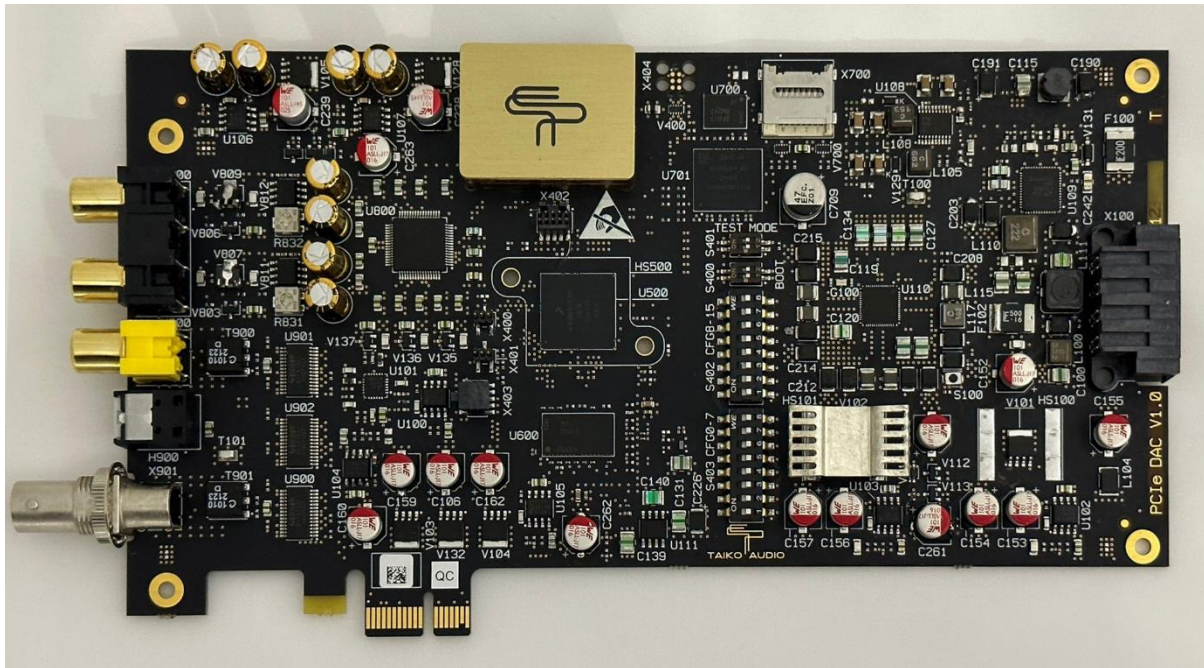


TACDA DAC & TACDD Interface

Pre-Announcement



Preliminary TACDA PCIe card shown with integrated DAC and fixed S/PDIF and analog outputs. The final production sample will offer a modular output section using a daughter board that can fit a wide range of output options.

TACDA - Taiko Audio CPU Direct to Analog

A new Taiko Audio Analog + SPDIF Output Option Board (Final name still pending, “TACDA” is a temporary unofficial name that we use internally)

TACDD - Taiko Audio CPU Direct to Digital

A new Taiko Audio Proprietary interface format

Features

- Rohm BD34301EKV DAC chip
- Operates on a 5V and 12V DC supply (can be powered internally from the Extreme power supply)
- Can be added to existing Extreme music servers

Modular Approach

We’re working on a multitude of interface options for both the TACDA and TACDD cards. We have decided to design a modular version of the TACDA PCIe card to be able to accommodate a wide range of interface options at a reasonable price level. Going modular protects the value of the investment into the interface/controller technology which is by far the costliest part of the design.

The interface section occupies 75% of the current card where the DAC / Analogue section occupies the remaining 25%. A different card for each option would make it very unaffordable (low qty per option).

The earlier announced non-modular version that we will no longer release was intended to have fixed outputs: analog RCA digital S/PDIF RCA, BNC, and TOSlink.

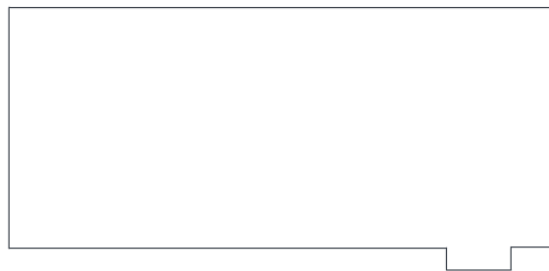
The Modular version that we will release will remove the fixed analog and S/PDIF outputs and substitute a new module. The PCIe card will have the controller/interface technology and power circuitry, with a connector to which you can connect a daughter board, which is the Modular Option.

This Modular Daughter Board will mount on top of the main TACDA PCIe board and can then provide one specific function from an array of options such as:

1. A DAC with Analog output
2. Generic S/PDIF, AES/EBU, I2s, or other digital formats
3. Custom output like MSB Pro ISL
4. New Taiko proprietary interface

USB will not be added, and as such, these new cards will not substitute the Taiko Enhanced USB card.

TACDA Model as originally intended
With individual fixed outputs



Individual Fixed Outputs:

- Analog RCA
- S/PDIF RCA
- S/PDIF TOSlink
- S/PDIF BNC

The card is powered internally
via a DC cable from the Extreme
Power Supply.

Revised TACDA Model for actual release
With Modular output



Potential Output Module options:

- Analog RCA (The DAC will also be on the Daughter Board)
- S/PDIF in any variant
- I2S
- AES/EBU
- Other standard Digital formats
- Custom output like MSB Pro ISL
- New Taiko proprietary interface
- Potential other formats

The card is powered internally
via a DC cable from the Extreme
Power Supply.

Expected Availability

March 2023

Initially, the TACDA will be made available only for existing Extreme owners. At a later stage, it will be made available to the wider public.

Pricing

We don't know yet, not even ballpark. This has a very large R&D component and we need to think about on how to recoup.

For some time, the question on many people's collective minds was: "When will Taiko bring some form of DAC to market?"

As you all know we have been advocating the use of the USB interface to connect to your DAC while most other server vendors advocate the use of SPDIF/AES/I2S and in a few rare cases Ethernet. The reasons for this are pretty straightforward.

You aspire to meet or exceed CD transport playback performance for 16/44.1 files at a competitive retail price level. This first issue you will run into is a quite obvious one, you need a very significantly larger amount of PCB real estate, functionality and processing power which require much more filtering to have competitive electronics noise levels. You could argue that a CD transport comes with additional expense for rotational stability and vibration control (jitter) but then you're disregarding the streamer hardware possibly being equally sensitive to this, but you do have the luxury of the absence of a motor. Then you need an interface to the DAC. Very low noise SPDIF/AES/I2S solutions have been around for decades with not much, if any, mystery surrounding their sound quality performance. And obviously, using the same interface as a CD transport, it becomes easier to approach a CD transport sound signature. However, with a limitation of a 24/192 data rate over a single line, and due to how the interface works, increased noise levels at higher sample rates. Typically, this interface will not sound better for higher sample rate files than 16/44.1 (note that the source master quality tends to exceed any of these differences at all time), and worse than 16/44.1 with DSD/DXD files due to the need of significant conversion processing. Ideally you have managed to have CD transport quality playback, for all sampling rates... To us this has been an unacceptable approach from day 1, which is why we went all in on USB. USB data packet rate is fixed and does not change with sampling rate, the interface is universal, the interface sound signature does not change with sampling rate, and it's the same for all receivers, or at least, that was the design goal... Today we know and have proven this is not true. Sure, we have developed an USB card with noise levels at or below those of an AES/SPDIF/I2S interface without the jitter/timing sensitivities of those interfaces. But still there were deviations and discrepancies from expected performance. It took designing our own USB driver, querying all DACs our customers support, and designing our driver to be adjustable to... different implementations of USB receivers in DACs. This was quite an elaborate project, but as you have all witnessed the performance delta can be dramatic. However, as you also all know by now is that the playback software has its signature too, and Roon's signature has changed over time. Roon currently sounds more expansive than the average CD transport, but also softer and less clear, and some prefer this over CD, some don't. We now have XDMS (currently in Alpha state) to level the playing field once more. For 16/44.1 (local file playback), XDMS on the Extreme sounds like a mix of CEC TLO 3.0 timing, Kalista color shading, and the bass of a Mark Levinson 31.5. We like to think that what we have today is competitive performance at 16/44.1 to top flight CD transports, and we deliver on the promise of better performance at higher sample rates (again assuming corresponding master quality).

Where to go next?

During our journey, exploring the USB interface, driving it to its absolute limits, coding drivers, coding playback software, the idea came to bear there's room for improvement, considerably so, as further improvements in code are not possible due to USB interface hardware limitations. We conceptually have an even better USB interface design, but still, this will have the same limitations. This kind of improvement would be similar to the improvement that results from overengineering linear power supplies for a bigger multi box model Extreme without actually solving the "problem", without real progress or innovation.

So, we took it upon us to embark on a very ambitious project of designing an entire new interface not hindered by the limitations of either the USB or AES/SPDIF/I2S interfaces. This project involves coding a whole new driver stack with corresponding software from scratch and a whole new hardware interface. We have not thought of a name for it yet but internally we refer to it as: TACDA and TACDD for Taiko Audio CPU Direct to Analogue and Taiko Audio CPU Direct to Digital.

The first product we have using this technology is actually close to release already, being a PCIe card with analog RCA outputs, and SPDIF RCA and BNC, and TOSlink digital outputs. We do not expect many people using TOSlink, but it costs virtually nothing extra, and might be useful to hookup an A/V receiver.

We have talked to Lukasz "Lampizator" Fikus who is open to incorporating this new interface into his DACs, to Jonathan Gullman of MSB who is willing to port this to their PRO/ISL interface, and have just approached Vincent Brient of Totaldac, which would lead to a very nice next phase of this project. More recently, we talked with Stavros of Aries Cerat, and he's interested as well.

Currently interested parties are:

- Aries Cerat
- Lampizator
- MSB
- Totaldac

We're pulling an additional new project to the front of the queue, for which we actually had not yet scheduled capacity, being the design of interface cards for use with alternative interfaces, like MSB Pro ISL, other forms of I2S and probably dual AES/EBU.

Q&A

Why interface to another DAC if there is already a DAC chip on board?

To improve performance. 😊 We're not DAC designers, the innovation is in the superior interface, we've incorporated a Rohm BD34301EKV DAC chip because we thought it sounded best of the available "off the shelf" DAC chips (more "analog" than for instance ESS Sabre) and added a JFET class A output stage, but that's about all we could fit on a PCIe card sized PCB. It may compete with some 10-20K DACs, but to directly compete with a top-level DAC such as a Lampizator Horizon, MSB Select 2, or Totaldac D1-12 is a bit much to ask for! 😊

Why did we choose Rohm?

There aren't actually that many options to choose from anymore: AKM, Rohm and ESS. The Rohm "sounds" the most natural to us. We did not try the new revision AKM flagship though as it wasn't available yet. But I should add that the influence of the DAC chip itself is actually not that large, if I had to put numbers on it, it would look something like this:

-Interface 40%, DAC chip 10%, analogue stage 50%.

The Rohm current segments do allow for a more “elegant” analog output stage design which might be what placed it ahead. This might perhaps give it a larger share in the 10/50 figures quoted above, like maybe 20/40.

How would I connect DAC XXX to the new TACDA?

Coaxially either via S/PDIF RCA or via BNC. In an ideal world all DAC manufacturers would follow suit and incorporate our interface. 😊

For those DAC manufacturers who decide not to support the new Taiko digital protocol to transmit digital data from Extreme to DAC, would it be feasible for Taiko to develop an interface box, similar to MSB's Pro ISL box, to receive the Taiko protocol over the Taiko cable and convert it back to something the DAC would accept so that a very short cable would connect between box and DAC input?

Transporting I2S over a distance is generally problematic which for example MSB has addressed in their Pro ISL interconnect. So, you could have a potential benefit from going this way for an "old fashioned" direct I2S transport by shortening the distance, but it's hard to predict how it will all work out. We could run an experiment and see what happens, it would not be hard to do. But for AES/EBU or S/PDIF, there would be no benefit.

Would there be any benefit over USB from Extreme to DAC by going Taiko protocol from TACDD (in Extreme) to a Taiko box incorporating the "other half" of the Taiko protocol, which then outputs some connector/cable format the DAC accepts? Particularly, for dCS?

For dCS, that would then equate to dual AES/EBU. I don't expect AES/EBU to suffer badly from cable lengths. A box with direct AES/EBU plugs as outputs without any cabling is not impossible to design but surely challenging.

In addition to dual AES/EBU, it would be ideal if the dCS clock signal could also be sent back to the Extreme. In a dCS stack with clock, the clock cables also have a large influence on the sound.

That would actually also be doable, and we do have a fairly large amount of DCS owners amongst our customer base. We have added this feature request to the list.

What is more ideal, S/PDIF (BNC) S/PDIF (RCA)?

The outputs should have the same specification but it's too soon to tell.

Will the TACDA have any Digital Input(s) to take advantage of its capabilities?

Currently, no.

Will TACDA have multiple BNC outputs for higher sample rates?

1 BNC output means a 192 kHz 24-bit max limit. That is perfect for all the Totaldac users but only until Lampizator, MSB, and TotalDAC add TACDD receivers into their DACs. That will surpass the performance of current formats such as S/PDIF, AES/EBU, and USB.

What type of cable will carry this new interface?

At the moment this is undisclosed.

If one is fine with 24/192 and has no need for DSD/DXD, would S/PDIF on the next gen card provide a sonic upgrade versus USB XMOS?

We're not sure, the thing is, the more time we spend with it, the more improvements we find, parameters affecting sound quality, some expected, some unexpected, even just the driver code has an incredibly large effect on the resulting sound, what we are used to listening to is severely compromised with regards to transients, dynamics and timing but also texture, spatial information, decay. Bottom line, we're just getting started here, it's brand new technology.

If you are using the TACDA card with the analog/RCA output, can one play any format PCM/DSD files, and any resolution?

Per the DAC chip specs:

Sampling Frequency 32 kHz to 768 kHz (PCM mode)

DSD 2.8 MHz, 5.6 MHz, 11.2 MHz, 22.4 MHz Available

Will this PCIe card be available for non-Extreme owners?

Yes, we actually most likely will make it available for the wider public. In this case we'd be looking for a degree of market adaptation. This has been a very expensive project meaning it would probably end up retailing at the same 10-20K if the card was only purchased by say just 20% of Extreme owners currently owning a DAC in that price range.

Does the TACDA replace the USB card?

The new technology interface card is CPU / PCIe direct to DAC - Analogue out AND CPU / PCIe direct to SPDIF (with RCA, BNC, and Toslink connectors). The DAC card is not meant to replace USB with SPDIF.

What exactly is the full value offered to an Extreme user by the PCIe DAC card?

The value is:

- A start with addressing one of the largest SQ limiting issues in high-res digital playback
- Being able to offer a much-requested feature (one box solution)
- Significantly upgrade our SPDIF output option
- A potential direct upgrade for about 20% of our customers
- Expanding to a medium timeframe upgrade for about 60% of our customers (2023)
- Over a longer timeframe possibly providing an upgrade to 90% of our customers (into 2024)

PCI slot availability - If one has the USB card as well as the new ethernet card installed in the Extreme already, there seems to be no spare PCIe socket for the coming Extreme TACDA & TACDD interface card? Does the USB card have to be removed to make room for the new interface card?

You could either replace the USB card for which we could look into doing a trade-in deal or you can move the Optane OS drive, and there's room to relocate the storage cards.

Will this card work with Apple Mac?

The current implementation is Windows only and it is not likely that we will develop an Apple Mac version.

Will the TACDA PCI card be compatible with AMD Zen 3 hardware and/or with Linux OS?

Yes, that should work fine. Linux driver support is not hard to add.

Why no XLR Balanced Outputs?

Space is limited and we'd have to deal with double heat dissipation from an actual class A Jfet output stage.

Market Adaptation - What's the likelihood of the collaboration with other D-A converter DAC manufacturers for the new card output?

The aforementioned manufacturers have expressed their willingness. Naturally, we're going to need market adaptation. These are not cheap developments, it's either going to be a long-haul investment project taking years to break even, like XDMS for example, or it's going to take off like a rocket and be widely used inside of 1-2 years. The pace will be largely decided by how well the products we launch that utilize this standard sell.

We would like to request from our readers to not contact your DAC manufacturer to request adoption. We understand the enthusiasm surrounding this project but this can be counterproductive to the process. We have a very clear view of the DACs used by our customers and we'll contact the manufacturers ourselves in a timeframe that works for us.

TACDD interface - please can you shed some light on the TACDD interface between Extreme and external DAC?

This is still to be designed and launched later.

Can we listen to Extreme with this TACDA output at the upcoming HE Munich in May?

We're fairly sure that it will be used somewhere! 😊

Will there be licensing costs for adapting TACDD for DAC manufacturers or will Taiko support DAC manufacturers to get market penetration?

We have not given that any thought yet.

What output voltage will the RCA outputs of the DAC card have?

It will be another month or so before we will disclose any more details on that.

Is it possible for Lampizator or MSB to develop an interface for TACDD that could obviate the need for a new DAC or even having to ship back current DAC like the Horizon or Select 2 to the manufacturer for retrofit (like a home install/upgrade)?

For MSB, it can be relatively "easy" to implement. There are several parts in play here.

- The controller, for USB, the vast majority uses an XMOS controller, this controller is USB in and I2S out.
- The transport between devices, this can be:
 - Using a USB cable where the XMOS controller is located inside the DAC, like Lampizator and most other DACs really, the I2S signal is then generated inside the DAC.
 - Using a separate external box, in which the XMOS controller is located with an USB input and AES output (Totaldac reclocker), or an USB input and I2S output, like the MSB Pro/ISL module, though that's a proprietary implementation of an I2S transport, if you're interested in the specifics read up on the MSB website.

- Placing the XMOS controller inside the server, convert USB to I2S internally, and then transport over a different link to the DAC, like Wadax for example.

What we're doing is replacing that XMOS controller to rid ourselves of USB entirely.

For MSB we could provide direct PRO ISL out from the server, that is the easiest way.

For other DACS we could provide direct I2S out but transporting I2S over a distance is very problematic. That is why MSB went through the trouble of designing PRO ISL in the first place. So it would be better to take it further and add a new interconnect design, which we are aiming to have ready in May 2023. This would require placing a small module inside the DAC, in a Lampizator DAC it could replace the JLSounds USB module for example and it would not need a high level of expertise to mount, we could probably find local people to do that about everywhere.

Can you share details on how the clock signal is handled?

We would go for a link that is not sensitive to clocking, at least not in hardware, but that's about everything we can share about it at this stage.

Is there a digital interface that is essentially Immune to Jitter/reclocking artifacts? Or might there be one in the near future?

Not as far as we know.

Any future plans to reverse this allotment of space and offer an enhanced DAC card without having to devote so much space to interface options?

We can surely spend years cooking up all sorts of iterations & improvements, hence the decision to go modular now. This would also protect the value of the investment into the interface/controller technology which is by far the costliest part of the design.

We can surely look into expanding options to provide an enhanced DAC if it proves to be popular. We could even make a multi PCIe card setup. As far as we are aware, Slot 4 is not in use in any Extreme for example, slot 5 is used by the UB card, slot 6 by the VGA connector which is almost never actually used and as good as redundant, so we could even make a triple card setup, and each of these cards could have daughter boards, and then we could make external add-on boxes, but then we'd have become actual DAC manufacturers which we want to stay away from. We prefer to spend our R&D resources on improving source and interface, where there still are strange new worlds to explore, where we can seek out new life, to boldly go where no man has gone before.

Will the original non-modular TACDA board be discontinued when the modular one is released or do both run parallel?

We will not release the earlier model but split it into a modular design. That actually has a minimal impact as we need to change a few other things anyway. The final design won't have dip switches and other testing fixtures.

Will the Switch have the same grounding terminal as the Extreme?

Yes.