Archimago's Musings

A 'more objective' take for Rational Audiophiles. Among other topics!

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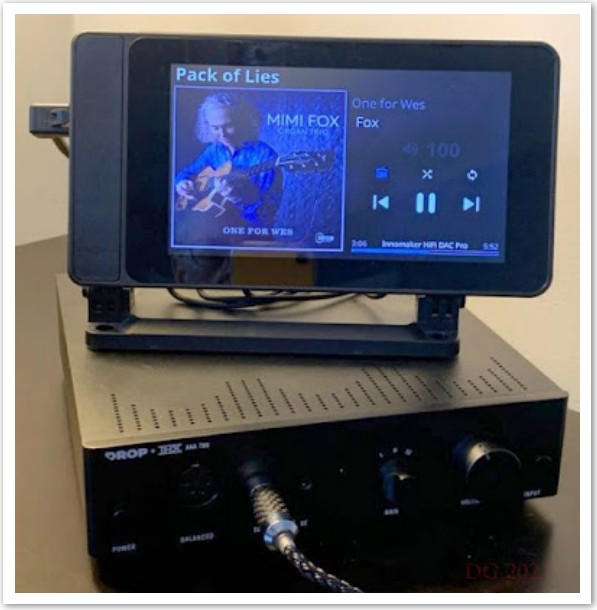
[Some items linked to my Amazon Affiliate account - I may receive gift certs from qualifying purchases.]

Saturday, 8 April 2023

As We Hear It: Innomaker HiFi DAC Pro HAT review by Doug Gardner. And MQA is bankrupt; the end is here.



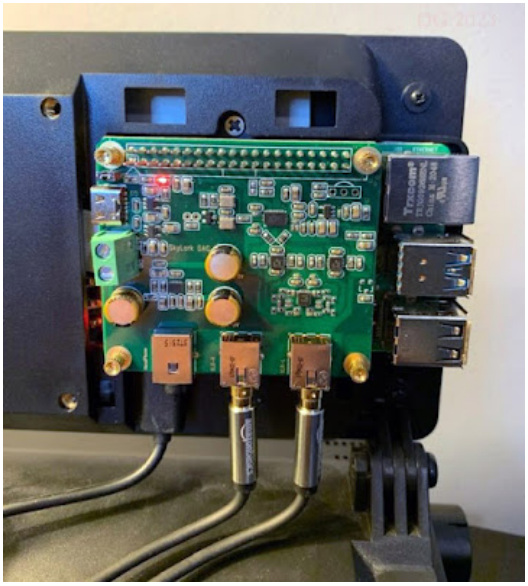
Arch,

I've been following along with your experiments using the Cosmos ADC and APU to test a variety of gear and I've put together a similar setup to do some measurements too. I'm sharing some results from testing I've done of the **Innomaker HiFi DAC Pro HAT** for the Raspberry Pi. I bought the DAC for US$89 directly from Innomaker for use in my home office.

My home office system is headphones only using the Drop THX-789 headphone amplifier fed by a Khadas Tone1 (Tone Board Generic Edition) DAC connected via USB to a Raspberry Pi 4 with display running RopieeeXL. Music playback software is Roon with Drop+Dan Clark Aeon X, Aeon Noire, or Drop x Sennheiser HD6XX headphones with PEQ settings from Oratory1990 to make the physical sounds. This setup gives me a clean and compact footprint with a touch screen for ease of use and objectively good fidelity per the measurements and reviews performed by you here on your blog and by Amir over at *Audio Science Review*. A drawback to this setup is that the Tone1, sitting in a separate box and with the USB and unbalanced audio cables, makes for additional clutter on the desk.

The Innomaker HiFi DAC Pro uses the same DAC chip, ESS 9038Q2M, as the Khadas Tone1 but, unlike the Tone1 Generic, is HAT compatible and has both balanced and unbalanced output. Balanced output is via two 3.5mm headphone jacks and unbalanced through a single 3.5mm output that can also serve as headphone out. I chose to use the balanced outputs. I assembled 3.5mm to XLR cables from spare Amazon cables I had on hand. No need for anything flashy on the cable front. If you don't want to roll your own then you can buy 3.5mm to XLR cables from Innomaker's Amazon store. It should sound like the Tone1, right?

Above you see the picture of the Innomaker DAC with a Raspberry Pi Display from the front. Here are a couple of pictures of the setup with the Innomaker DAC HAT from behind and with the Tone1.



Mimi Fox Organ Trio album One For Wes (2023, DR11) on screen.

Power for the Innomaker comes from the Raspberry Pi. There are jumpers that can be set if you want to power the Innomaker from a separate power supply. For my testing and my personal use, I powered it from the Raspberry Pi.

The device overlay is the same as the Allo Katana DAC. It's not clear to me what relationship, if any, there is between Innomaker and Allo or why it is that the controller interface is the same. Regardless of the how and why, it was straight forward for me to install the Innomaker HiFi Pro DAC onto my Raspberry Pi Display and to configure it through Roon and RopieeeXL by selecting, "Allo Katana DAC", through the RopieeeXL web interface and using the default Katana device configuration on Roon. It's worth noting that the Allo Katana was also reviewed and measured on *Audio Science Review* if you'd like to see those results.

Before measuring the Innomaker, I did some comparative subjective listening with the Khadas Tone1. The THX-789 supports both balanced and unbalanced inputs that are switchable from a selector button on the front panel and Roon can group zones together so I could play the same track synchronized through both the Innomaker and the Tone1. *[Ed: Brilliant!]* Switching between the two was instantaneous with only a very soft click. The Tone1 was connected through its unbalanced outputs to the THX and the Innomaker through its balanced outputs. I used REW to level match between the two inputs but the best I could achieve was just under a 0.5dB match. While not perfectly matched, I still couldn't hear any tonal differences between the Innomaker and Tone1 and subjectively listening to one or the other for extended periods of time was equally enjoyable. I alternated giving the benefit of 0.5dB to one device and then the other. It really didn't make much of a difference when toggling through music tracks.

► 2021 (53)
► 2020 (48)
► 2019 (51)
► 2018 (47)
► 2017 (46)
► 2016 (46)
► 2015 (51)
► 2014 (49)
► 2013 (65)
► 2012 (2)

Audiophiles Around The World!

Most read over the last year...

24-Bit vs. 16-Bit Audio Test - Part II: RESULTS & CONCLUSIONS


MEASUREMENTS: Topping HS01 - USB 2.0 Isolator & Ground Loop Eliminator (and a listen to Santana's "Blessings and Miracles")


MeLE Quieter2Q (8GB DDR4, 128GB eMMC, Celeron J4125) Mini PC: An inexpensive, silent, multichannel Roon Endpoint. On Paul McGowan (PS Audio): "digital audio is soooo noisy", and "computers are the worst". [+ Windows 11 Update]


MEASUREMENTS: Intel i7 PC and Raspberry Pi 3 B+ Audio Streamer - XLR / RCA, Noise and Jitter. Do digital transports / streamers really make a difference? Do USB cables?


As We Hear It 2022: Hypex nCore NC252MP DIY, The Joys of Modern Digital Audio, Upsampled Streaming, and Audible Amplifier Differences.

REVIEW: Sabaj A20d 2022 Version DAC [Part II] - Resolution & Distortion.

It occurred to me while performing the subjective listening how confidence in the electronics influences my perception. On the one hand, I had the Khadas Tone1 with a measured SINAD of essentially 110dB and, on the other, an untested Innomaker DAC using a driver overlay built for a different device and connected up with some cables I ginned up in my basement workshop. This uncertainty about the objective performance had me doubting the subjective performance I was experiencing. Yep, no audible difference between the two but oh wait, that cymbal crash sounds better than it did on the other one. Hit the switch and play that section again. Yep, that sounds super good on this one too. Is this section sounding softer? Nope, when I hit the switch there's no difference. One could go round and round on this for hours, but really, these two DACs sound the same to me.

[Ed: Excellent observation about human psychology; the biases we hold and the effect of shifting attention to minute details. Alas, I think there are some people who might compare like this for hours and perhaps not recognize their own psychological biases. Alternatively, they'll just say "I prefer longterm listening/reviewing" and still not have psychological insight that their comparative accuracy becomes more than likely even worse!]

Now to the measurements…

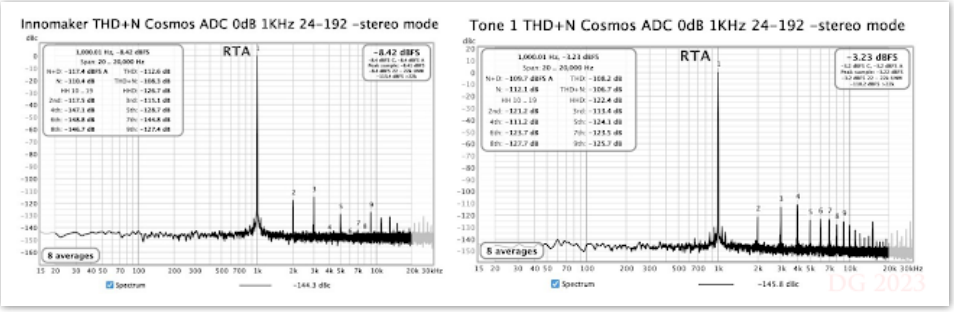
My measuring system consists of the E1DA Cosmos ADC, B Grade, connected to my Macbook Pro. I also have the Cosmos APU that I can use to confirm that the device under test isn't bumping against the performance envelope of the B Grade ADC. The Innomaker was connected to the ADC with the same 3.5mm to XLR cables used with the headphone amplifier and the Tone1 was connected with Amazon Basics unbalanced to XLR cables to the ADC and USB to the Raspberry Pi 4. I used REW on the Macbook to perform the measurements.

Because a DAC HAT can't connect directly to my computer, I have to go through Roon to run the various test signals. Thankfully, the test signals from REW can be saved as .WAV files and I did that to create the various tones used in the testing. A downside of this configuration is that I could not find a way to run stepped volume tests like IMD vs. volume and channel separation. *[Ed: Yes, computer control of signal generator needed for those stepped tests.]* If the Innomaker performs similarly to the Khadas Tone1 in the other tests then one might fairly presume that the two devices will have similar characteristics across the board given that they use the same DAC chip.

The table below shows the performance of these two devices with a 1kHz 0dbFS tone at various resolutions from 16/44.1 kHz through 192 kHz. Performance is within a couple of dB's of each other. 16/44.1 was no challenge for either of these DACs. THD+D, N, and N+D were close across the board but the Innomaker was slightly better on THD measurements. The measurements were the same when performed through the ADC only or through the APU+ADC.

	44.1 kHz		96 kHz		192 kHz	
	Innomaker	**Tone 1**	**Innomaker**	**Tone 1**	**Innomaker**	**Tone 1**
N+D	-108.9	-102.7	-117.4	-109.8	-117.4	-109.7
N	-98.5	-98.7	-110.2	-112.1	-110.4	-112.1
THD	-106.8	-105.3	-112.8	-108.4	-112.6	-108.2
THD+N	-97.9	-97.8	-108.3	-106.9	-108.3	-106.7

Here are graphs of the 192kHz spectrum:



Both the Innomaker and the Tone1 performed well on THD vs Frequency with no measured anomalies that would impact subjective performance. The Innomaker's performance degrades a tad with a full-scale signal (0dBFS). This is probably related to how the DAC behaves as it gets to overload.

Dynamic range measurements varied depending on the measurement process.

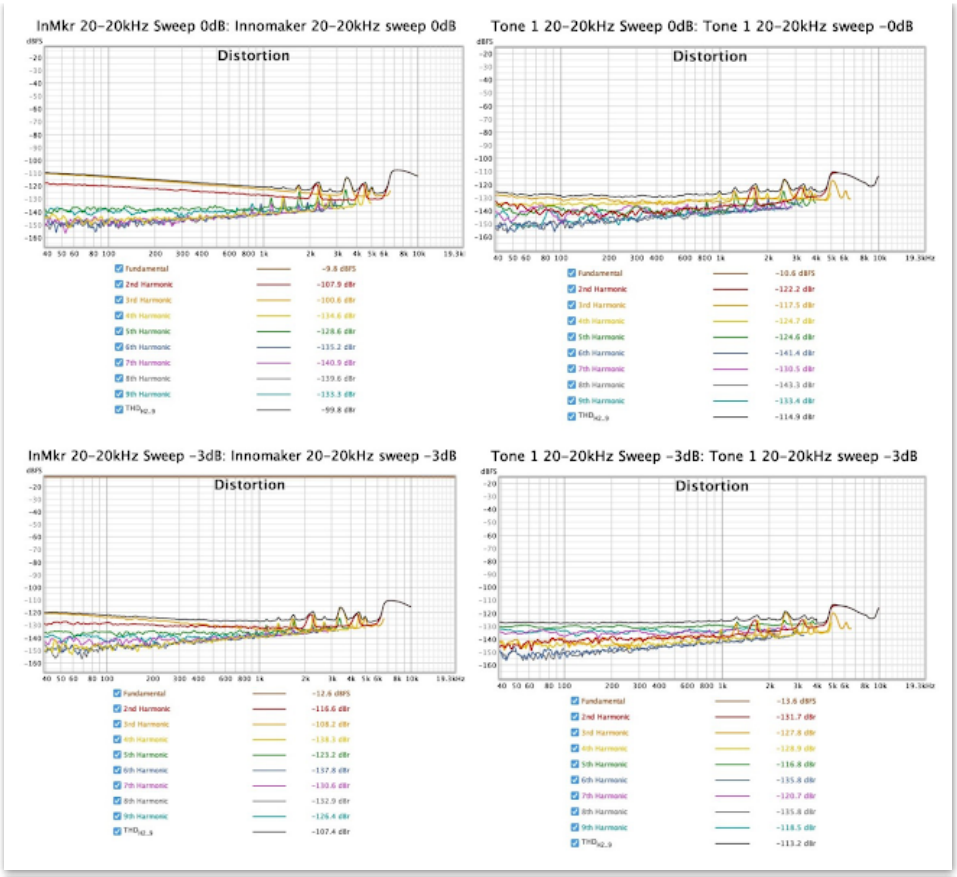
(Windows 11 22H2 available. Greetings from Peru!)

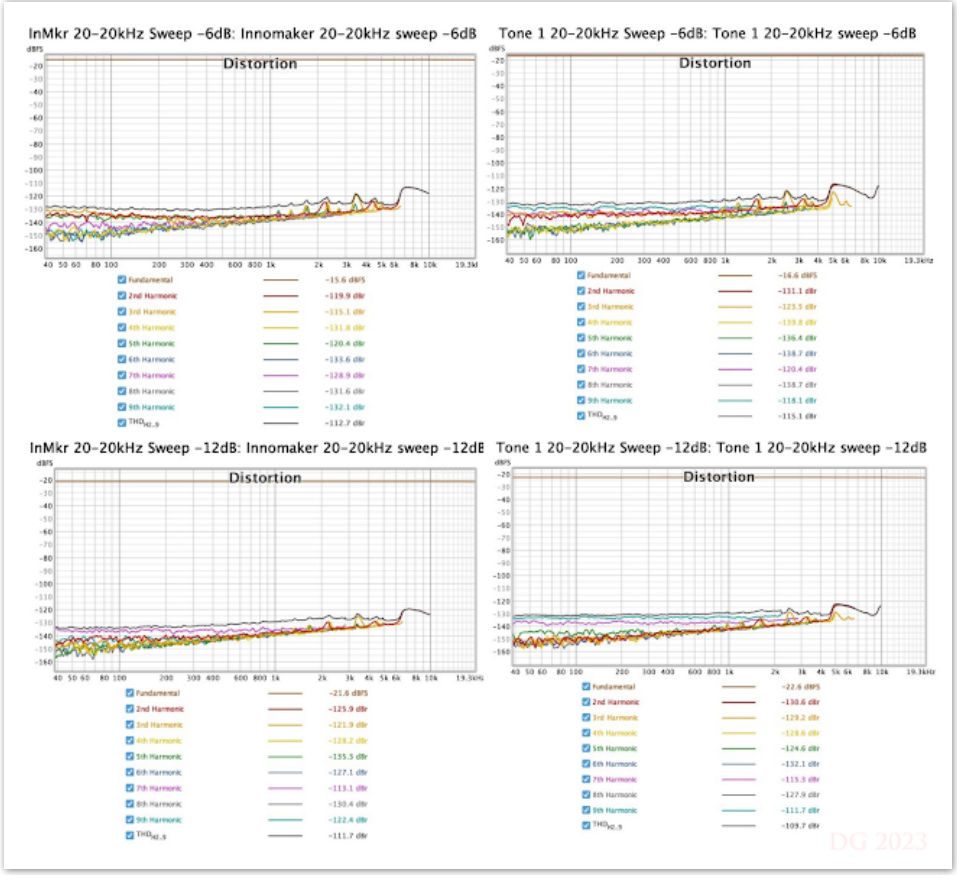
REVIEW: iFi GO Bar - Portable DAC / Headphone Amp (Cirrus Logic DAC, Balanced & Unbalanced).

REVIEW: Beelink Mini S (Celeron N5095A 4C/4T CPU, 8GB DDR4 RAM, 256GB SSD) Mini-PC. (And E1DA Cosmos ADC follow-up: RIAA EQ & 768kHz.)

INTERNET BLIND TEST: Do digital audio players sound different? (Playing 16/44.1 music.)

REVIEW: E1DA #9038D6K Dongle DAC / Headphone Amp (Part II): Headphone Amp Power, DSD, Subjective Impressions, AMPT & Perfectionistic Tweaking!



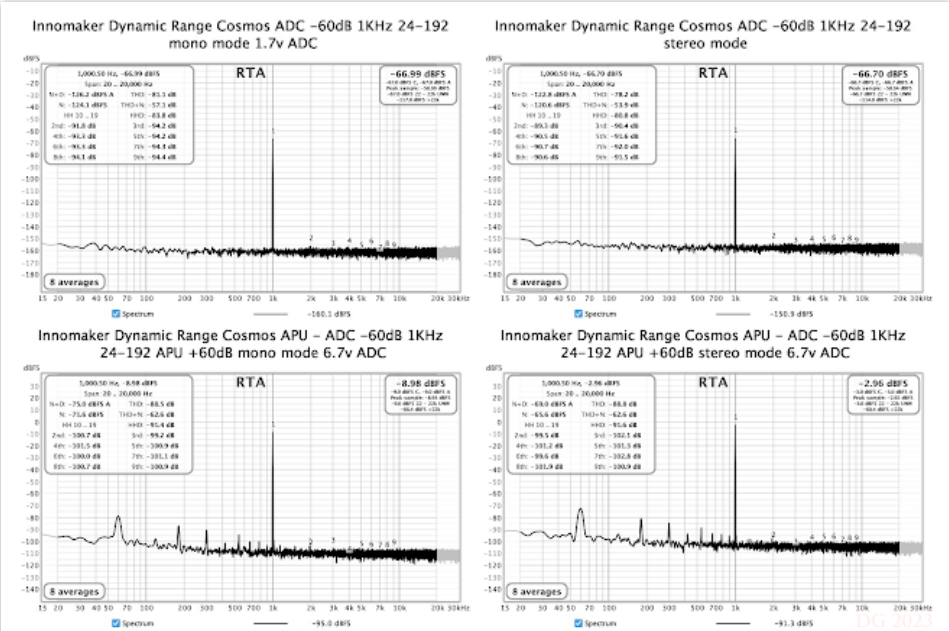


Dynamic Range 24/192 -60dB tone		
	Innomaker	Tone 1
ADC stereo	113.9	117
ADC mono	117.1	119.6
APU+ADC stereo	122.6	118.2
APU+ADC mono	122.6	119.6

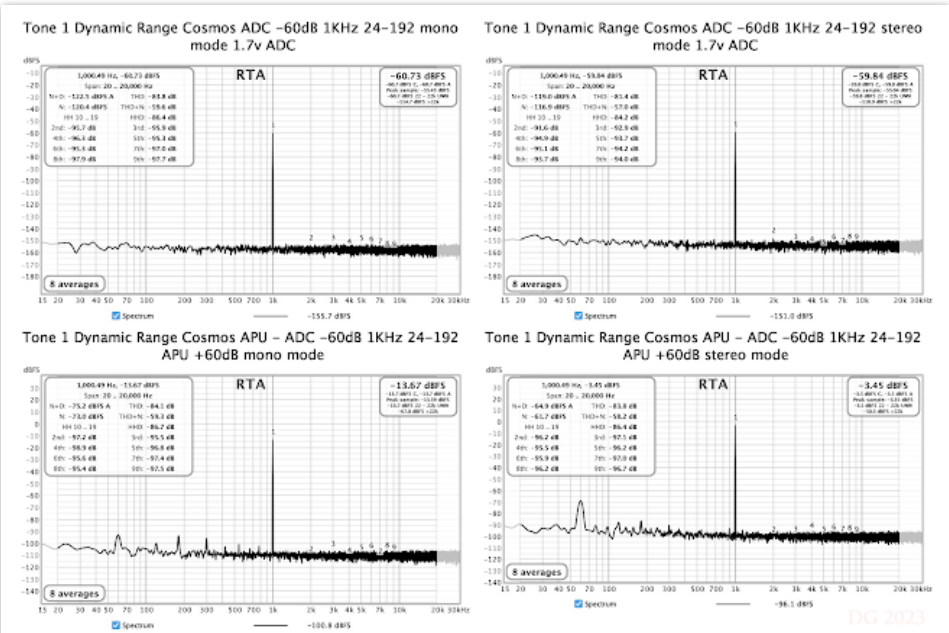
When measuring through the Cosmos ADC only, DR varied between stereo and mono mode on the ADC. Through the APU+ADC the results were more consistent. Looking at the prior blogs on the APU/ADC using the Topping D10s, this seems to suggest that my ADC is at its limits. Given that the DACs under test use the same chip as the ADC and the more consistent results I get when adding the APU to the process, this makes sense. I was surprised that the Innomaker measured so well; slightly better DR than the Tone1.

Both the Innomaker and the Tone1 yield >20 bits of dynamic range and >17 bits of resolution (THD+N).

Here are the detailed graphs of the dynamic range measurements:

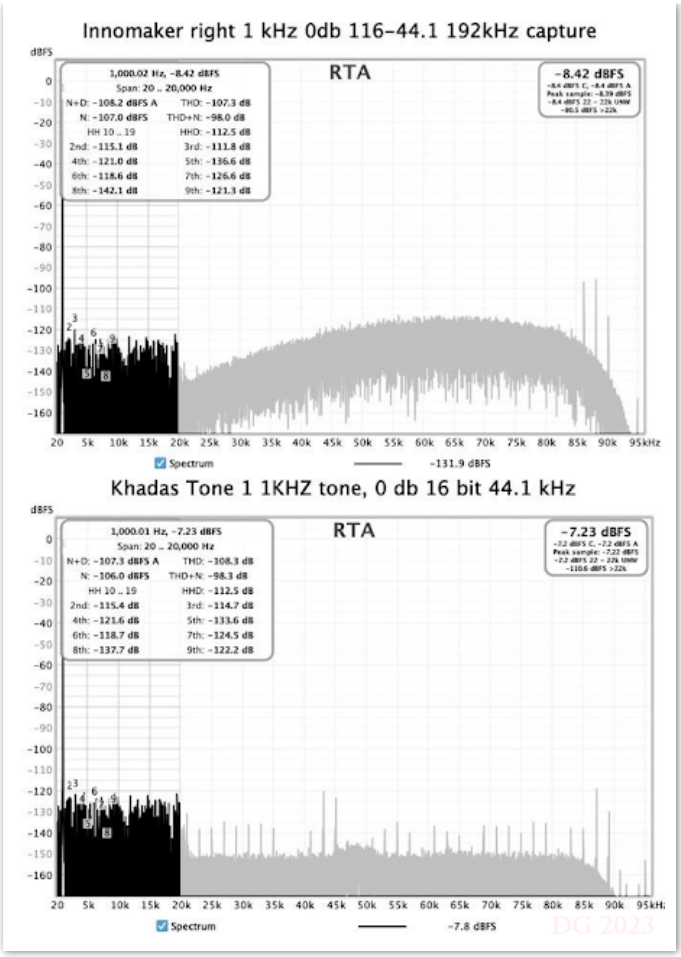


Innomaker HiFi DAC Pro HAT DR - various methods with E1DA Cosmos ADC +/- APU.

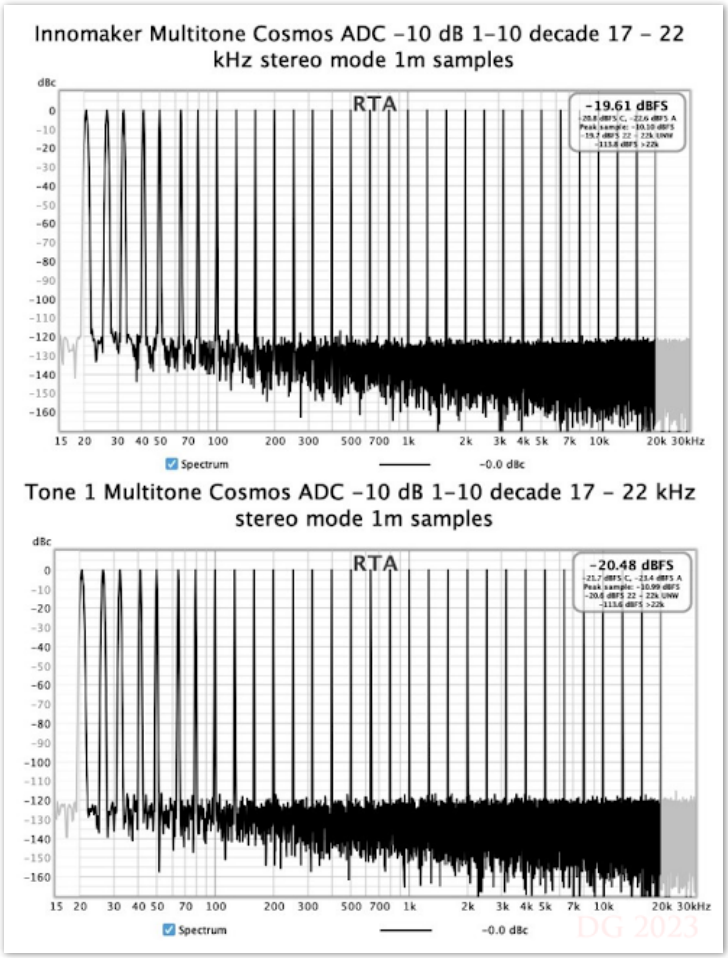


Khadas Tone1 Generic Edition DR - various methods with E1DA Cosmos ADC +/- APU.

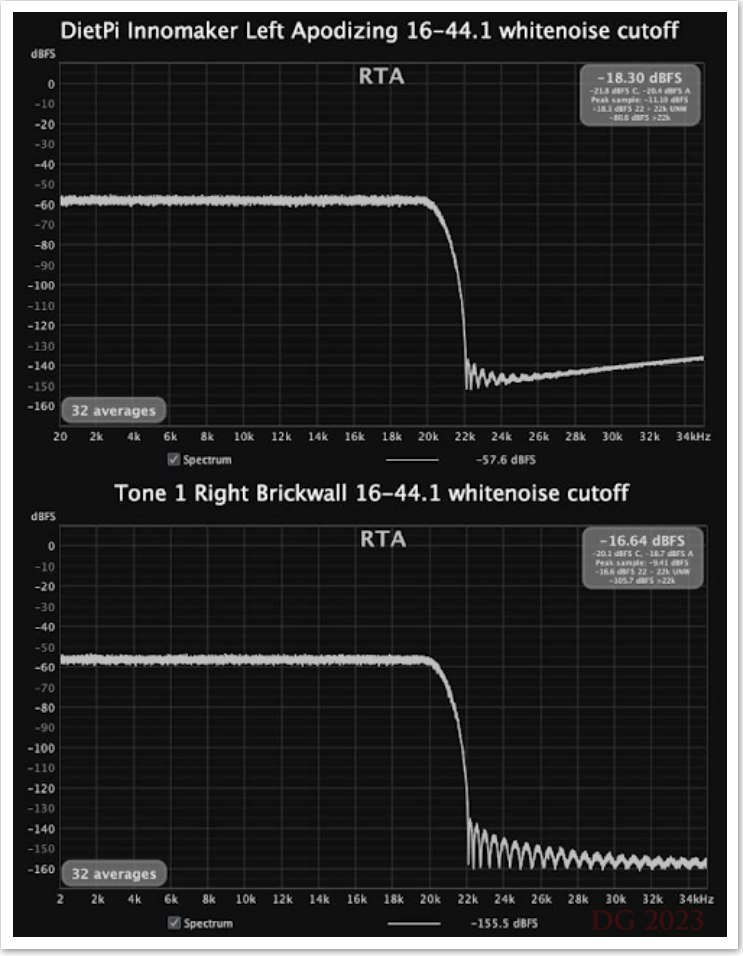
Knowing that the Cosmos ADC achieves a flat noise floor so would not add its own character to the ultrasonic measurements, looking at the broadband spectrum of each device, we can see a difference between the DACs. The Tone1 seems to be able to do a better job of filtering out high frequency noise from the oversampling process. This noise is outside of the audio band and was not audible to me on either device.



Multi-tone tests were excellent with both devices; both provide outstanding resolution. The performance of the Innomaker is particularly notable. I'm not aware of any Raspberry Pi HAT measuring this well.

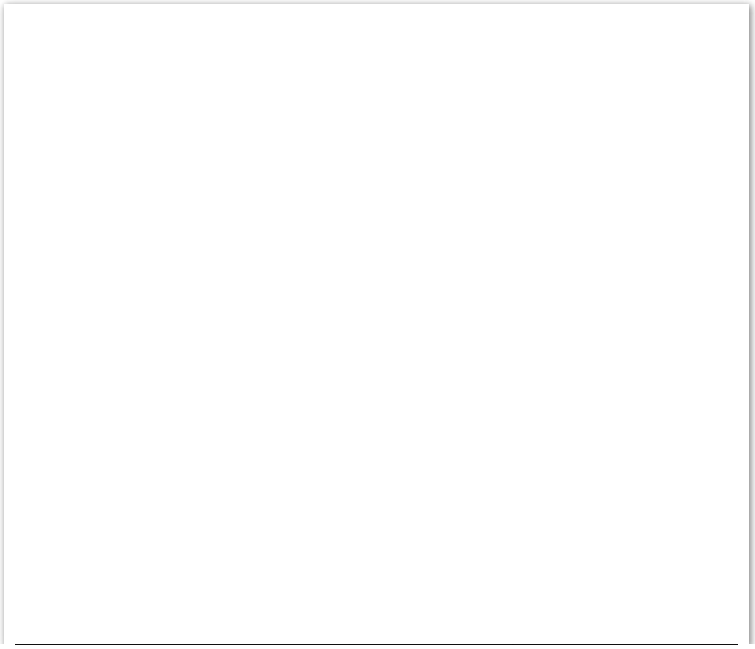


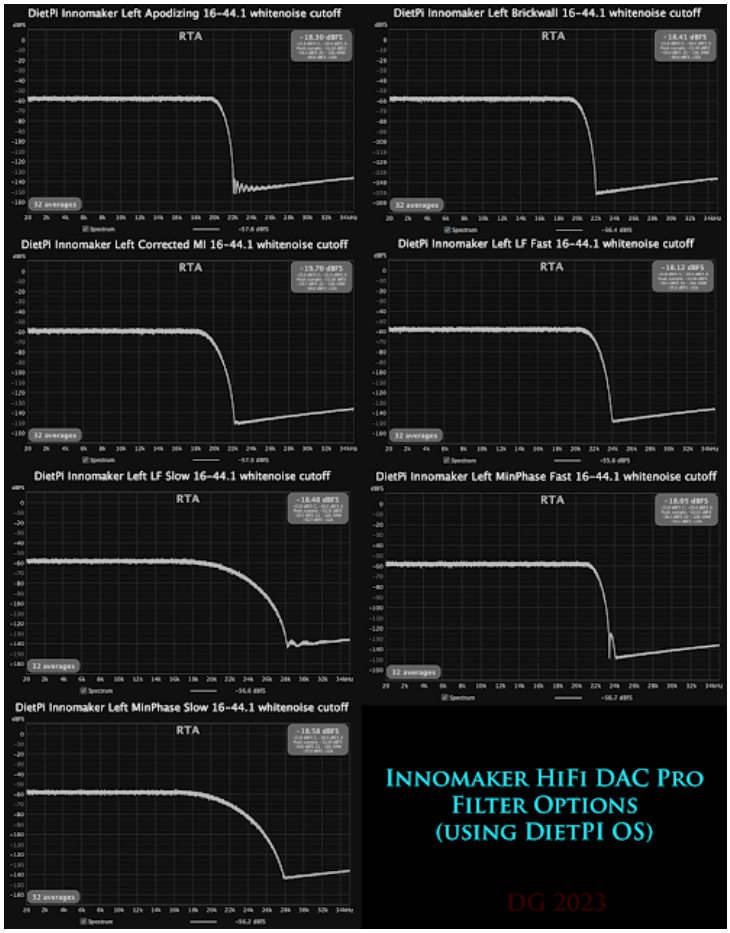
Both devices appear to use ESS's apodizing filter by default. The spectra averaged over longer duration show the telltale signs of that filter. NOTE: Khadas Tone1's filter is mislabeled as "Brickwall" when it is actually "Apodizing".



The ESS 9038Q2M supports several different filters. I'm not aware of any mechanism to change the filter setting on the Tone1 but I did find that the Allo Katana could change filters if configured through the *Alsamixer* settings from the Raspberry Pi. Given that the Innomaker DAC uses the Katana driver overlay, I thought I'd see if those settings are available on the Innomaker too.

Ropieee has removed its SSH capability so there's no longer a way to remote login and fiddle with overlays or Alsa settings. Not to be thwarted, I flashed DietPi OS onto the SD card and replaced Ropieee with DietPi to see if those settings were available. Yes they are, and I was able to select between all of the standard ESS 9038Q2M filters – brick wall, apodizing fast, linear fast, linear slow, minimum fast, minimum slow, and corrected minimum phase fast. Measurements of each below. *[Ed: Nice man! That's quite a bit of work getting this done above and beyond the call of duty!]*





Click on image to have a closer look.

Audibly, filter selection ought to not make a difference especially with the fast variants but it would be great if there was a way to tweak the overlay with RopieeeXL. I'd prefer the frequency extension of the Linear Fast filter for technical reasons. If you want to use alternate filter settings then you'll need to use DietPi or something other than Ropieee that lets you get at these settings but then you lose that nice RopieeeXL display interface I enjoy so much.

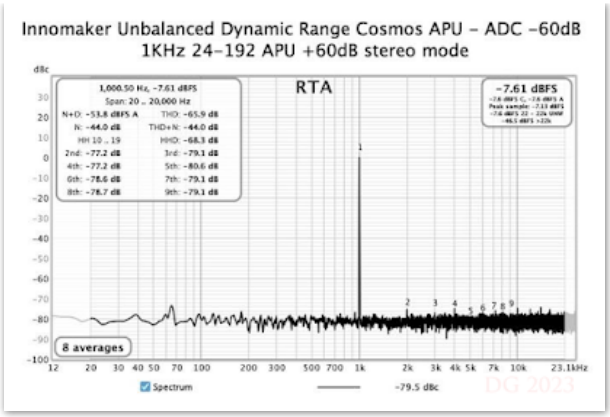
On the downside, the specifications for the Innomaker DAC say that it supports DSD but I was not able to get DSD to work in my setup. Since I use PEQ this isn't a show stopper because Roon has to convert DSD to PCM to perform the PEQ. I don't perceive any value in converting back to DSD and with only a few DSD recordings it isn't something I care to fuss over. Also, the performance specifications on Innomaker's website describe the ESS 9038Q2M capabilities and not the performance of this DAC implementation so don't expect 129dB of dynamic range or THD+N of -124dB.

Summary:

All said and done, the **Innomaker HiFi Pro DAC** does exactly what I had hoped it would do. It works well as a Raspberry Pi HAT with performance comparable to a stand-alone DAC and comparable to the Tone1 that I enjoy. Priced at $89, it's a cost-effective solution for folks looking for a DAC HAT with top tier performance and balanced outputs. It's not objectively state-of-the-art but objectively measures at a level of performance that is excellent; certainly, good enough. *[Ed: More than good enough! ;-)]*

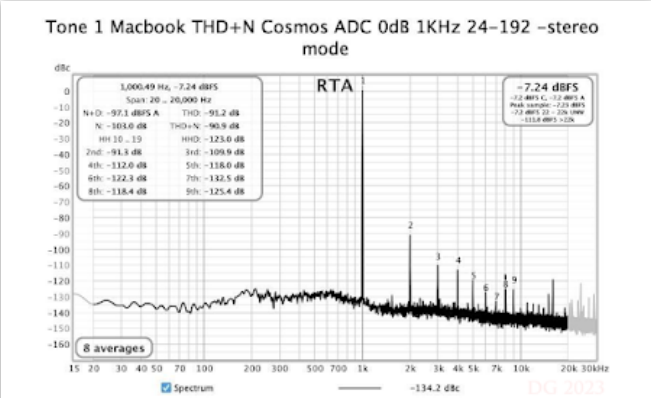
Additional Measurements:

I performed some additional measurements using the Cosmos APU that showed unexpected results. Cursory measurement of the unbalanced output of the Innomaker DAC showed its inferior performance compared to the balanced output. The Khadas Tone1 seems to have a significantly better implementation with this DAC chip than the Innomaker for unbalanced output.



Connecting the Khadas Tone1 directly to the MacBook via Apple USB-C multi-adapter yielded much worse results than when the Tone1 was connected to the Raspberry Pi. With the Tone1 connected to the MacBook and using REW to generate 0dB 1kHz signal at 192kHz sample rate, THD+N was only 90.9dB compared to 106.7dB when playing back the same signal through Roon via the Raspberry Pi. The second order harmonic is noticeably higher when directly connected to the MacBook. The result was the same with the MacBook running on battery or on AC adapter.

Using a 3 kHz tone revealed that the performance degradation is from ground loop noise in the USB configuration. I'll be adding a USB isolator for future measurements where the DAC is directly connected to the measuring computer. *[Ed: Yes, I suspect something like the Topping HS02 as discussed last week would help in a loopback measurement configuration like this.]*



Loopback measurement using MacBook - Cosmos ADC - Khadas Tone1 Generic.

Notes on my test setup:

- Cosmos ADC (B Grade SINAD > 122dB)
- Cosmos APU
- MacBook Pro powered via AC adapter or battery (no measurable differences)
- Cosmos ADC to MacBook Pro via USB-C
- Cosmos APU powered by battery

Innomaker HiFi DAC Pro HAT installed on Raspberry Pi and Khadas Tone1 USB to same Raspberry Pi 4 with Raspberry Pi Display.

APU testing follows methodology outlined in Archimago's blog, *Early Look: E1DA Cosmos APU* and *Early Look: E1DA Cosmos ADC*.

Test signals generated in REW, saved to .WAV files and played back via Roon to the device(s) under test. Test signals are 32 bit except for 16/44.1 tests.

Thank you and wonderful work Doug!

A really nice review and set of measurements looking not just at the DACs connected to your Raspberry Pi but also the resolution limits of your E1DA Cosmos ADC (B) in stereo and mono modes, as well as with the Cosmos APU. Impressive how much performance we can get from inexpensive DACs these days! This is to be celebrated even though I think the idea might send shivers down the spine of many "high end" companies that desire to distance their products as being "better" sounding despite the lack of objective evidence (as opposed to subjective opinions only). For example, we have this recent example of a US$10,000 DAC that performs at the fidelity level of devices from the 1990's, complete with an obligatory subjective review by an elderly gentleman possessing unclear auditory abilities.

With availability of affordable and very high resolution ADCs like the E1DA and also APU for notch filtering, high-resolution testing has become much more "democratic". IMO, unless one is a professional engineer who needs finely calibrated tools (like the Audio Precision), for the rest of us audiophiles, we can now confirm the performance of our own gear with not a lot of money invested in the rig and a bit of know-how which we can all learn.

As demonstrated by Doug, one can use the multiple inputs of devices like the Drop+THX AAA 789 headphone amp (among others) for quick A/B switching while matching output levels. With such "honesty controls" implemented, we can truly gain insights by addressing psychological biases, and cognitive limitations (eg. limited echoic memory) when performing subjective listening. Furthermore, correlating what is heard with measured technical performance results will take an audiophile hobbyist to the next level of understanding; not just of the technology, but also ourselves and what we can and cannot hear (obviously, none of us should be so grandiosely inclined to think we have infinite "Golden Ear" auditory acuity, especially as we get older, right?).

IMO, the path forward for the audiophile community would be for more reviewers - especially in magazines and online YouTube videos - integrating both objective+subjective modes of thinking in their reviews! **I know doing this is not easy.** It takes time and discipline - education requires effort. And as the case may be, I think this is also the price to pay to extricate oneself from neurotic audiophilia to become a much more rational audiophile.

Again, fantastic work, Doug! Looking forward to "hearing" about your future adventures in audiophilia. ;-)

To end, I guess it's no surprise that **MQA is *finally* going into "Administration" in the UK a.k.a. "Chapter 11" bankruptcy**; this self-proclaimed "revolutionary British streaming technology" company. Financial statements over the years from the company have not been good and it was clear as an observer that there was minimal interest despite attempts to entice the public through audiophile and social media.

We've discussed here over the years since early 2015, about the questionable claims that were promoted from the start; the hype surrounding this codec, the cheerleaders and mainstream magazine influencers they've tried to develop, all in the name of dubious benefits with zero evidence that this scheme does anything other than present a semi-lossless attempt at high-resolution audio. All this while streaming of lossless hi-res audio had already been achieved without unnecessary contortions for many years (issues/concerns summarized by 2018).

Companies like MQA and the audiophile magazines I hope recognize that they can't just take audiophiles as fools who will simply accept anything they say these days and hand over money without demonstrable *value*. In the information age, with educated consumers, the claims of a well-known name like Bob Stuart or the (ostensibly) sage advice of some venerable audio reviewer "high priest" means little unless the claims "walk the talk". Eventually, the *truth* will win out even if it takes years.

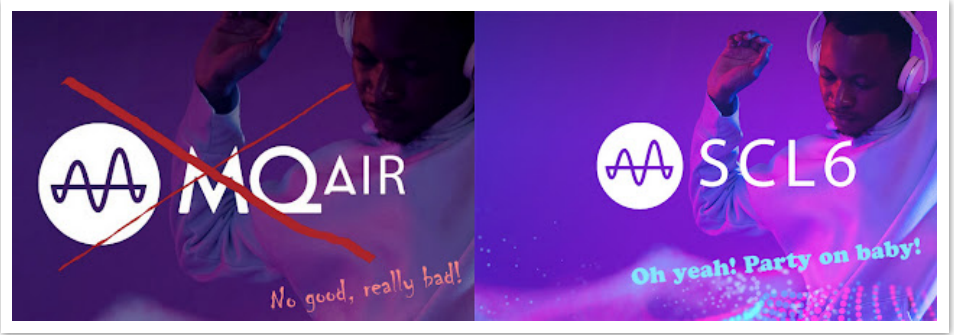
The demise of MQA is a win for audiophiles and IMO makes the hobby stronger for demonstrating that "we" can resist nonsense and snake oil directed at hobbyists - even despite support of audiophile gurus and the willfully blind cheerleader press behind it. A warning to other companies who want to promote nonsensical "technologies" - financially, there's much for investors to lose as they obviously pulled the plug on a company which has been on life-support for years.

It'll be interesting to see in the days ahead where things go from here. What will become of TIDAL's use of MQA? It might actually help the business by closing down the HiFi Plus tier at some point as suggested in 2021 and clean up the MQA-infected files.

How will mainstream audiophile media/magazines handle this? Will they disengage gracefully and recognize with some humility that their overzealous support (including editors of certain magazines, audio engineers like

2L's Morten Lindberg, Bob Ludwig, or Wilson Audio's Peter McGrath) early on was at least premature? Will they now finally stop talking about the MQA versions of albums that really never sounded better when more than likely they were influenced by Industry biases, or just liked a kind of DSP-ed character MQA processing imparted? Or will MQA be spoken of with nostalgic reverence in the days ahead as if Bob Stuart / Meridian / MQA was ever going to deliver us to the Promised Land of audiophile bliss thanks to their "deblurring" and "authenticated" blue LED. And audiophile "nay sayers" be branded as conspiracy theorists to maintain some audiophile writers' delusion of having "Golden Ears" with subjective opinions worth respecting?

I suppose if there's not going to be much in the way of MQA-encoded content going forward, devices like the Topping D90SE and D90LE should be priced about the same. There would really be no market for a US$100 premium to own a basically-dead decoding feature, right?



In recent days, MQA has been talking about the **"*MQair*" SCL6 codec** which refers to "scalable codec generation 6" or something like that, a bitrate adaptive technique that could be used to stream hi-res lossless (20Mbps - stereo 24/384) down to lossy wireless headphones (200kbps). It's no wonder they're preferring to use the *SCL6* name. Given the terrible negative sentiment, calling *MQAnything* is the kiss of death!

Hopefully it doesn't incorporate the filtering non-sense, and silly "authentication" of the core MQA codec. Obviously, it is lossy given the adaptive nature and bitrate limits of target devices like Bluetooth headphones (realistically <1Mbps to reduce errors). Let's hope that if SCL6 ever does come out (presumably owned by a different company than MQA), they spare us from crazy hype and recognize that well-encoded, reasonably high bitrate lossy like 320kbps MP3 sounds great already. I'm certainly not against something like SCL6 if the technology can advance Bluetooth sound quality and compatibility as a competitor to the likes of Sony LDAC, or aptX Adaptive. Note that the adaptive bitrate streaming technique isn't new as it has already been in use for years with video (as per YouTube, Netflix...) and audio such as the aforementioned aptX Adaptive. In fact, Neil Young promoted his adaptive Xstream as discussed back in 2019; I wonder how that compares with SCL6.

Important to recognize that SCL6 will face stiff competition in the higher quality Bluetooth codec space with LDAC freely integrated since Android 8 (2017), the market foothold of aptX/Qualcomm, and Apple products entrenched in AAC 256kbps for now (not to mention the less popular but new LC3plus and LHDC/LLAC/HWA). Unless SCL6 can do something really special in its implementation and allows low-barrier software integration into new products, I suspect many consumers would just ask "Why bother?".

Looks like we are well at the end of MQA as a "going concern" for audiophiles who care about the best audio quality and not having a codec-middleman with DRM-implementation potential in the way. By June (next 8 weeks), I guess we'll hear more about the dissolution/restructuring plans. While MQA won't disappear immediately since "the end" is always a process, clearly its "best days" (whenever those were) are well in the rearview mirror. I would not be surprised if in the history of our little audiophile hobby, this chapter with the introduction of MQA and its ultimate insolvency is an important landmark.

Have a great Easter everyone. What an interesting week in politics and with MQA!

Hope you're enjoying the music.

*[Reminder: The **16-bit vs. 24-bit Blind Listening Test** and **Audiophile Survey** are still ongoing - only a few more weeks!]*

Posted by Archimago's Musings at 09:10:00

Labels: DAC, MQA, Raspberry Pi

23 comments:

thegeton 9 April 2023 at 10:09

The death of MQA could not come too soon. Snakeoil at its worst.

Reply

Replies

Archimago's Musings 9 April 2023 at 21:19

Hey *thegeton*,
Or at least one of the most *grandiose* examples of snake oil! Most snake oil products are just single items like a magic cable, or blessed stone, or some weird clock tweak that affected only a few (gullible) audiophiles. Imagine, at one point these guys were hoping to control the digital streaming system with this "format"!

I guess can't blame 'em for not dreaming big.

ArmySlowRdr 11 April 2023 at 12:44

No, a lot of SR products are the "worst".

Archimago 11 April 2023 at 18:09

Yeah... Those *Synergistic Research* products. And *Machina Dynamica* also.

Top tier "oil". Scary, bizarre stuff. IMO, just walk away boys.

Reply

Errant Audiophile 9 April 2023 at 17:52

The MQA explanation for going into administration was that one of the main financial backers of the company wanted to pull back its investment, meaning that the company had to be put up for sale. Going into administration and restructuring was, according to the company, the best way to prepare to be acquired. The company is continuing to do business as usual, as I understand it. This may all be corporate spin, but it is probably premature to start dancing on the grave of MQA (the company). (See, for instance, https://www.whathifi.com/news/mqa-is-going-into-administration.)

Reply

Replies

Archimago's Musings 9 April 2023 at 22:13

Yeah, good to be cautious, I agree *Errant A*...

However, this is serious stuff. Nobody comes out publicly to declare that they're **insolvent / bankrupt / broke** unless it's dire and this has to be done legally regardless of the reputational damage.

The end-of-year 2021 company financial information found here:
https://find-and-update.company-information.service.gov.uk/company/09123512/filing-history

tells us that they were only managing a turnover of around £660k that year but lost £4.3M, and furthermore had almost £9.5M in net debts.

At this point, we must be suspicious that 2022 was an even worse year resulting in at least one of the major backers pulling the plug as per the company press release (suspicion this was Reinet owning ~25% share with the pulling out of Anthony Edward Rupert from the directorship in March). Presumably futile to put any more money chasing after unlikely returns on investment.

Here are the main shareholders:
https://www.companysearchesmadesimple.com/company/uk/09123512/mqa-limited/#people

This isn't a huge amount of money in the big scheme of things. Presumably someone wantd to own the SCL6/MQair IP. Don't know if anyone really wants the MQA codec but I suppose the "core" encoding may be interesting. I wonder if Tidal might be interested if it's cheap and ownership might decrease disruption to their HiFi+ streaming tier. But then again, with this "authentication" mechanism, there could be infrastructure costs we might not appreciate like continuing with the contracts with Ultimaco for the authentication mechanism and such. Tidal apparently is not looking great financially either.

Don't know if it's "business as usual". Seems like the kind of thing one says to keep the hope alive. I see that their Twitter feed has gone quiet since April 4th which is unusual. Who knows, maybe they're on Easter holiday... Will see next week.

Reply

Danny 9 April 2023 at 23:41

Here's the best summation I've seen: https://www.ecoustics.com/news/mqa-bankruptcy/
MQA may survive, but it isn't a serious money generator. My guess is that manufacturers will, over time,

stop supporting it and it will become a legacy product.

Reply

Replies

Archimago's Musings 10 April 2023 at 12:03

Thanks *Danny*,
Yeah. Still lots of uncertainty about time frames but I think with all that's happening, just a matter of time before MQA turns "legacy". Sooner the better... The world doesn't need any more music touched by this codec.

I see the Twitter feed for MQA remains silent. That's good.

Reply

Danny 9 April 2023 at 23:44

Where are the Robert Harley's , Lee Scoggins, and the two JA's? No comment?
I wonder why? I bet there will never be a real admission they were wrong. They will blame Archi and the rest of us for sabotaging it, or some such nonesense.

Reply

Replies

Archimago's Musings 10 April 2023 at 12:16

I see that Andrew Quint of *TAS* made a statement on *Audiophile Style* today.

And here's my response to him.

I really think responses by these guys have to be careful not to alienate audiophiles; many of whom I believe have become sick and tired of being marketed to all these decades. If they've been willing to go along with MQA despite all the concerns for **8+ years**, just what kind of honesty do we expect from them going forward if they don't at least take a moment and address this nasty "elephant in the room"?

They can put their heads in the sand for years supporting this company, but the time has come when the failure needs to be reckoned with.

Reply

FastFreddy 10 April 2023 at 05:34

The MQA king is death. Long live the king. LC3(plus). Just like any other lossy audio compression (MP3, AAC, OPUS) it uses a Low Delay Modified Discrete Cosine Transform module (LD-MDCT). This is basically a time-to-frequency transformation frequently used in perceptual audio codecs. What makes the codec tick is that the frequency components generated by the LD-MDCT are passed to the Spectral Noise Shaper (SNS). This shapes the quantization noise to maximize the sound quality. But that's not all. After the SNS is a TNS (temporal noise shaping) module. his reduces time domain errors which manifests themselves as pre-echo distortion artifacts.

At lower bitrates another artifact raises it's ugly head. The Birdies. Robotic sounding bird chirps. These are fixed with the Noise Level/Filling module that uses a pseudo-random noise generator to fill the holes.
But this is only used at very low bitrates.

Nothing is exactly new here but it was not implemented in smart phones before because of the added computational complexity. It's not a problem to use advanced DSP techniques on modern Smartphone CPUs.

Subjective PEAQ (Perceptual Evaluationof Audio Quality were conducted.
In subjective listening tests, a group of expert listeners listen to various
audio samples and score the experience on a scale of 1 to 5. LC3 consistently scored close to 5 which means the audio is perceptually transparent.

Recommended reading material: Unraveling Bluetooth LE Audio: Stretching the Limits of Interoperable Wireless Audio with Bluetooth Next-Generation Low Energy Audio Standards"

This is only to get going. It doesn't provide much detail about the LC3 Codec but this is probably a good thing. Not many people are fluent in advanced math ;)

Reply

Replies

Archimago's Musings 10 April 2023 at 12:25

Nice *Freddy*!
I'd be curious going forward if SCL6 becomes an actual "thing" how it scores on the PEAQ. We clearly at this point don't know enough about it other than "it's software" to be able to evaluate just what kind of computational complexity it has. Probably not unreasonable to think that it does not have the complexity of LC3(plus) until shown otherwise.

These days I've been playing with LDAC Bluetooth headphones and they sound very good although 990kbps can be sketchy depending on transmitting device and headphone.

Plenty of potential developments in the wireless audio space.

Read 10 April 2023 at 15:32

So it is LDAC superior to all the others "enhanced" BTs??

Reply

BigPhatStax 10 April 2023 at 08:53

Wild stuff on MQA, Arch and the guys in the discussions! A soap opera and I'm on "Team Audiophile & The People" hoping that "Team MQA & The Press" gets the boot for years of dishonesty and biased reporting.

Also thanks Doug for the nice test and discussions on the InnoMaker. I just bought one of these HATs last month. Just put it in a standard box without touchscreen, now I'm tempted to build one with the screen also. Sounds great and I was wondering about how it performed. Now I know! Excellent product for such a low price.

Keep up the great writing and work Doug and Arch. Cheers!

Reply

Replies

Archimago 11 April 2023 at 17:58

Thanks *Stax*,
Yeah, it's always nice getting connected with readers and their contributions!

Great that you got some answers about the recent Innomaker DAC purchase. ;-)

Reply

Read 10 April 2023 at 15:30

Great Report, "promoted to homepage" as Amir uses to say ;-))) !!! Couple of questions here: Does this HAT deliver on its balanced output double the power than on unbalanced? They also claim on their site best results will be obtained by powering the HAT separately from the Rpi, did you measure this? Best regards!!

Reply

Replies

Doug 25 April 2023 at 12:44

Not sure what you mean about balanced being double the power of unbalanced but if you are referring to the voltage level then yes, it measures as expected with roughly double the voltage of an unbalanced connection but it is still a line level output.

On the topic of separate power supplies, you can see from the measurements above that there really aren't any issues with powering this directly from the Raspberry Pi. Looking at the multi-tone graph in particular you can see that is the case. Separate supplies would also defeat my desired goal of reducing clutter. For these reasons I didn't configure or test the board with an external power supply. There just isn't anything for me gain in my configuration by adding additional complexity. Based on the measurements I performed, I'm confident that I wouldn't hear any improvements over this setup.

Reply

Stephan_M 13 April 2023 at 03:40

Speaking of MQA: With the Powernode I had a device that can do MQA decoding. I noticed a clear difference in the CD quality. When I then saw a YouTube video comparing audio samples from MQA with 44.1/16bit, I initially felt vindicated. But then I asked myself, how can such a lossy soundtrack, YouTube audio is max. 384 kbit/s in stereo, make such a clear difference audible? Is what is special about MQA just a tone coloration, similar to DSP?
I'm now weaned from MQA like an alcoholic from daily beer and happy with Spotify and DSP now.

Here is an older video by Rick Beato about bitrates in MP3.
https://www.youtube.com/watch?v=YgEjI5PZa78

Reply

Replies

Stephan_M 13 April 2023 at 03:43

P.S.: I wish that the so-called "Hifi reviewers" would have the courage to do this test in front of the camera.

Reply

Steven 22 April 2023 at 23:46

I'm not sure the MQA demise proves that audiophiles are resistant to snake oil. It's still almost impossible for them to admit transparent lossy compression is a thing, or that lossless or even hi-res audio is (objectively) unnecessary. You don't have to be schizophrenic to be able to accept those objective truths and at the same time prefer a DAC for its looks or background story or technology, or stream lossless because that feels better.

Reply

Measurbator 11 May 2023 at 07:16

Hi @Archimago - no jitter measurement? Sure jitter is not a problem with the ethernet transmission. I'm moreso interested in the jitter at the point of D to A with this DAC. Can you add it?

Reply

Replies

wtnh 28 June 2023 at 16:01

Doug - great review. I had a similar question about jitter. In your configuration was the default for the Innomaker to be in IIS master mode, thus supplying the clock signals to the Pi? I am guessing so, otherwise the results would have probably been a lot worse.] Most of my builds have been with PiCorePlayer - so I might try one of these to replace an old Allo Boss. BTW - Amazon is now selling these for $59.99!

Reply

Measurbator 12 May 2023 at 17:32

Hi Archi - are you aware this Innomaker has balanced output impedance = 2100 ohm ? I think this would negatively affect your measurements using the Cosmos ADC which has low input impedance.

Reply

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