

## “Le Petite Sarcophage R2”

An entry level design for newbies

Years ago I built a TM/W design using GRS drivers that I named Le Petite Sarcophage. This design represents an upgrade and evolution of that design. Upgrade comes in the form of a much better woofer and tweeter – but retains the excellent and affordable sealed back midrange offered by GRS.

The initial design was to utilize the newer sealed back midrange, which is essentially identical to a Goldwood model advertised as “heavy duty”. The linear and non-linear distortion on that driver was unacceptable even considering the price tag. I decided to re-use the other model in its place. Just a better driver overall.

It was also slated to use the little Peerless waveguide BC tweeter but that driver suffers from some degree of difficulty getting it to cross high enough to be used in a 3-way. The waveguide does its job quite well, however – the combination of a high Q motor and the waveguide means it is not easy to get hammered into shape much above the corner frequency of the waveguide. It should be an excellent tweeter for medium to medium-large 2-ways, however. Just don’t expect it to be easy to use at 5K! Rare small form factor tweeter that is better at 2500 than 5000, but it is what it is. I decided to go with the Dayton Designer Series soft dome instead, based purely on using the same through hole mounting size as the Peerless.

So, driver selection is (various model numbers will be in BoM):

Woofer – GRS 8” poly cone “subwoofer”

Midrange – GRS 5” sealed back midrange

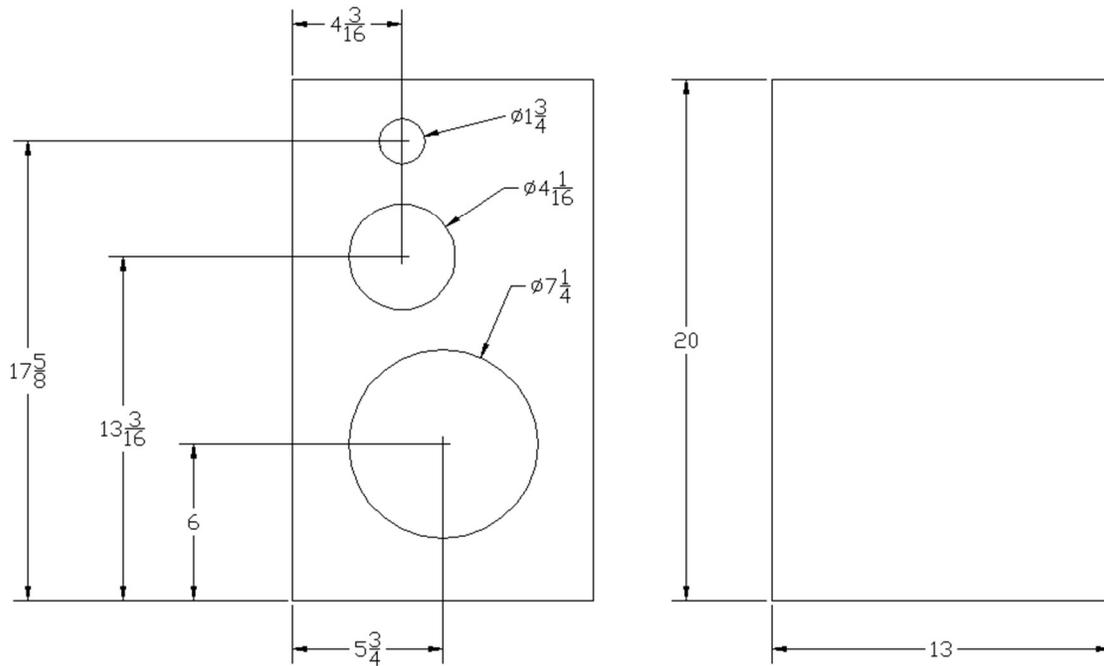
Tweeter – Dayton Audio Designer Series soft dome

Cabinet design was relative straightforward, and was chosen based on the following constraint:

It should be buildable with nothing more than a jigsaw. Yes, that was the constraint I placed on myself. Personally, I built these with a circular saw, jasper jig on a router, and a drill but you can use just a jigsaw with a straight edge if you want. This designs entire purpose is to serve as a simple, wide-range, reasonably high output, solid sound quality and easy to build speaker for newbies looking to move beyond glue-up kits.

Since I am not much for preambles, I’ll jump right into the goodies. For starters, here is the CAD drawing for the cabinet. Let me explain the dimensions – given how intent I was on this being as easy to build as possible, I used nothing but particle board shelving from Menards. As it happened, the front and rear are 11-1/4” wide but usually the shelves are 11-1/2” wide. Do NOT sweat that quarter inch. It is barely measurable difference on baffle signature and absolutely not audible. I digress. You can build these using six of shelving boards. At current prices, that is around \$25 in cabinet materials. Bonus is you need only cross-cut a few times and careful setup with a straight-edge and circular or jigsaw will yield excellent results. I cut four panels to 18-1/2” and two panels to 13” per cabinet. This yields an internal volume of around 1.2 cubic feet, which in turn (using an entire pound of Walmart polyfill) yields a Q of

1.2 with a center frequency of 58Hz and F3 of 48Hz. In case you are wondering, that is exceptional sealed bass for an 8" driver. BUILD THESE WITH MIRROR IMAGED BAFFLES!!!!



The four 18-1/2" panels serve as front, rear, and side baffles. Be sure that the top and bottom are glued to the top and bottom of the side panels, and that the front and rear are the narrow sides. If glued up correctly, the dimensions will match above so be sure to think it through first. Use scraps as braces, I ran one left to right and a couple angle braces here and there. What's important is that each panel is tied to at least one additional panel and all will be well.

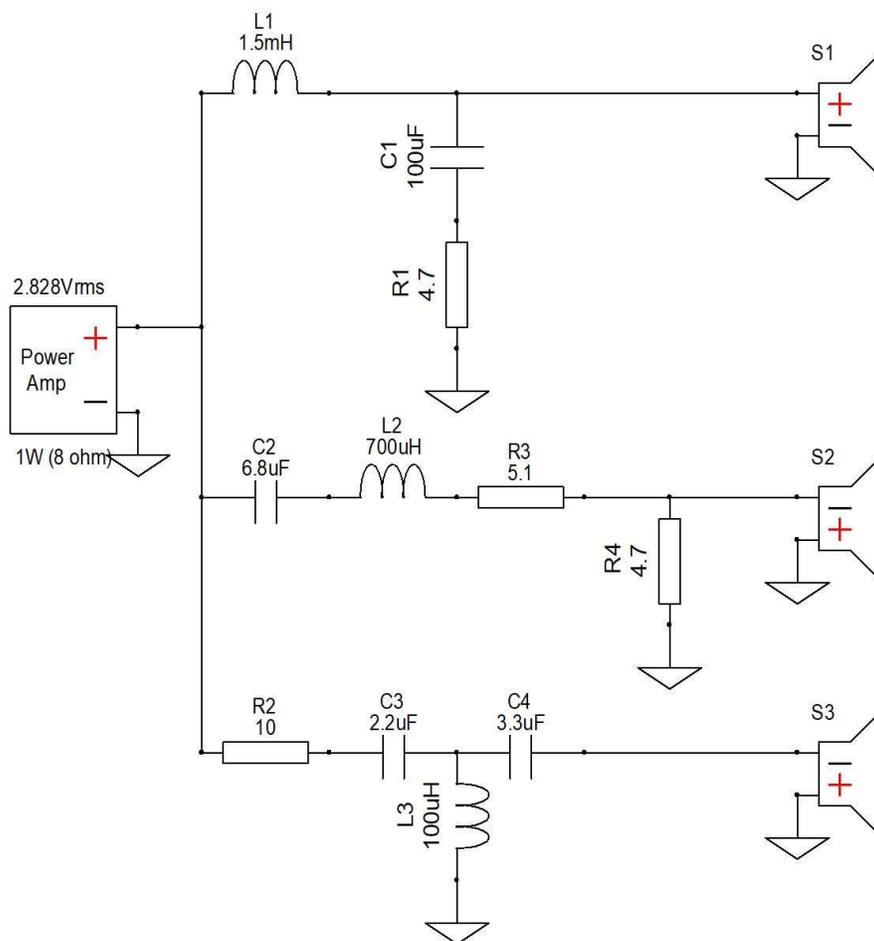
The key to using basic tools for this type of project is patience. Take time to understand how to set up a straight edge for your circular saw. Repeatability is key here. If you are 1/8" short or long wont matter, just keep driver spacing more or less the same. Speaking of, these are not flush mounted and I make no apologies for that so there.

Use plenty of glue, and while Titebond is not designed for interstitial use – it can fill smaller gaps and excessive squeezeout inside can take the place of traditional caulking so goop the heck out of it. For clamping, I personally use no more force than I can exert by hand and then use the brad nailer as the clamping agent after my initial body pressure is applied. It is a myth that you need to crank things down when gluing wood.

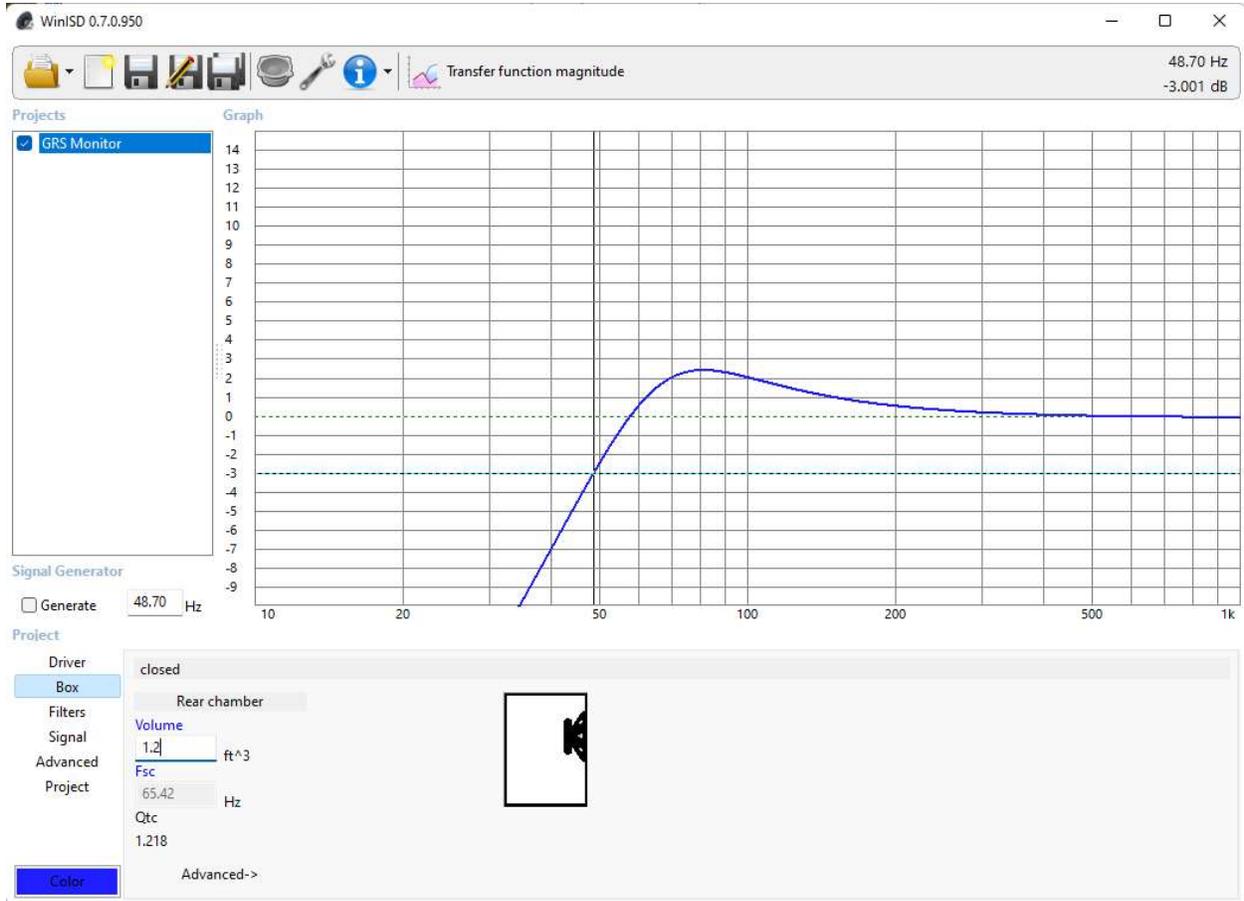
OK, so now we have some cabinets built, time to build crossovers. If you are new to this, it is probably best to build your crossovers by laying them out as the schematic shows. As you improve your ability to build and understand how crossovers are connected, you can start getting creative with your layouts.

When I say build as the schematic shows, I mean physically. As in, even to the point of printing the schematic out and laying the various components on the schematic and start connecting. The only real advice I can give for newbies is to buy some wirenuts and build your crossover this way. In the event you make an assembly mistake, wirenuts are a lot easier to undo! Also, you can make pigtailed for shared common points in the crossover. When all else fails, ask someone in TechTalk or the MAC forum for assembly advice.

Here is the schematic. It uses eleven components with no special trickery that creates complexity. It consists of a 2<sup>nd</sup> order electrical on woofer, 1<sup>st</sup> order electrical on midrange, and 3<sup>rd</sup> order electrical on tweeter. A single padding resistor on the tweeter and an L-Pad on the midrange. TI suggest using red for the + and white for the -. The reason I recommend white is it is just easier to see. Use whatever color scheme you want – this is your speaker. Note – very important that the midrange and tweeter are connected in reverse polarity. Very important.

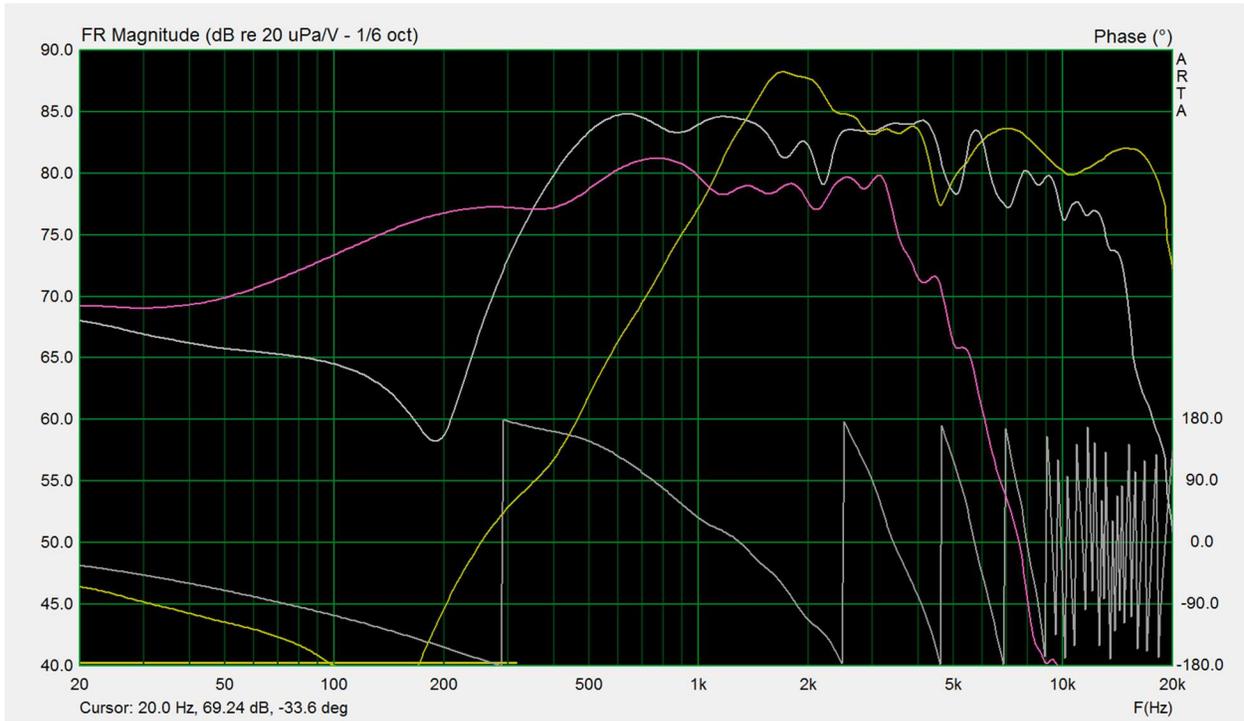


Install all the things in the cabinet. For binding posts, I use whatever is on sale at the moment. I usually zip tie the crossover to a brace. I used #6x1" deep thread screws from Parts Express to mount the drivers. When all is installed, here is the bass response you can more or less expect:

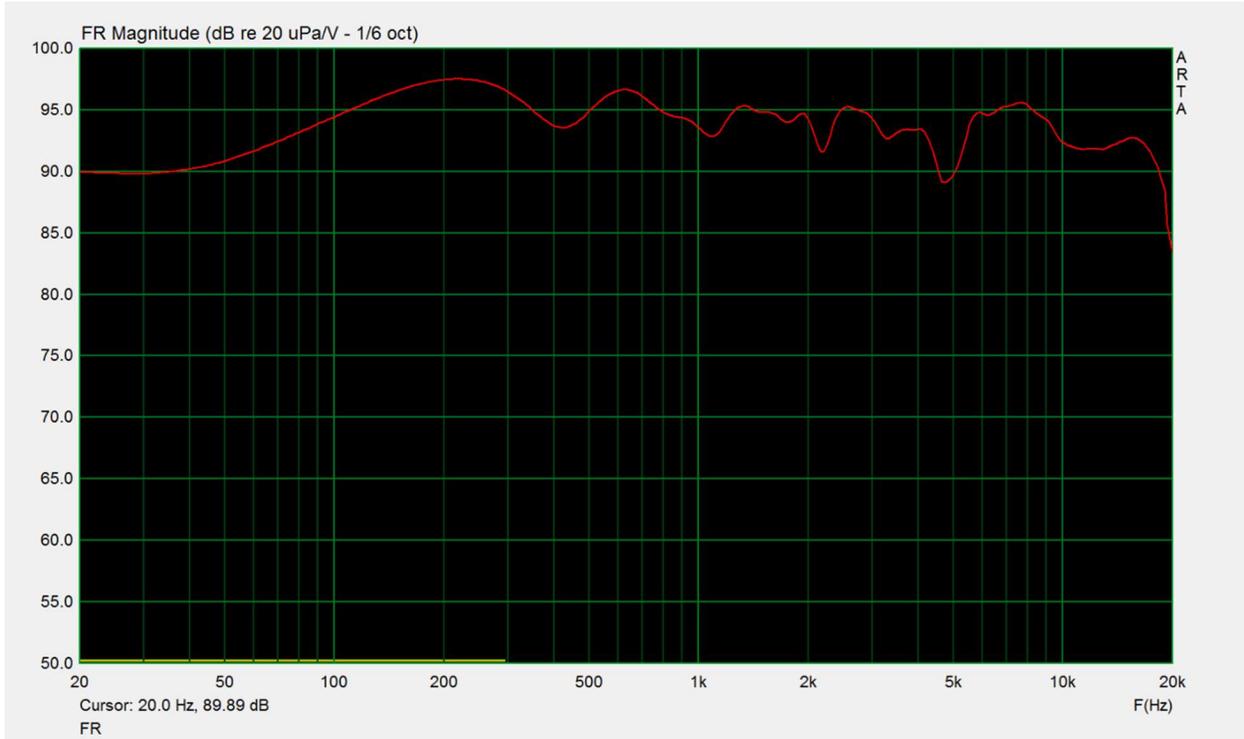


The slight ripple centered around 80Hz will give a kick in the pants for free. Seriously, these are great on bass. Just crank them and enjoy. Don't let the hump scare you, the resolution on the chart is 1db. The woofers should hold their composure on all but the bassiest of bass heavy music up to a pretty good volume. Remember, though – it is still just an 8" woofer. You just cannot expect 12" bass from any 8" woofer short of one of those funky Sundowner 8" monsters with a kilowatt behind it. I'll never understand that process, myself.

Speaking of, here are the responses of the raw drivers on-baffle.

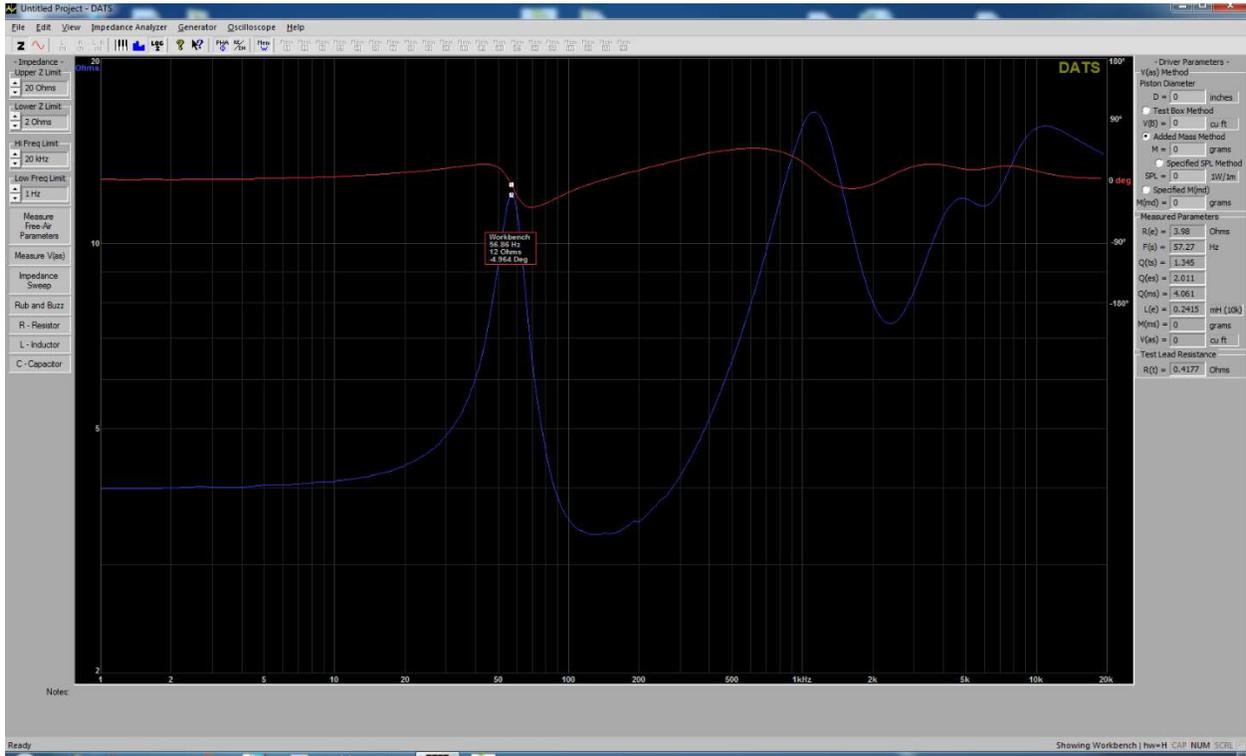


Here is the response after the crossover:

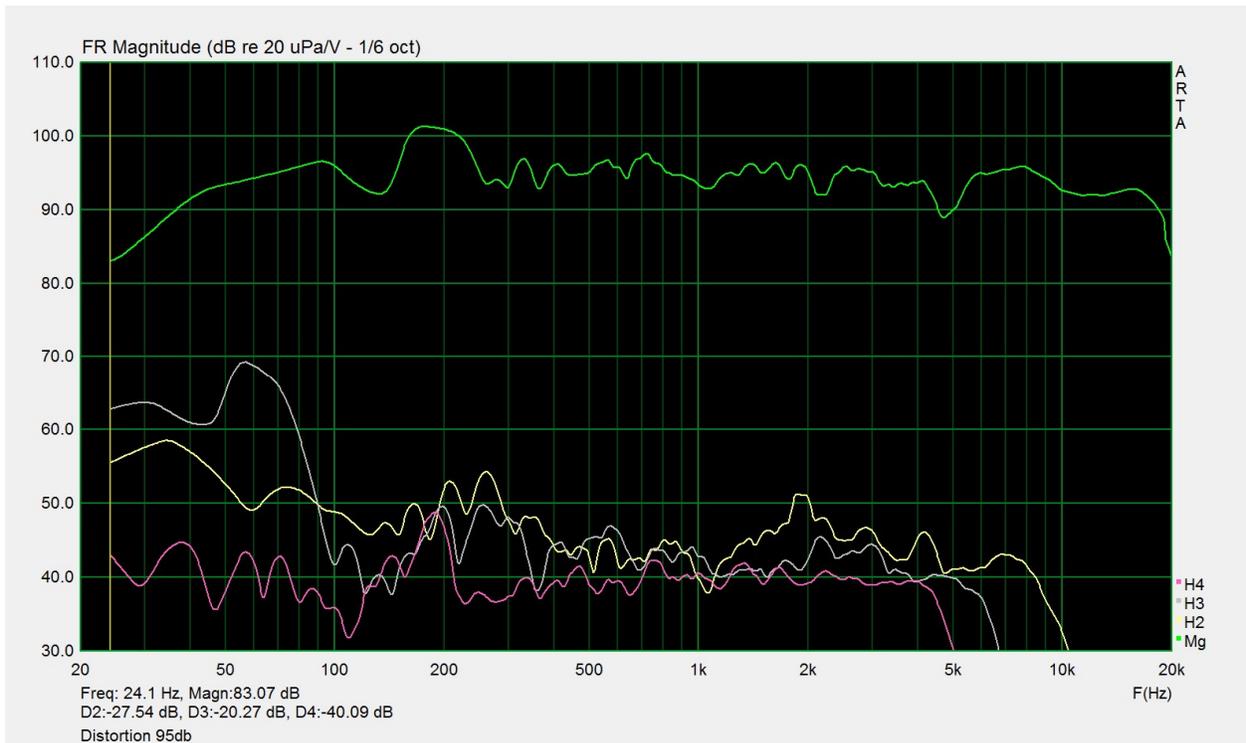


A very slight downward spectral tilt. The 5db dip at 5k will disappear off-axis. The 2.1k dip disappears off axis, as well. All in all – not bad at all for the price of the drivers.

Here is the impedance, probably best to use class D or a high current AB amp with these, they dip below 4 ohms at one point. You will likely be fine with any modern HTR, though:



...and my favorite squiggle on this design, the surprisingly low distortion:



That distortion measurement is SPL accurate at 1M! Bill of materials available as separate PDF.

Anyways, have fun and enjoy the process and hopefully you enjoy the speakers!

