



Silent Angel Bremen SL1 Plus

Streamer/DAC



- Silent operation
- Superb sound
- Great looks



- No headphone output
- No SPDIF input
- App-only control



RRP \$1,690

Given that Silent Angel names its products after German cities — Bremen, in the case of the SL1P being reviewed here, but other models bear the names Munich, Rhein and Bonn — one could be forgiven for thinking the company is German. It isn't.

As well as being manufactured in Zhuhai city, Guangdong, China, Silent Angel products are also designed in China, under the leadership of Dr Huang Jian and Chorus Chuang, who in 2014 founded Thunder Data (Zhuhai) Co. Ltd, of which Silent Angel is a subsidiary. According to Huang Jian, the company's aim is "to provide customers with high-performance storage, small and medium enterprises and home network storage, digital music resource management and playback for hi-fi audiophiles".

While for the sake of brevity I will refer to the Bremen SL1P Plus as simply the 'SL1P' for the rest of this review the model name is something of a misnomer, because the

word 'Bremen' does not appear on the unit itself or its packaging, and the 'P' in the name apparently stands for 'Plus', so the unit should either be called the 'SL1 Plus' or just simply the 'SL1P'. Indeed, Google the model and you will find that different websites list it under different names.

THE EQUIPMENT

The SL1P's front panel is nothing if not austere: nothing decorates it other than the model number, whose font initially made me read it as 'SLIP' rather than 'SL1P'. Perhaps this was a deliberate reference to one or more of the common meanings of 'slip', which include: 'to move, flow, pass, or go smoothly or easily; glide; and slide.'

Not even an LED blesses the front panel to indicate whether or not the streamer is powered up. Instead, Silent Angel has put that LED underneath the chassis, relying on the light from it being reflected from whatever surface the unit is sitting on.

The light's colour (either blue or green,

depending on the SL1P's operational status) and its intensity are rather dependent on that surface, then.

So how do you control the SL1P? It's all done using Silent Angel's own VitOS App, available on Android and iOS devices. According to the company's website, three versions of the app exist — Manager, Orbiter and Lite, but I couldn't find that last one on the Android app store. Indeed, Thunder Data seems to have discontinued Lite, which was intended for use with the B1, B1T, and B2.

The Orbiter version is the one designed to be used with the SL1P. With it, says Silent Angel, you can 'easily locate and set up a new device, browse and stream music. Listen to all your favourite songs with displayed details such as bitrate, sample rate, bit depth and format (e.g. DSD, WAV or FLAC).'

As you have hopefully gathered from all this app talk, the Silent Angel SL1P is a music streamer (which the industry has

come to define as a network streamer *with* an integrated DAC; those without built-in DACs are commonly referred to as ‘network transports’). This Silent Angel streamer has been designed to enable stable, jitter-free music streaming via both wired and wi-fi connections. Despite being a new product, it is based on the brand’s successful entry-level B1 and B2 streamers released several years ago, although note that whereas those models had Bluetooth onboard, the SL1P does not.

The SL1P’s DAC can handle pretty much the entire gamut of readily available digital audio formats, including MQA, PCM files up to 32-bit/384kHz, and DSD audio (which can either be converted to PCM or handled via DoP i.e. DSD over PCM). If, for any reason, you need to convert even higher PCM sample rates than the SL1P’s own DAC can manage, you can use one of the streamer’s digital outputs to drive an external DAC that *can* accommodate that.

As for compatibility with streaming services, the SL1P supports Tidal Connect, Qobuz, HighResAudio, Spotify Connect and AirPlay 2, plus all available internet radio stations. It will also function as a DLNA Renderer, in which scenario it is compatible with third-party DLNA apps JPlay and mConnect (and likely others, but I only checked those two).

As well as connecting to your network via Ethernet or wi-fi, the SL1P also offers two USB inputs, allowing you to plug in up to two USB sticks, NAS drives or SSD devices containing music files. If you use an SSD, it should be self-powered, because the maximum current capacity of the SL1P’s USB socket is 100mA, and exceeding this could damage the streamer. However, since 1TB USB keys are now commonplace and very affordable, it’s likely many owners would be able to store all their

‘local’ music on two USBs. The streamer’s outputs, meanwhile, include two USBs, SPDIF (Toslink and RCA) and analogue (unbalanced RCA or balanced XLR). It would have been nice for Silent Angel to include an SPDIF digital input, but it’s hardly a deal-breaker.

All the connectors enabling these plug-in options are very nicely laid out along the rear panel, along with a mains power switch, a fused 240V socket and a connector labelled ‘SA-LINK’, which

The SL1P also offers two USB inputs, allowing you to plug in up to two USB sticks, NAS drives or SSD

facilitates the SL1P’s connection to other Silent Angel products.

SET-UP AND OPERATION

The SL1P comes packaged with all the cables you need to get up and running, together with a nicely produced ‘Quick-Start Guide’. Most of this guide is well laid-out and easy to follow, although the section on how to connect to your device and wireless network (if you’re using wi-fi, that is) is provided via images of a phone screen that are so small I had to pull out a magnifying glass to see what I was supposed to do... then again, my eyesight isn’t the best! I later discovered the same guide is available to download from Silent Angel’s website (www.silentangel.com), allowing me to enlarge it on my screen.

My install had a hiccup right at the start

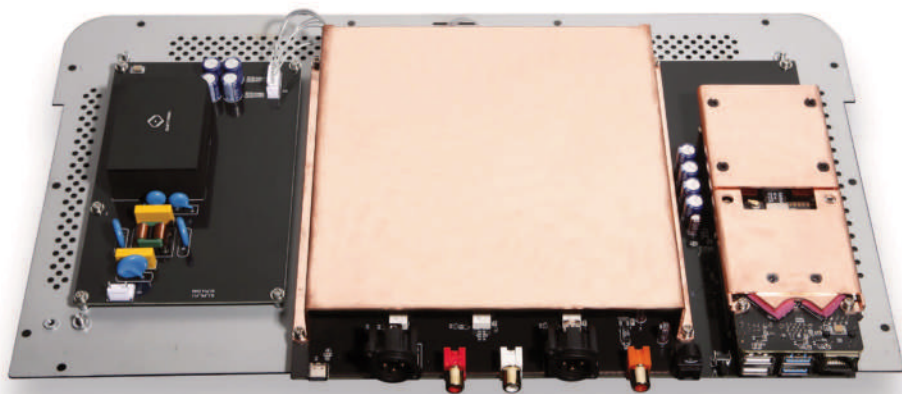
because the VitOS Orbiter app refused to load onto my Samsung Note 10 phone. My phone initially told me the app ‘has a bug, try clearing the app’s cache first and then re-open’, and then after I had done as it suggested, again refused to load, telling me this time around that ‘this app has a bug. Try updating this app after its developer provides a fix for this error.’ I had better luck when I downloaded Orbiter onto my Lenovo Chromebook — the install was totally error-free.

I primarily use my own personal music sources when evaluating hi-fi components, as this is almost exclusively what I do in real life. These are classed as ‘Local’ sources in the app. Here, I could choose whether to send music to the USB, SPDIF or analogue outputs. Each has its own control panel so that you can configure parameters such as maximum sample rate and bit depth, volume control on/off, and so on. It’s also possible to configure how the app displays song metadata.

In this ‘Local’ mode, you then click the ‘?’ button alongside ‘Local Music Information’ to enter an interface that displays the number of songs stored, their total playing time, and the last time the data was updated. The scan time to load all this information will depend on how much music you have, but once it’s scanned it won’t need to rescan until you load additional music onto your local drive(s).

I found that the Orbiter app responded quite quickly to commands from my Chromebook, though I found the ‘Search’ tool (which I sometimes use to locate a specific artist, song or album, predominantly when I’ve forgotten something I need in order to properly identify the specific track I wish to hear) to be rather rudimentary. Although the Orbiter app is satisfactory in that it does what you





need it to do (find and play music!), it isn't what I'd call 'slick' or even totally intuitive. While it's easy to, say, create and manage playlists, it isn't quite as straightforward as I would have liked. The app also didn't appear to be totally bulletproof: the screen would sometimes freeze and/or lock on 'Find Device', while at other times icons simply disappeared. I suspect these issues were down to me using a Chromebook rather than a phone or tablet, which highlights the fact that if you're planning to buy an SL1P, you should make sure it's compatible with the device you're planning to control it with, not least as, unlike some streamers, which can be controlled from the front panel, a supplied remote or via a web interface, the SL1P must be controlled by either a Thunderdata app or, as I stated previously, third-party software.

You can get a feel in advance for how the Orbiter app works by reading the user manual (parts 1 and 2), accessible via links at <https://silentangel.com/app/#vitosorbiter>

LISTENING SESSIONS

Once music was playing, everything panned out beautifully. The sound from the Silent Angel streamer was everything I wanted it to be. For a start, the streamer lives up to its manufacturer's name because it is completely silent — there's no noise from hard drives or cooling fans. Nor was there any background noise during music playback — silences were truly silent, with no hiss or hum audible through my loudspeakers, irrespective of volume level.

Stereo imaging was perfect, a trait which was evidenced when playing Tracy Chapman's *Give Me One Reason* from her fourth studio album, *New Beginning*, which has the vocals, drums and guitars placed consistently right across the stereo stage. The sound of the solo guitar, just to the left of centre, is so focused that it comes as

a real acoustic surprise when Chapman's vocal kicks in at stage centre. Shortly after, the drummer enters the arrangement, and the kit is very obviously behind where Chapman is standing, and you can also hear the precise *placement* of the various drums and cymbals. The lead guitar breaks at stage right flesh out the arrangement, which includes background vocals and electric organ. Impressively, the SL1P's entire rendition was completely clean and enormously dynamic.

As an aside, I found it more than curious that despite being a huge hit in Australia and the US, reaching #3 in both countries' charts, *Give Me One Reason* only just managed to creep into the top 100 list in the UK, charting right down at #95. Of course, those were pre-Spotify times; had the streaming service been around back then (and not, in fact, more than a decade later), its UK reception might well have been different. Indeed, it would be interesting to discover how Spotify has influenced musical tastes around the world.

I then tested the SL1P's ability to deliver deep bass and musical immersion with Pink Floyd's *Dark Side of the Moon*, which always gets a spin when I'm reviewing hi-fi, and not only because it's a great album for testing but also because I just like listening to it. It's one of the few albums I never tire of hearing. Once again, the SL1P delivered top-notch sound quality, particularly the sound effects of the various coins, cash register and tearing paper sounds on *Money*. The famous 'heartbeat' sound (it isn't one, of course) that introduces and closes out the album was clearly and precisely delineated by the SL1P, and Clare Torry's wordless vocal on *Great Gig in the Sky* was as emotive as I've ever heard it.

There is a lot of high-frequency information on DSotM, and I was already happy with the SL1P's performance in this regard, but I often use Stevie Wonder's

wonderful *Superstition* as a backup for testing treble. I just love the sound of the deep Moog bass line against the picky sound of Wonder's Hohner clavinet. One of my favourite musical memories is hearing him live during one of his tours here in Australia. The fabulous and unforgettable riff from this song was apparently improvised and is, according to James E. Perone, Emeritus Professor of Music at Mount Union College, 'probably Wonder's most memorable use of the minor pentatonic scale'.

CONCLUSION

Silent Angel's new Bremen SL1 Plus is a great-sounding, great-looking and all-round high-quality music streamer that handles more file types than many other streamers in its price category.

🎧 **Greg Borrowman**

SPECS & CONTACT

RRP: \$1,690

Warranty: 2 years

Control app: VitOS Orbiter

Inputs: wi-fi, Ethernet, 2x USB

Outputs: XLR balanced, RCA unbalanced, USB, optical, coaxial

SA-Link Port: Controlled via SA-Link

Memory: 4GB

Storage: 32GB high-speed flash

SSD expansion: M.2 NVMe SSD (22*80mm), up to 4TB

Processor (CPU): Dual-core Cortex-72 at 1.8GHz + Quad-core Cortex-A53 at 1.4GHz

Chassis: Galvanised steel with an aluminium front panel

Dimensions (hwd): 5 x 4 x 2.5cm (excluding antennas)

Distributor: Absolute Hi End

T: (04) 8877 7999

E: info@absolutehiend.com

W: www.absolutehiend.com

Readers interested in a full technical appraisal of the performance of the Silent Angel SL1 Plus streamer should continue on and read the **LABORATORY TEST REPORT** published on the following pages. Readers should note that the results mentioned in the report, tabulated in performance charts and/or displayed using graphs and/or photographs should be construed as applying only to the specific sample tested.

Laboratory Test Report

According to measurements made by *Newport Test Labs* of the Silent Angel SL1P's balanced analogue outputs, they deliver around 4Vrms when the onboard digital volume control is set to 0dB. Or, more precisely, as you can tell from the tabulated results shown in the chart below, 4.0365Vrms from the left channel and 4.0574Vrms from the right channel. The lab didn't measure the voltages at the unbalanced terminals, but according to theory they would be exactly half that of the balanced outputs.

You can see that the voltages aren't exactly equal, so there's a very slight imbalance between the two channels which, if you do the maths, works out at 0.045dB, which would be imperceptible to the ear. I suspect that if you switched the digital volume control off, the balance would improve, but as I hope I've made clear, you wouldn't hear the improvement... and you would lose the usefulness of having a digital volume control.

Separation between the left and right channels was absolutely excellent, as the chart also shows: 134dB at 16Hz, 144dB at 1kHz and 107dB at 20kHz... all outstandingly good results.

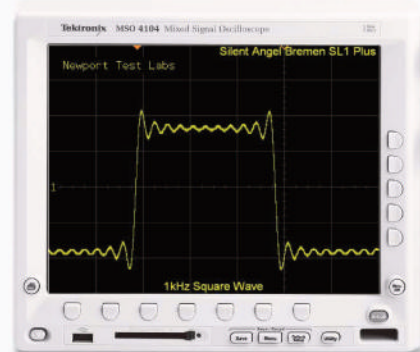
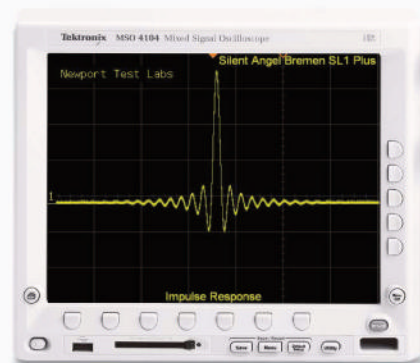
Channel phase was excellent across the board, too, but the best results were at low and midrange frequencies, with the SL1P showing just a 0.01 degree error at 16Hz, a 0.16 degree error at 1kHz and a 2.97 degree error at 20kHz. Again, these would not be audible — indeed, you would get a larger error by moving your left speaker a single millimetre closer to the listening position than the right.

Graph 1 on the following page shows total harmonic distortion (THD) when the SL1P delivers a 1kHz sine test signal at 0dBFS, which is a 'worst case' scenario, since all music will be recorded at levels that would ensure 0dB is never reached. Nonetheless, it's a good test for performance, and you can see that there's

a second harmonic at -95dB (0.0017%), a third at -92dB (0.0025%), a fifth at -102dB (0.0007%), a seventh at -109dB (0.0003%), a ninth at -112dB (0.0002%) and a tenth at -118dB (0.0001%). The even higher-order components visible on this graph are all more than 130dB down, or 0.00003%.

Graph 2 shows THD at around the maximum level you would expect to find music recorded (-6dB), and you can see that output distortion levels have dropped significantly. The second-order component is reduced to -108dB (0.0003%), the third-order to -100dB (0.001%) and the fifth to -118dB (0.0001%), while all the higher-order components are more than 120dB down (0.0001%), with some approaching -130dB (0.00003%). As you can see from the percentage figures, distortion at these levels is not audible.

Graph 3 shows THD at a recorded level of -20dB, which is where most energy is likely to be with music signals, and here you can see that the reduction in distortion is dramatic, with only the second and third harmonic distortion components visible above the noise floor. The second is at -135dB (0.00001%) and the third at -120dB (0.0001%). Note also that the noise floor itself is right down at -140dB, right across the audio spectrum, including at low frequencies, down where I would normally expect to see some hum creeping in from the power supply. This graph shows that there's no noise from either the power supply or the conversion process.

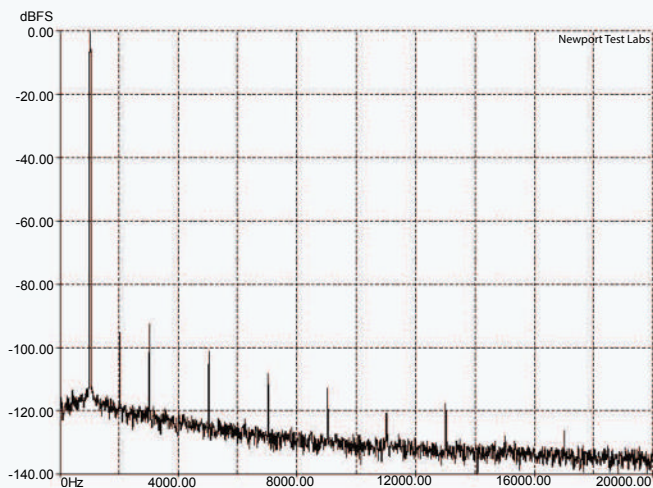


Of course, a noise floor measurement is *not* a signal-to-noise ratio (a fact that seems to have eluded some audiophiles, judging by some comments I've seen posted on online forums), which is why *Newport Test Labs* always measures signal-to-noise ratios. In the case of the Silent Angel SL1P, it returned figures of -113dB unweighted, and -118dB with A-weighting. These are superb results. Your amplifier is likely to contribute more noise to the audio signal than the SL1P.

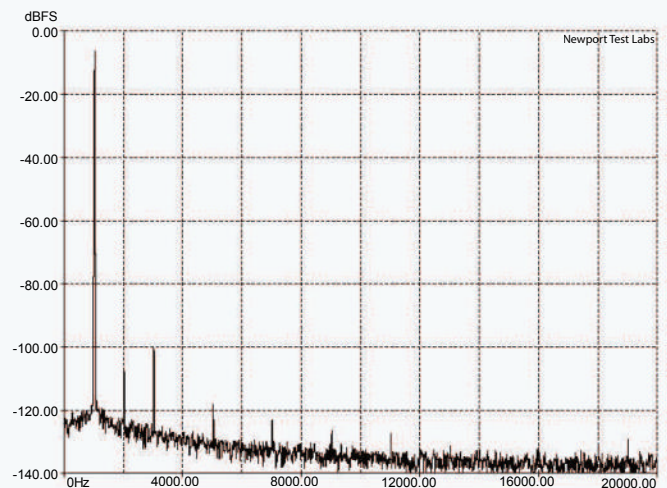
Graph 6 shows the performance at -60dB. This reveals that Thunder Data is using a conventional multi-bit oversampling DAC, and this is a typical performance for a

Silent Angel SL1 Plus Music streamer — Laboratory Test Results

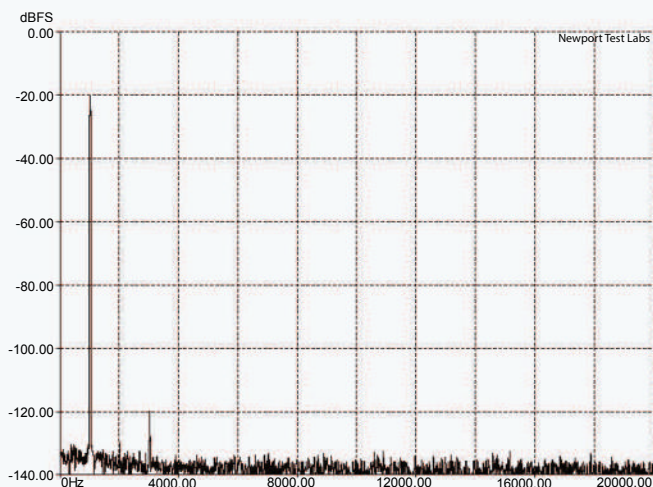
Analogue Section	Result	Units/Comment
Output Voltage (Balanced Outputs)	4.0365 / 4.0574	volts (Left Ch/ Right Ch)
Frequency Response	See Graph	dB (20Hz – 20kHz)
Channel Separation	134 / 144 / 107	dB at 16Hz / 1kHz / 20kHz
THD+N	0.002	@ 1kHz @ 0dBFS
Channel Balance	0.045	@ 1kHz @ 0dBFS
Channel Phase	0.01 / 0.16 / 2.97	degrees at 16Hz / 1kHz / 20kHz
Group Delay	0.04 / 5.63	degrees (1–20kHz / 20–1kHz)
Signal-to-Noise Ratio (No Pre-emph)	113dB / 118dB	dB (unweighted/weighted)
De-Emphasis Error	Not Applicable	at 1kHz / 4kHz / 16kHz
Linearity Error @ -60.00dB / -70.00dB	0.01 / 0.05	dB (Test Signal Not Dithered)
Linearity Error @ -80.59dB / -85.24dB	0.01 / No error	dB (Test Signal Not Dithered)
Linearity Error @ -89.46dB / -91.24dB	0.03 / 0.01	dB (Test Signal Not Dithered)
Linearity Error @ -80.70dB / -90.31dB	0.08 / 0.03	dB (Test Signal Dithered)
Power Consumption	5.73	watts
Mains Voltage During Testing	235 – 246	(Minimum – Maximum)



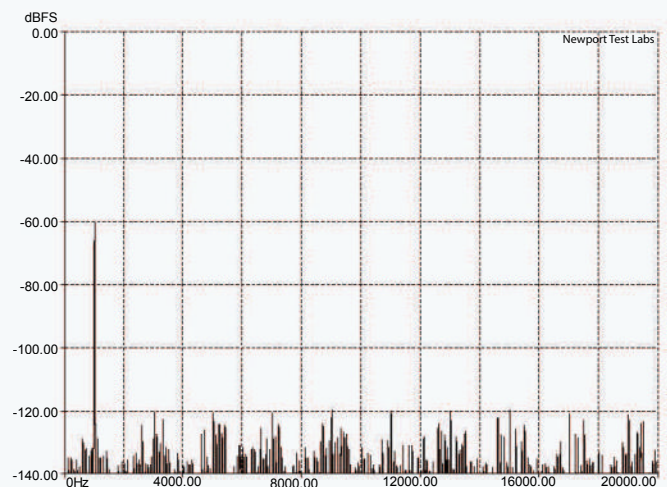
Graph 1. THD @ 1kHz, 0dBFS



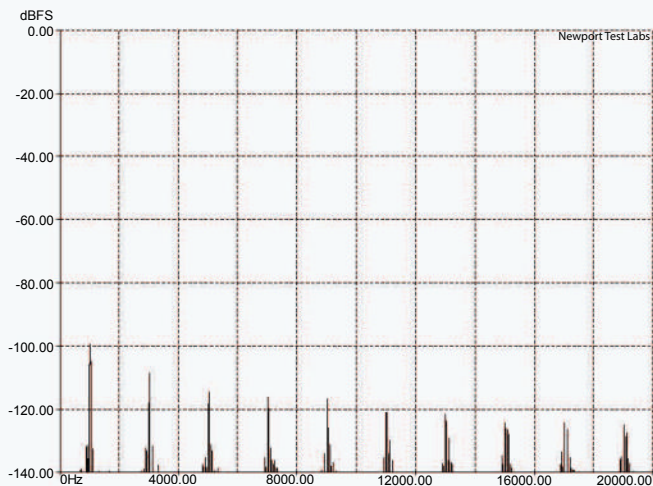
Graph 2. THD @ 1kHz, -6dBFS



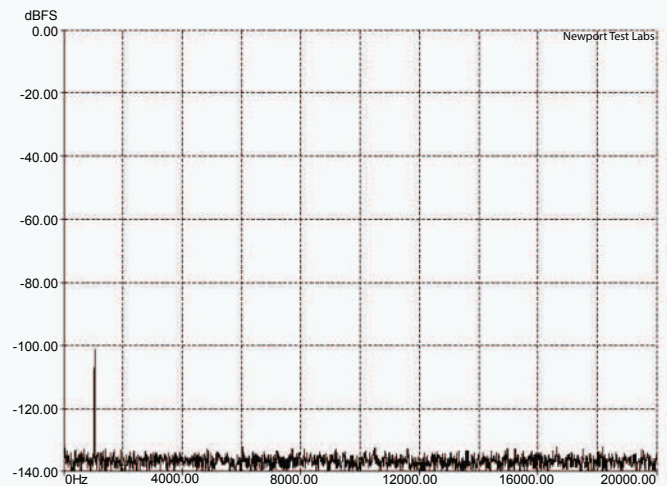
Graph 3. THD @ 1kHz, -20dBFS



Graph 4. THD @ 1kHz, -60dBFS



Graph 5. THD @ 1kHz, -100dBFS without dither



Graph 6. THD @ 1kHz, -100dBFS with dither

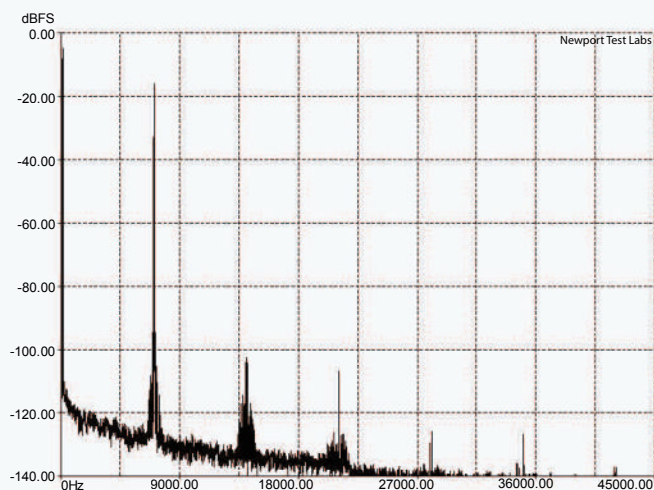
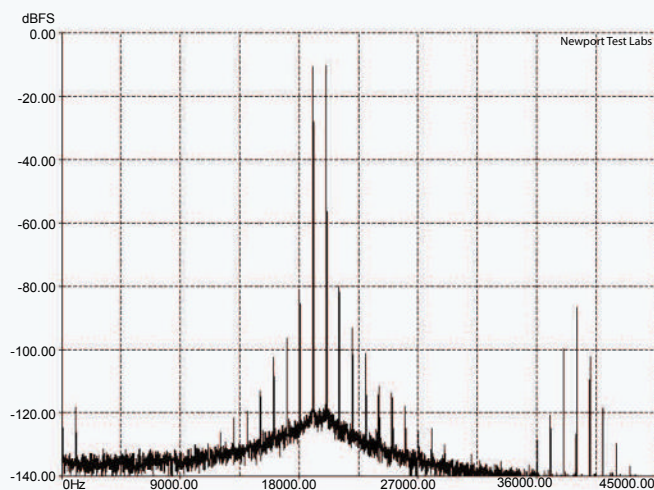
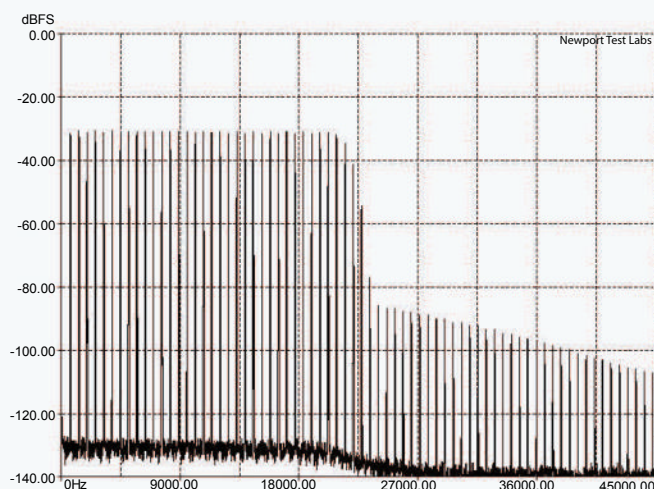
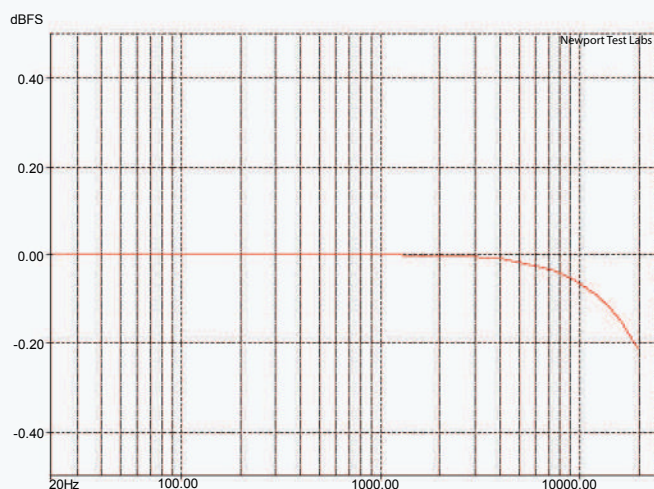
high-end DAC. The 'grass' on the noise floor is caused by quantisation errors as a result of the test signal not being dithered, as evident in Graphs 5 and 6. These graphs show exactly the same test signal at exactly the same level, but with one signal not dithered (Graph 5) and with the other signal dithered (Graph 6). As you'd expect, *all* digital music signals are therefore dithered specifically in order to remove quantisation errors, so

Graph 6 is typical of the performance you could expect from the SL1P.

Intermodulation distortion was very low, as tested using the SMPTE standard and shown in Graph 7. There are some intermodulation components clustered on either side of the 7kHz signal, but they are very low in level. Tested using the CCIF standard (Graph 8), there are sidebands at 18kHz and 21kHz that are

80dB down (0.01%), and sidebands at 17kHz (-95dB/0.0017%) and 22kHz (-92dB/0.0025%). The other sidebands are more than 100dB down (0.01%). There is an unwanted regenerated 1kHz difference signal visible at the left of the graph, but since it's at -118dB (0.0001%) it can safely be ignored.

The Silent Angel SL1P's frequency response is shown in two different


Graph 7. IMD using SMPTE 60Hz/7kHz test signal @ 0dBFS

Graph 8. IMD using CCIF 19kHz/20kHz test signals @ 0dBFS

Graph 9. Impulse response @ 0dBFS

Graph 10. Frequency response @ 0dBFS

presentations (Graphs 9 and 10). As Graph 10 is the more typical display format for this measurement, I'll address the result it shows, which is that the frequency response of the SL1P is superbly flat and linear. There is absolutely no deviation from the 0dB reference line between 20Hz and 1kHz, evoking the observation that it's 'ruler flat'. The fact that the response rolls off above 1kHz, to be 0.21dB down at 20kHz, is only obvious on this graph because of its extreme vertical scale, as you can see from the dB calibrations at its Y axis. Normalised, the response is 20Hz to 20kHz ± 0.1 dB.

As with most modern streamers and

DACs, there is no de-emphasis circuitry in the SL1P (or, more likely, the DAC offers it, but it's not been implemented) because it's really not been needed for nigh on half a century. After all, de-emphasis is only required when playing digital music recorded prior to 1985 that had been pre-emphasised. (If you have some this old, they will still play back, but the high frequencies will be slightly boosted, so it's no big deal.) As an aside on circuit omissions, it's likely that the DAC inside the SL1P also offers multiple output filters, but the ability for the end-user to select between them has not been provided.

There was almost no linearity error as digital levels decreased, as you can see from the tabulated results. In fact, at -85.24 dB there was no error at all: the SL1P reproduced the signal at exactly -85.24 dB, hence the notation in the tabulated figures. Given that the results are so good, I would have expected slightly better results with the dithered test signals (at -80.70 dB and -90.31 dB), but they are still so close to perfect that the difference is essentially

academic. Again, there would be no audible effect whatsoever.

The oscillograms on page 20 show the streamer's reproduction of a 1kHz square wave, and an impulse response showing the typical time-reversed ringing of an oversampling filter, with the uniformity of the reversal suggesting that Silent Angel has made no modifications to a standard (but obviously very high-performance!) off-the-shelf DAC. Looking at all the results and measurements, my guess is that Silent Angel uses a Sabre ES9069 from US company ESS Technology. This is a two-channel, 32-bit device that uses ESS's patented Hyperstream IV technology, but that's just my guess; don't take it as gospel! The impulse response also shows that the signal polarity is positive (i.e. not reversed).

As you have no doubt gathered by now, I really cannot fault the technical performance of the Silent Angel SL1P music streamer. It performed superbly, returning state-of-the-art results for all the tests performed on it by Newport Test Labs.

Steve Holding

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