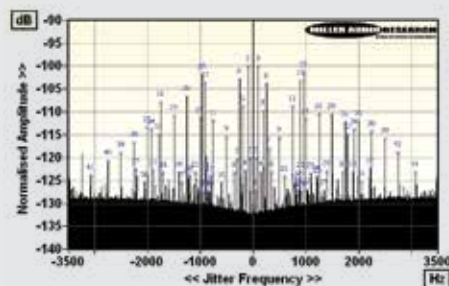
ABOVE: High res. jitter spectrum (48kHz/24-bit data). PSU and data-induced patterns, but no phase noise

HI-FI NEWS SPECIFICATIONS

Maximum output level / Impedance	3.69Vrms / 114-549ohm (XLR)
A-wtd S/N ratio (USB-A, re. 0dBFs)	99.6dB
Distortion (1kHz, 0dBFs/–30dBFs)	0.21% / 0.015%
Distortion & Noise (20kHz, 0dBFs/–30dBFs)	0.25% / 0.011%
Freq. resp. (20Hz-20kHz/45kHz/90kHz)	–0.3 to –2.3dB/–7.0dB/–21.4dB
Digital jitter (48kHz / 96kHz / 192kHz)	995psec / 445psec / 311psec
Resolution (1kHz @ –90dBFs/–100dBFs)	±0.6dB / ±0.7dB
Power consumption	20W
Dimensions (WHD) / **Weight**	450x100x370mm / 10kg