

It's time to get personal!

It's been 2 years...how time flies. I thought it'd be a great time to introduce something new and off the beaten track in personal hi-fi. For the past several months I have revisited the *Warpspeed* design to look into its adaptability, and found it is versatile enough to work with headphones. Since then I've also purchased a humble, but great sounding Grado SR80i. Partly because it's relatively inexpensive, I chose a Grado since these can make some head amps shake in their boots -being low impedance, but also has a 98dB/1mW spec going for it to counter-balance things out.

And the *WarpspeediER* (inner-Ear Revelation) headphones volume control came about. It will work well with most brands/models of dynamic headphones and IEMs. Low impedance IEMs are also nicely counter-balanced with higher sensitivity ratings (ex. 16 ohms, 103dB/1mW or greater). Except for electrostatics and lower than 93dB/1mW planar magnetics, most usual suspects in high-end headphones are welcome. Oh the LCD3! Ah the HE400! At this time I can only wonder how sweet these planar mags are?

So without listening room effects coming into play, let's listen to again one less link in the component chain. NO headphone amp; NO additional gain stage and feedback; NOT even a buffer is required!

Here's a chance to hear our high-end Sources and DACs and earn their keep, unplugged -from our head amps! Hear what's truly recorded straight into our headphones through the pure transparency of the *Warpspeed*.

The output impedance of our Source/DAC will determine how much max current it is capable of delivering. For a given max output voltage ( $\geq 2$  Vrms), the lower the Source/DAC Zout ( $\leq 200$  ohms) the more current is available, and is preferred for all phones -from 16 ohms through 600 ohms. A Source or DAC that touts very low Zout ( $< 50$  ohms) but smokes its output stage when accidentally shorting the output connectors is not a good design. The *Warpspeed* however serves to "buffer" HPs from the Source and will prevent max current from being drawn. The Light Dependent Resistor's greatest strengths are its wide range of adjustable resistivity, and being mostly resistive in nature with very low specified capacitance (2pF for the Silonex -the venerable Toshiba 2SK170 has 30pF) will have a benign effect on frequency/phase response. Due to this resistive nature, the *Warpspeed* will only introduce the required signal attenuation and inherent resistive insertion loss.

To rock out on a 32-ohm/98dB/1mW HP we essentially will need lower than 600 ohms for Source Zout. For higher impedance HPs like 300-ohm Sennheisers (102dB/1V = 107dB/1mW!) or 600-ohm BeyerDynamics, higher Source Zouts ( $\geq 300$  ohms) will still generate thunder in our heads. Remember that an 88dB SPL directly into our ears (a mere 0.1mW on 98dB/1mW HPs -that's 1.77mA on a 32-ohm HP or 245mV on 600-ohm HP!) is already very loud, albeit good quality loud through the *Warpspeed*. I hope not one of us aspires for 100dB SPLs directly into our ear canals -this number is acceptable with loudspeakers in a typical listening room volume with furniture, other sound absorbing materials, and we are 8 feet away. 90dB to 93dB peaks however are plenty loud for headphones. **WARNING: Due to the clean, high quality sound we might be tempted to listen to high SPLs for long periods -please operate the volume level knob responsibly to preserve our precious golden ears.**

## WarpspeediER

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With Noise-Induced Hearing Loss (NIHL) already pegged by OSHA at levels above 85dBm, it is safe to say headphones used on standard digital Sources/DACs with 2.0Vrms and  $\leq 200$ -ohm Zout that we have more voltage/current than we will ever need! It is more than enough for sonic bliss on high-end headphones with typical sensitivities of 98dB/1mW. Guess what? There are several more decibels of loudness headroom to boot.

And so we find that the old, familiar story is again a case of attenuating the Source signal to make it usable for our head amps to not clip and distort –maybe sometimes they do contributing to what we call sonic signature. There is no need to require a head amp to drive headphones to their max or close to it – rated at 100-120dB SPLs -this is inviting permanent hearing loss to come live with us. In fact with middle of the road 93dB or more per 1mW headphones, all we need to do is attenuate the Source signal to more comfortable and enjoyable levels as required by our mood at that moment in our space-time continuum. ☺

In summary, with the correct components combination of 2Vrms Sources having 200-ohm Zout or less; 16 thru 600-ohm headphones with 93dB/1mW or more are all we need to complement the WarpspeediER –which about covers most dynamic HPs, IEMs, and even some planar mags. Again high voltage electrostatics and low sensitivity planars are not recommended.

As proof of concept I built this lightning bug I now call the *tachyon* (an homage to a sub-atomic particle that in theory can travel faster than light). As a reward for using optocouplers on battery, it's totally quiet with no turn ON/OFF transient pops to go. I've been enjoying it on the Grado with a 200-ohm CD/HDCD/DVD player and also with a laptop thru a 250-ohm USB DAC.



The iER will be available with the *tachyon* or as a 2<sup>nd</sup> independent output option on a V4 or on a V4-xW1. Balanced iER is of course still in the future but I'm sure at *Warpspeed* we'll get there soon!

Much credit goes to the following for all the info and great stuff on their website and blogs that helped me have a better perspective of what I was trying to accomplish:

-Inner Fidelity <http://www.innerfidelity.com/headphone-data-sheet-downloads>

-NwAVGuy <http://nwavguy.blogspot.com/>

-HeadWize <http://gilmore2.chem.northwestern.edu/faqs.htm#amp> (offline)