

Review of Rockna Wavedream DAC by Srajan Ebaen, april 2016, on :

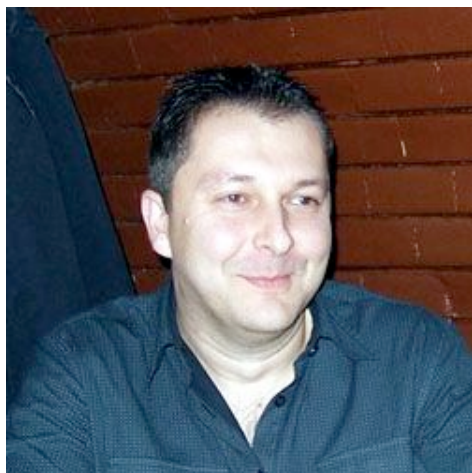


If you've paid any attention to DAC development over the past few years, you've noted the vast majority of Delta-Sigma users; a far smaller group of classic multi-bit contrarians who either harvest dwindling inventories of 16-bit NOS chips (AudioNote UK, AMR), exploit industrial/military current silicon (Schiit) or mint their own ICs (Metrum); and the even smaller FPGA brigade who code programmable chips to do their bidding, sometimes in PCM mode (Chord), sometimes in DSD mode (Meitner, Playback Design, PS Audio). A fourth group of refusniks to fashion and current trending are spiritual kinfolk to the classic multi-bit contrarians. They however execute their R2R ladders with discrete resistor arrays, not integrated chips. To this crew belong MSB from the US, S.A. Lab and Wagner Audio from Russia, LessLoss from Lithuania, TotalDAC from France - and today's Rockna Audio. Like my favourite accordion player Roberto de Brasov, Rockna stem from Romania. Their Wavedream converter started life driving MSB modules like the Bulgarian Thrax and Swiss ReQuest Beast still do. But today's Wavedream runs on proprietary tech. Over the years, Rockna's engineering rock Nicolae has provided OEM/ODM assistance to Audio Mirror, Acoustic Precision, Fase, Jadis, Nonsolomusica, PS Audio with their PerfectWave transport, Wadia, Goldmund and even MSB. Whilst his name might not ring a bell, Rockna Audio have been around for 15 years.

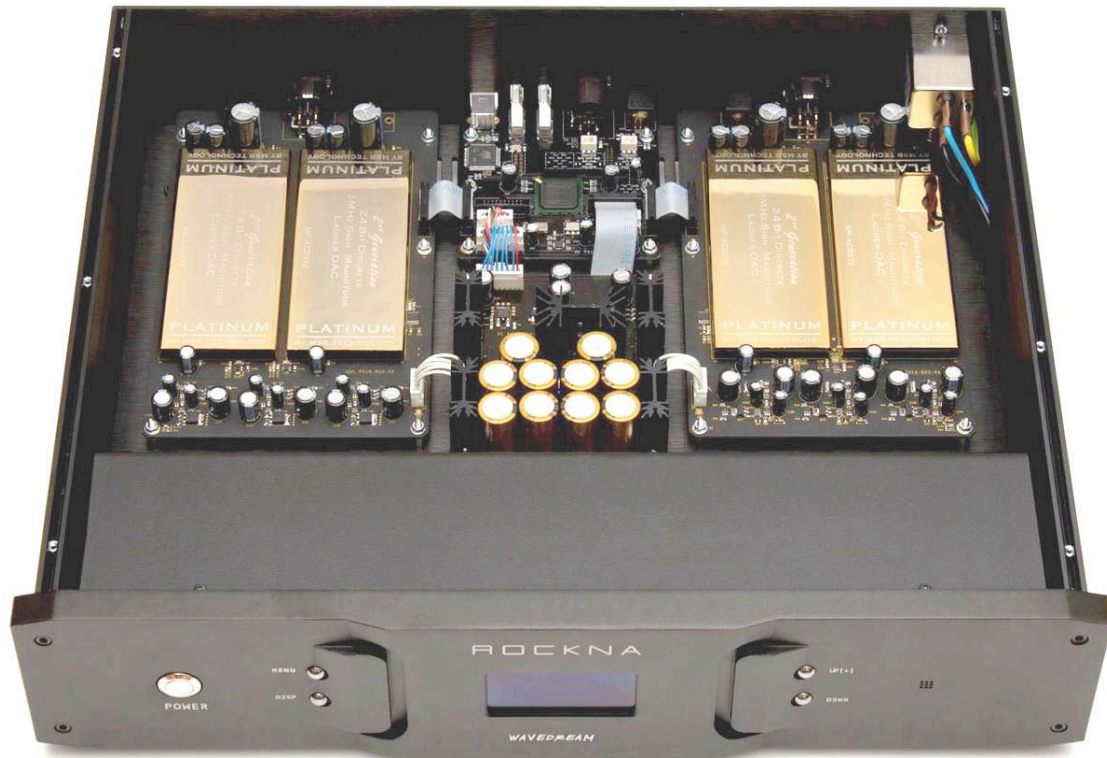
Where Rockna are the no-holds-barred high-end division, Audiobyte are their more affordable spin off. Audiobyte's tidy catalogue is currently three deep: a D/D converter aka USB bridge; an optional ultracap'd linear power supply for it; and a 3-for-1. That's a digital pre/headfi amp and DAC called Black Dragon. It's the replacement for the earlier Silver Dragon. Befitting Audiobyte's Rockna DNA –hold tight to your wig because now we'll rattle off lotsa tech –there's FPGA-based 500MHz sampling, 15 DPS-core filtering, sub pico-second reclocking and 127-step precision volume control with memory function. D/A conversion is via dual Asahi Kasei AK4396 chips for balanced mono processing. The Black Dragon eschews all analogue inputs to be purely digital via USB, 75Ω coax, 110Ω AES/EBU, Toslink and I²S over HDMI. Class A fully discrete zero-feedback outputs come in triplicate: 10vpp RCA, 20vpp XLR, 800mW/32Ω 6.3mm. Sample rate support is up to 96kHz for optical, 192kHz for S/PDIF and 384kHz/DSD128 for USB/I²S. Bit depth is 24 bit for all inputs except USB/I²S which accept 32 bits. Finally there's remote control and a red-on-black dot matrix display. The custom FIR filter can be defeated but is recommended to stay on. It eliminates pre-ringing. Hence the bold capitalized command. Stay warm. Keep yer fur on.

Okay, that I did fib in Photoshop. It really says FIR ON. But where's the fun in that? A fur filter sounds far more cozy. And if steeper pricing gets you frosty, now is the time to engage your own thermal filter –heat flash or power surge as women say–as we transition to Rockna Audio and their up to \$20'000 Wavedream DAC. This intro simply let you know that a \$2'100 Rockna-derivative DAC is available too at 1/10th the wallet pain.

With a last name like Jitaru, Nicolae is genetically wired to feel all jittery about jitter. The WaveDream DAC not only gets a proprietary USB solution –not a generic M2Tech, XMOS, Amanero & Co transceiver module– but also selectable digital filters. Those were written by Jitariu's team. Wig time again. These filters exploit 15 GMACS of processing power from 58 DSP blocks and "avoid standard Nyquist rate filters" in favour of "an advanced 2000-tap convolution filter created from a Parks-McClellan equiripple combined with a raised cosine type". I have no idea what that means.

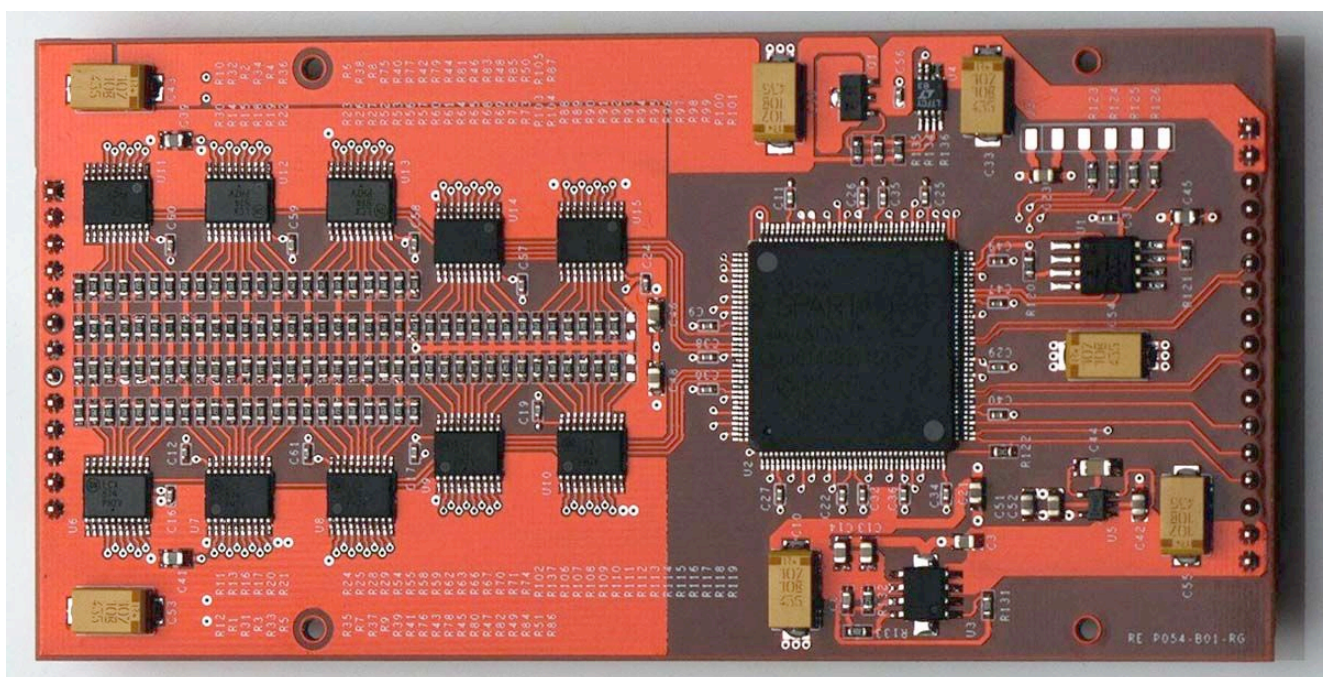


Even Nucu's Femtovox clocking scheme is different. *"The heart of the WaveDream clocking system is a digitally programmable low-jitter clock. Its precision is set by a 38-bit control word which gives an accuracy of <math>< 1\text{ppb}</math> (parts per billion). This clock generation creates a very low jitter of 0.3ps or 300fs on any input sample rate. In absolute terms there are claims of lower jitter figures on the market which can be obtained only by using oven-controlled crystals at single frequencies. With sample rates varying from 44.1 to 384kHz, it's unlikely that a DAC can work with a single master-clock frequency unless it uses an ASRC with its own set of problems. Our digitally controlled clock allows bit-transparent operation without the smearing caused by an ASRC block. But the master-clock generation technique isn't all. To properly adjust the digitally controlled oscillator frequency, our system measures the incoming sample rate with high accuracy. Whilst that could simply program the DCO, we use a complex algorithm that takes care of the real frequency that's written in real-time to the DCO. The algorithm keeps frequency variations to a minimum to yield a fixed frequency in the short term and to track source frequency deviations over the long term. The resulting loop corner frequency of the system is as low as 0.5Hz."* All incoming data of 44.1kHz or multiples thereof upsample to 705.6kHz. 48kHz and its multiples arrive at 768kHz. A-weighted dynamic range is 132dB, S/NR 132dB, output impedance 0.5 Ω . Asynchronous input reception occurs at 560MHz sampling and the "memory-based digital-domain PLL" operates at 300fs jitter. Mathematical precision is 68-bit integer, the volume control is a 256-step custom multiplier array over 0.5dB increments implemented as quad 63-bit DSP inside the FPGA. Selectable dither is "4-bit Gaussian ultrasonic". The 128x65 yellow Oled display is dimmable over 8 steps, the firmware is USB upgradeable –which by altering the FPGA coding actually upgrades hardware– and there's remote control. The user can invert phase, select between linear, minimum and hybrid filters, activate the dither generator and alter the digital PLL settings between local clock and clock stream. Phew. Have we reached brain overload by now?



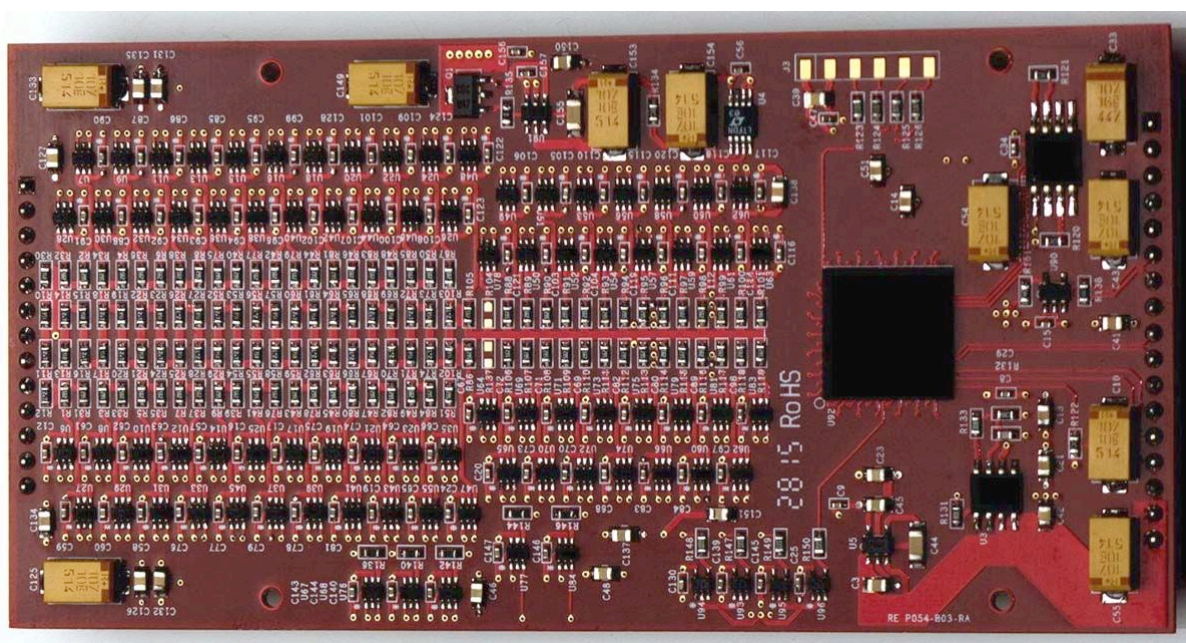
Current Wavedream with Rockna RD-0 modules in fully balanced guise

The original MSB-powered Wavedream had no output stage where it mimicked the Metrum Acoustics converters. "We initially planned on a tube stage but eventually had insufficient space for something proper. Then we experimented with a solid-stage analog volume control stage. After extensive listening tests we realized that our digital volume control was truly exceptional. So finally we opted for taking the output signal directly off the DAC modules. Ours has 63-bit internal resolution and a very low noise floor. Being digital domain, beyond a certain level it becomes lossy of course. There's always a trade-off between losing bits and signal-path purity. Mathematically any digital volume control throws away 1 bit every 6dB. But in practice it depends how you are doing it because you basically get the signal level closer to the noise floor. In our particular case we have large dynamic range (32 bits = 192dB) so even if we start to subtract bits, there's still a lot of dynamic range left to match even very good analog attenuators."



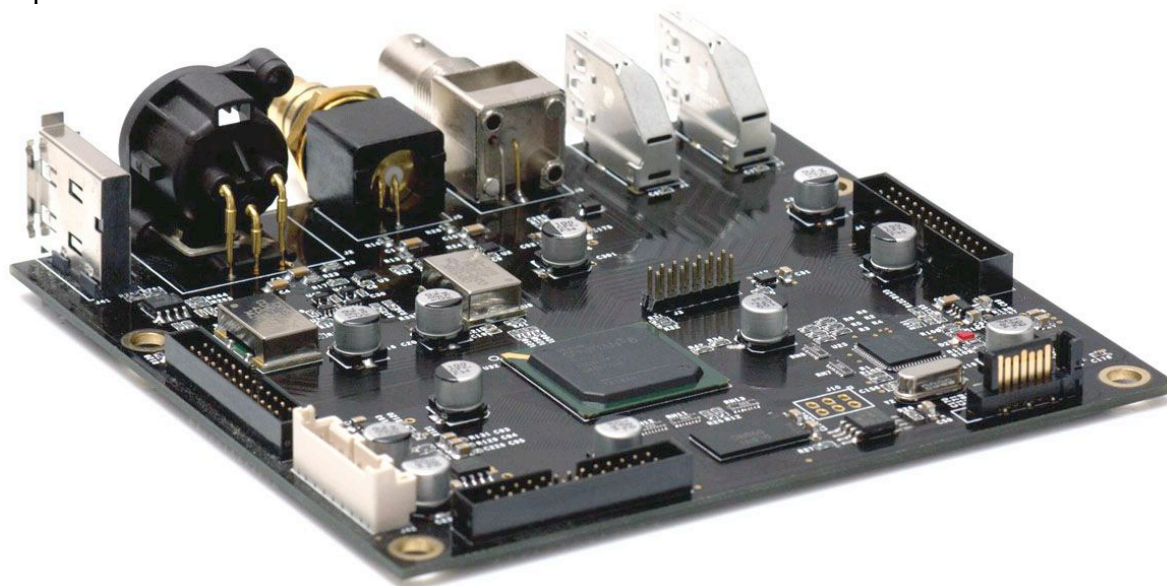
Rockna's RD-1 discrete R2R board

The new Rockna-powered Wavedream has an output stage. "Designed from scratch, the output stage is fully discrete and acts as a high-speed buffer. Made entirely with through-hole components, we combined Jfet and BJT transistors into a class A stage with closed-loop output impedance of $<1\Omega$ and equivalent input noise as low as $1nV$." Finally about Nicolae's discrete R2R conversion, there are the 27-bit RD-0 board used in the Signature versions; and the 26-bit RD-1 board in the standard Editions. "Currently either module can sustain a maximum sample rate of 6MHz, the industry's maximum sample rate specified for an audio converter. The outputs of the converter modules are un-buffered to allow for maximum transparency and natural sound." Both Signature and Edition models are available single-ended or balanced. The latter obviously require two modules per channel. Either deck does up to 256DSD and 384kHz PCM. On specs, the costlier Signature has the lead. Specifically, THD+N between these siblings works out to 0.003% versus 0.0008%, S/NR and dynamic range to 122dB versus 132dB. Max output voltage between them is 6.6/13.2V versus 10/20V for the SE/XLR versions respectively. Hence the Signature has more gain and lower noise and distortion.



Rockna's RD-0 discrete R2R board

On how the RD-1 and RD-0 modules differ: "The RD-0 gets individual not shared switches; a lower impedance regulator; one extra bit; a 5V rather than 3.3V reference for higher dynamic range; a 6-layer not 4-layer impedance-controlled PCB; 'one-shot' master-clock driven conversion for lowest jitter; and a matched-phase clock across the ladder."



Here's what Fred Crane, dealer/importer of StereoDesk and AudioPrana, said about the Wavedream: "Nucu worked very hard on his own module. It deserves to be heard first on your pages. The feedback on it has been at the top of the game. The fully loaded unit is \$20K stateside but once auditioned, has a very high success rate. To be more specific, the four owners with the top version all had it on contingency first but all kept it. The competitors we had to beat were Berkeley's new top converter, the new Nagra HD, a Bricasti and a Playback Design deck. Not bad company to keep. Two of those gents had systems designed by us so it's no wonder the Rockna played well." To alleviate the worst of wallet cramps, remember that the single-ended Edition version starts at \$6'600. Many a DAC with off-the-shelf silicon stuffs one or two of Rockna's custom boards into a sub stamp-sized commercial chip to sell for the same or more. That's like charging the same for a prefab house versus building one by hand, one (resistor) brick at a time.

Cutting open the tape on the double cardboard box revealed a full-size component with power cord and rebranded remote sans batteries. No instructions either. Popping the hood showed four RD-1 modules for the fully balanced €10'000 Edition trim package, €3'500 less than the just departed TotalDAC d1-six-tube. Popping the full-width metal shield behind the inner front panel unmasked three compact power toroids. With mirror-polished lids concealing the resistor-ladder modules, this Wavedream played up the silent strong type in chic stealthy black. Even powered up, not one lone current-source LED lit up inside for proof of life. Only the yellow Oled display with its brief readout of RD status and firmware version before settling into standard mode showed how currents were flowing. Time to put the hood back over the dead-silent transformers, redo the thick top cover and hook up some cabling for first sounds.

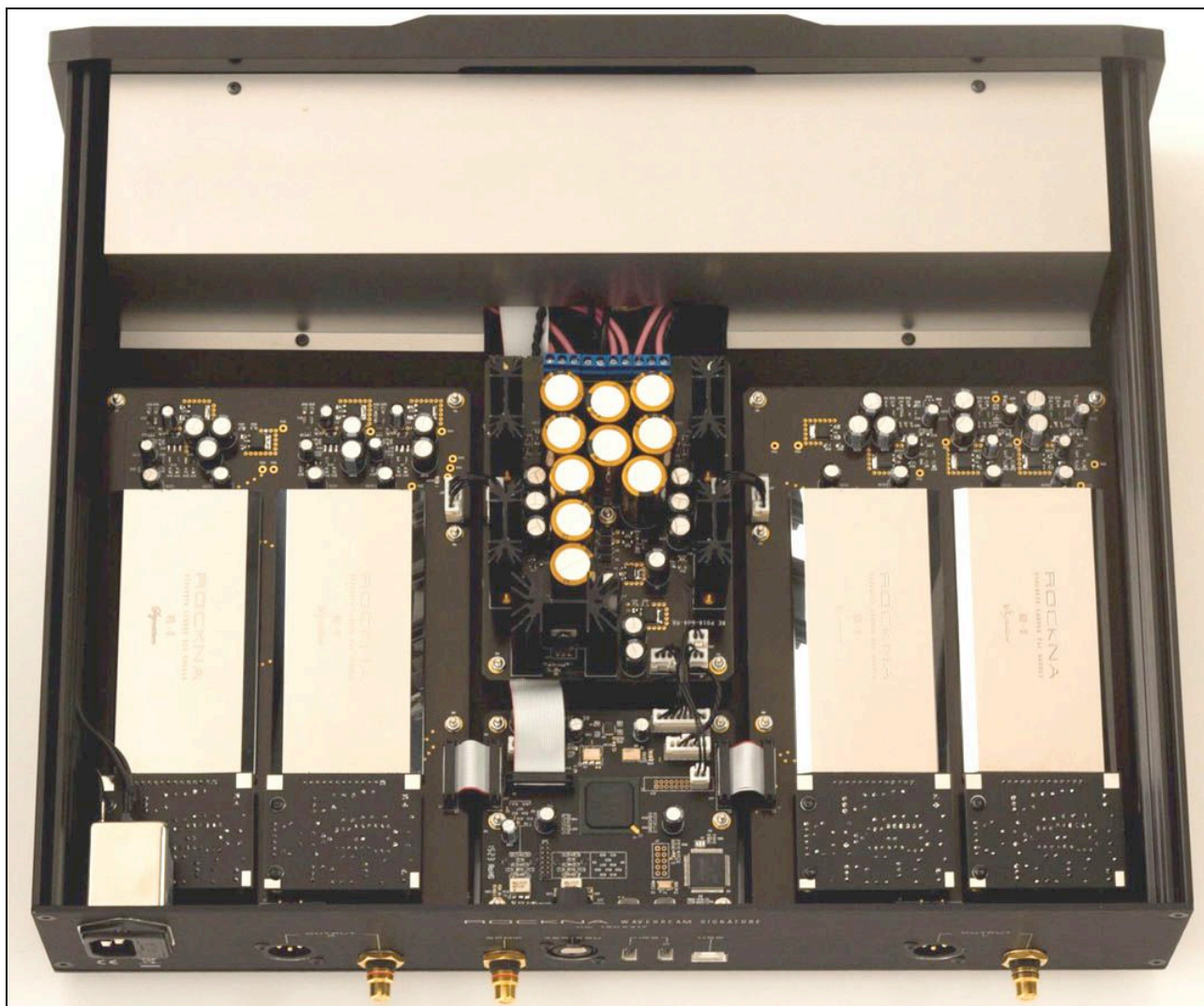
This proved trickier. The USB device refused to show up as selectable in AudioMidi, hence just as absent in System Preference's sound panel or PureMusic's device selector. No sequence of cable seating, power cycling or Mac reboot made the Rockna visible. A quick hop to their website and the owner's manual confirmed it. OSX required no drivers. I replaced my usual KingRex double-header USB cable with a standard Curious Cable. No joy either. Stumped, an email went off. Fred Crane was just as surprised. Even designer Nucu thought it "weird". He asked that I check his machine on my Win 7/64 PC. His driver installed fine but the device still didn't show up. Did we need to reflash its firmware?

Operation proved perfectly intuitive. Pressing 'menu' starts at source selection. The up/down buttons or remote equivalents move through the inputs. Subsequent 'menu' prompts toggle through filter options, polarity, dither on/off and clock streaming/local. A longer 'menu' press reverts to the default display. That can be dimmed over eight stages including fully off. An exceptionally broad attenuation range spans from -127.5 to 00dB for the onboard FPGA volume. The enclosure itself is very solid and impeccably made. A deeply engraved Rockna logo runs across the top cover with beveled side edges. Like the recently reviewed Meze 99 Classic headphones, for build and styling this machine calls Romanian hifi manufacture fully competitive with older brands from Western Europe.

Whilst not as industrious yet as Poland, Meze, Rockna and Audiobyte might be forerunners of things to come from the land of Castle Bran immortalized in the Dracula legends; and by their most famous musical export, the Taraf de HaÛdouks aka the Gypsy brigands of Clejani village. Look them up on Youtube for many memorable concert videos; or on their above Facebook page. It's traditional virtuoso Balkan music at its very finest and most authentic.

Whilst awaiting Nucu's instructions on how to make his Wavedream show up for my computer sources, I thought about how best to review it. At ~9'000, COS Engineering's D1 clearly would be the most viable contender. It combines a DAC and fully analog preamp in one casing to offer similar functionality for similar coin. Ditto for the ~6'000 Phison PD2 from Denmark in for review. It's another fully balanced transistor DAC/pre in one box. To test Nucu's digital volume, I'd compare it to Vinnie Rossi's Lio as passive autoformer volume control just as I'd done with Vincent Brient's discrete R2R TotalDAC d1-six-tube. With my travel route mapped out for a hopefully compelling destination, I was all set.

Without Rockna's matching Wavedream transport –or AudioByte's Hydra Z USB bridge– I obviously wouldn't exploit the DAC's HDMI-carried I²S inputs as its presumably ultimate entry points. According to Dirk Sommer's German report*, inserting a Hydra Z between a PC's USB output and the Wavedream's I²S input via HDMI cable is an audible upgrade path. It simply wouldn't be part of my journey. Nor would DSD which the Wavedream, up to DSD256/11.3MHz, converts to PCM. That's some math-intense work on the fly. Very low on the work meter meanwhile is output impedance of 0.5Ω ; 100 x lower than the 420Ω of TotalDAC's d1-six-tube. Combined with 10V balanced outputs (the TotalDAC had 1.4V), the Wavedream thus promised enthusiastic drive of even long cables.



* With the Wavedream presumably running the same Rockna-specific USB transceiver tech as the Audiobyte unit, one wonders why/how externalizing this module would improve the sound when it entails an extra cable connection (HDMI) that couldn't possibly be advantageous. Dirk Sommer chronicles further sonic upticks when he added the Hydra Z's optional outboard PSU. If true, value shoppers will be disappointed to learn that a "10'000 machine can still be improved by add-ons. One possible explanation might be analog's triple mantra of power supply which states that beefing up a PSU nearly invariably improves sonics. Perhaps the Hydra Z's real estate dedicated solely to D/D conversion includes a bigger power supply than the Wavedream had room for to dedicate to the same function?

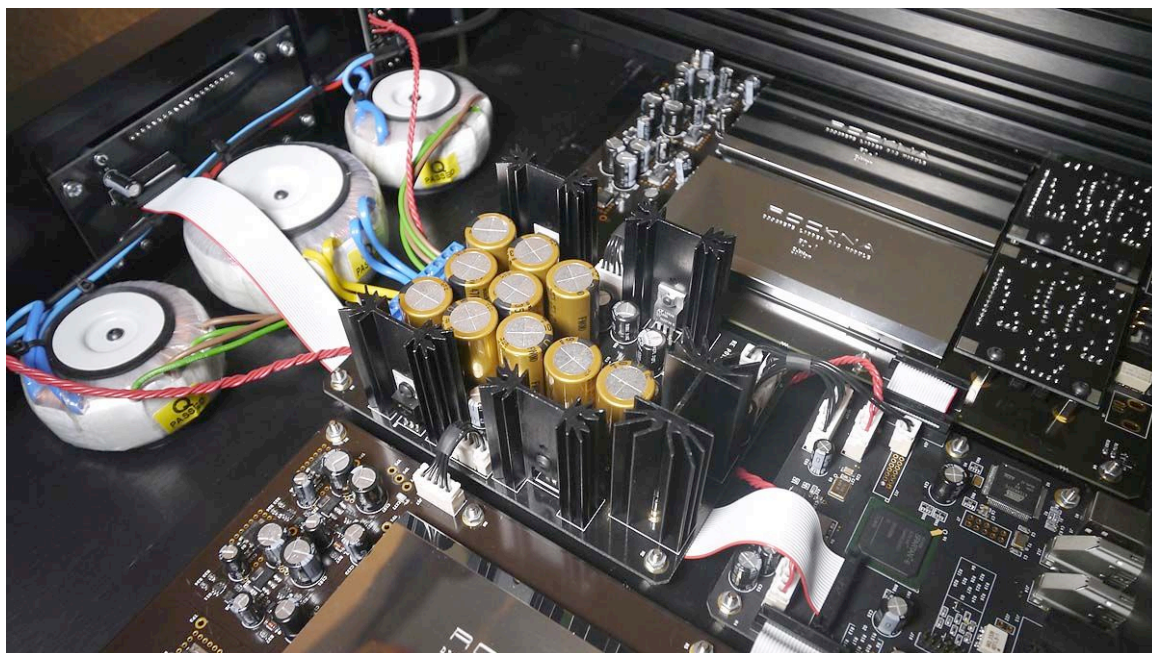
For their three custom filters, Rockna publish these visualizations. 'Linear phase' splits the ringing equally pre and post the impulse. 'Minimum phase' shifts the pre ringing behind the impulse. 'Hybrid phase' reduces the post ringing of the 'minimum phase' filter yet still exhibits low overshoot before the impulse. A listener can also opt for filter-less NOS mode. Selectable ultrasonic dither applies to only the last 4 bits of a digital 24-bit word to improve the R2R ladders' linearity. Polarity inversion is self-explanatory.

Aside from pressing 'play' on a transport or software player, that's the extent of what one does with the Wavedream. In my case, I was asked to send it back to Romania as they suspected hardware failure. Fred punned that they'd never had one before. Of course it had to happen to a review unit. That's simply Murphy's law. Nicolae: "Got the unit back, tested it, result as you described. Found the ARM (USB) interface chip dead in the water; properly soldered, all voltages okay, nothing wrong around it yet still no movement. Never seen such an issue before. Changed it and everything works. Will prepare sending it back early next week." With the Rockna returned, it instantly showed up on my iMac as 'Wavedream' with a 384kHz limit. For five minutes, things were peachy. Then a loud fart as though one shuts down a fussy source or preamp whilst the amp remains powered up signaled trouble. By now I barely had any signal on the left channel. It was there but strongly attenuated and partly distorted. As I walked over to the Pass Labs XA30.8 amp to power it down, I noticed that its always centred meter needle sat off to the right. That was a first. Powering it back up, the needle remained off. Powering the Rockna off, the needle immediately centred itself. Powering the Rockna back up, I replaced the XLR interconnect with an RCA equivalent, thinking that perhaps one of its balanced output modules had died. Now I was back in 2-channel business. Trying XLR once more, that too was fine. Whatever gremlin had hogged the connection seemed to have made onwards tracks to bother someone else. Fingers crossed, I considered myself booked for the duration, hoping for no more daculent flatulence or tweeter scares. None occurred.



Before Phison's PD2 hoofed it back to its Danish stable, I ran an informal A/B against the Rockna. To set the scene, some important boiler plate lifted verbatim from my Phison review. "Discussions on modern digital ought to include small print about its current spec craze being quite irrelevant. Digital specs continue to improve but they're surrounded by choking bottlenecks. The majority of popular recordings are artificial splice'n'dice jobs. They are also dynamically compressed butchery. Our speakers suffer distortions and nonlinearities several orders of magnitude higher than anything preceding them. Amplification components exhibit S/N ratios far below what's measurable in the digital domain. Our living rooms are sonically compromised. Unlike anechoic chambers, they also exhibit constant noise floors of 30-40dB. With 85dB peaks in the seat perceived as sufficiently loud by most, real-world dynamic range is seriously narrower than modern digital specs would have you believe. Drawing blood from this stone recently had one reader "realize the one thing you always emphasize: that there is no best. With the same budget, it is better to pursue several mid-level but excellent components than to spend every penny on a 'high-end' one." Having acquired an end-of-life Soudation DAC, he'd subsequently auditioned a far cheaper Aqua Hifi LaScala MkII. Confirming my assumption that he'd not been able to declare the first superior, he put it this way: "Exactly. I heard more difference than improvement."

This didn't imply that the Soulution couldn't measure better. It could be technically more advanced. But until playback addresses a number of far greater weak links than the potential but currently minute benefits of escalating digital specs, getting geeky about -145dB SN/R and sundry misses the plot. It puts the cart before the horse. Far more fundamental flaws in the playback chain must be fixed first before digital advances can begin to matter to the extent they ought to given rising costs and propaganda. In other words, today's top digital tech already exceeds what's real-world relevant at this time. Due to analog gear, speakers, recordings and our rooms not having caught up, it can't fully deliver despite what its super specs would promise. Feel free to disagree. That's simply my opinion after having reviewed converters up to "20'000."



With PureMusic handling power-of-two upsampling of RedBook material to 352.8kHz, either DAC drove the Pass Labs XA30.8 amplifier via a 6-metre balanced Zu Event cable. Speakers were the 85dB Mythology M1 by EnigmAcoustics, their matching Sopranino super tweeters on top Mohawk style. Granted, a truer blood test for non-lossy digital volume would have been speakers of 100dB or higher efficiency. Those would enforce deeper attenuation to become critical rather sooner. I simply don't own any; nor did I have a pair on hand. I merely compared Phison to Rockna, the former with AKM's Verita AK4490 chip and analog volume, the later with discrete R2R and FPGA-embedded 63-bit digital volume. Where COS Engineering's D1 and the PD2 had been very much alike as chronicled in the latter's review –they'd played on the level, distinguished only by a slight offset in damping vs. bloom– the Rockna built out an actual lead. This manifested as a grouping of qualities which are perhaps best summarized as presence. The Rockna played it weightier, more robust/substantial, more focused and finally had more frontal in-room projection. Mind you, this still wasn't at anywhere near the hit-over-the-head force by which many imagine that expensive DACs justify their expense beyond the best of the \pm "5K lot. As I had with the "20'000 Gryphon Kalliope vs. the "6'800 Fore Audio DAISy1, I simply heard enough extra to qualify it as superior performance, not just a different flavour.

On good recordings, the Rockna also unraveled more difference between similar instrumental timbres; and more strongly identified various unisono overlaid tone colours meant to create a new complex timbre. This ability to dig a bit deeper into an instrument's self sound, to make an oud still more 'oudy', less 'guitary' - that's what one expects from higher resolution and/or lower distortion. I'd thus accord the Wavedream some factual extra resolution which didn't just factor on paper. It actually mattered in a real-world context; if one cares and listens critically enough. Unlike with the TotalDAC d1-six-tube, I had no complaints about the lower reaches of Nucu's digital volume control. To quantify that with more specifics, I set up Lio as benchmark. Because the Vinnie Rossi lacks balanced outputs –that'd require four Slageformer attenuation modules for which there simply isn't enough room– I connected both Rockna amp direct and Rocka into Lio as volume control then amp via standard RCA cables.

At standard and lower levels, the autoformers had no advantage I could hear. It was only at very subdued levels that I thought that the Lio retained more substance and texture. Extending my session into an AB between XLR and RCA paths, the former won on the same count. Balanced sounded even more robust and incarnate; not matzah but primo meat balls. Identifying the true benefactor (the DAC; or whether the Pass amp simply sounds better via XLR than RCA) is beyond this review's purview. My basic takeaway was that while, versus the very best analog options, this digital volume control might lean out, eventually, I consider it a non issue in the real world of majority usage. The Wavedream's integration of this function really does decommission a separate preamp if one only runs digital sources. Obviously you must like your amp/speaker pairing as is. The Rockna won't inject 'tubular' qualities should you find those MIA. Just so, its class A output stage did exhibit all the telltale signs of active not passive preamplification. There was very obvious drive, gumption and physicality. Nothing about its sound was pale, wimpy or half baked.

Having in my book earned its "10K stripes with real if incremental returns over transistorized competitors from COS and Phison and –if recent memory was trustworthy– even the costlier d1-six-tube from France's discrete R2R champion Vincent Brient, I felt inclined to call it 'fair value'. That's despite the obvious perversity of associating anything hifi at "10'000 with the V word. Pushing the envelope to have a 100-metre sprinter beat an Olympic record by 1/100th of a second means real sacrifices and pain. As this page's first paragraph suggested, measurable digital gains might become more relevant once present choke holds in the hifi chain are lifted. That the Wavedream could already clock a lead plainly visible to the naked eye as it were, not merely by laser gun, impressed me given today's imbalanced circumstances. If you assemble proper digital competition, that happens rarely. With my triangulations squared off, what else should I say about the sound of Rockna's Wavedream?

Good crunch. As so often, it's a term borrowed from foodie talk. Even if two meals were to taste identical, the one with crunchier vegs or crispier crackling would win. That adds to the eating experience as distinctive textures and chewiness. The extreme opposite would be a gruel that goes down without any toothiness at all. No hifi should ever sound so homogenized. But even if it didn't, it still may not rise to that sensation of most excellent crunchiness. Suffice to say, the Wavedream had good crunch. Related to that or perhaps just another view on it was rhythmic virility. Anything percussive like actual drums, string plucks, brass and woodwind staccato was spiky, toned and unconfused. It's a quality often claimed as an R2R strength. Whether it automatically implies that $\Delta\Sigma$ can't equal it is for the engineers to debate. I'll just say that the Wavedream had taut timing precision in its back pocket. Finally, it also was chunky tonally. That means virtues one expects from valves relative to tone; or from Zu speakers based on their beefy 10.3" widebender used well into the lower treble. Combined with crunch, this chunkiness summed to feisty, robust and dynamically vigorous. This segues back at active not passive preamp action. A number of DACs no longer use actual output stages. Their output voltage past I/V conversion is high enough to not require an additional stage. The Wavedream has one and sounds it. Whether that's the actual cause matters not. What matters is describing the sound in ways which communicate. If you're familiar with the differences between active and passive preamps, this pointer ought to paint the picture.

Off the res. To communicate high resolution, hifi discussions routinely list tiny details their contributors hadn't heard before, on albums they were very familiar with. With the excellence of my resident competition, that really didn't seem to factor. What did were the aspects already mentioned. Is sonic materialism a function of more details? I consider it academic to break down what contributes to or causes more substance or robustness. It's enough to say that the gains the Wavedream exhibited over what I compared it to happened in that realm. Shall we be snarky and call it the analogue domain? That'd play to my belief that in the end, analog execution of output stage and power supply trump the digital half. If I kept an SE index like Aussie contributor John maintains his Darko index for digital converters, I'd list the Gryphon Kalliope at the very top. One tier below would have today's half-priced Rockna Wavedream and the Fore Audio DAISy1. Therein lies subtext. After all, both the Kalliope and DAISy1 drive Sabre, i.e. off-the-rack ICs, albeit with customized firmware. Going discrete R2R has more street cred but it's not the only way to make top sound. What Nicolae Jitaru's recipe ended up with was greater physicality or presence than the two solid-state DAC/pres I compared it to. What more could one want? Romania score a very memorable goal!

Srajan Ebaen