Markaudio CHP-70-P Gen2 with Elite VRT18 Ribbon

michael chua February 28, 2020 Drivers Thiele & Small, HIFI DRIVERS CHP70, Elite, Markaudio, Ribbon, VRT18

First Impressions

I'm not a fan of full range drivers but I was curious as to the performance of the **CHP-70 by Markaudio**. I've never owned nor heard any drivers by Markaudio before so I'm approaching this with an open mind. Out of convenience, I installed it in a 1.7 liters closed box just to have a listen. And guess what, I'm impressed.

The first thing that struck me is the midrange. Vocals in particular are smooth and crystal clear. There's no honking or shrillness. When I looked at the frequency response plot in Fig 1 again, it is not difficult to see why. Notice that there are no sharp peaks from 700Hz~3kHz.

CHP-70-P-Gen2 Frequency Response

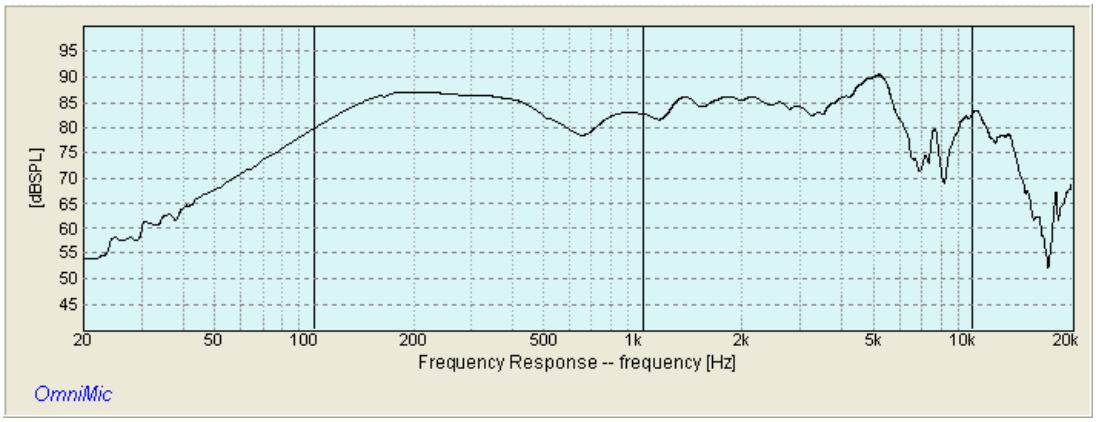

Fig 1 – Baffle Width = 6-1/2" | Sealed Box 1.7 liters | 500Hz and below in Nearfield | No Smoothing

After I measured the CHP-70, I was a bit concerned with the peak at 5kHz. That's a good +5dB treble boost. Will it sound harsh? Fortunately on playback, it sounds perfectly fine. It's not as smooth as I would like it to be but it's perfectly acceptable for the price.

And lastly, it seems that the CHP-70 is blessed with an excellent motor. Even with a box as small as 1.7 liters, the bass is tight and dynamic. I am looking forward to hearing the CHP-70 in a bass reflex.

If you want simplicity, full range drivers are the way to go. Just one driver, no crossover required. Choose a type of box for the bass you want and that's it. If this is your first build, I highly recommend the CHP-70-P-Gen2. You can't go wrong.

Expanding on the CHP-70

Having heard the CHP-70, I know what it can do as a full range driver. My next step is to see how well the CHP-70 performs in a 3-way system. I will be leveraging on the CHP-70 midrange as the heart of the system.

For the tweeter, I will marry it with the Elite VRT18 ribbon first. Since I just finished running some measurements with this VRT18, it's a good time to listen to this budget ribbon. Again, I've not heard this ribbon before so I'm don't know what to expect. From my previous measurements, it appears the VRT18 can be crossed at 4kHz with the 12dB/oct crossover that's included. My first step is then to find the best roll-off for the CHP-70.

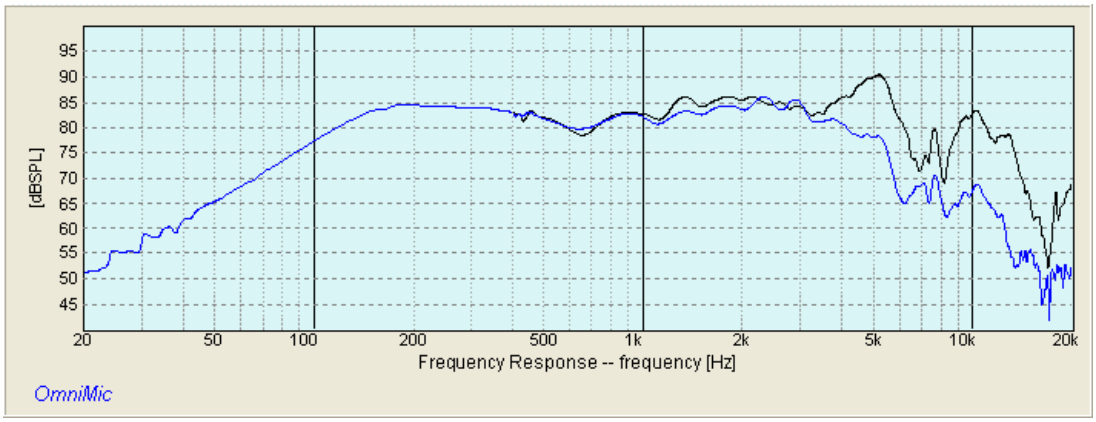

Fig 2 – CHP-70 Frequency Response

My initial attempt was to use a 2nd order low pass filter but I found that it wasn't sufficient to suppress the 5kHz peak. Because of that, the summing was less than optimal. I switched over to a 1st order with an LCR (notch) filter to tame the cone breakup at 5kHz (Blue plot). It came out exactly what I was after.

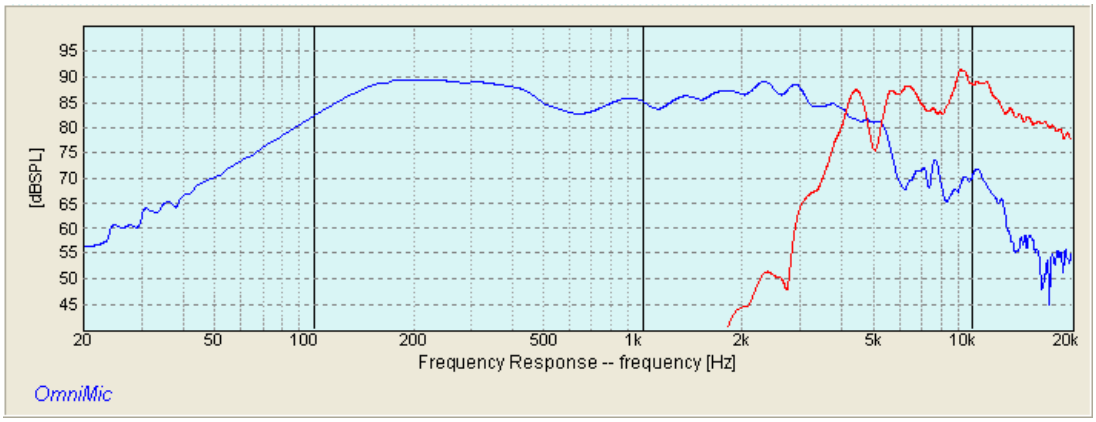

Fig 3 – CHP-70 with VRT18

Fig 3 shows the CHP-70 (Blue plot) crossing over to the VRT18 (Red plot). I had to activate the -3dB pad in the VRT18 crossover to match the sensitivity to the CHP-70.

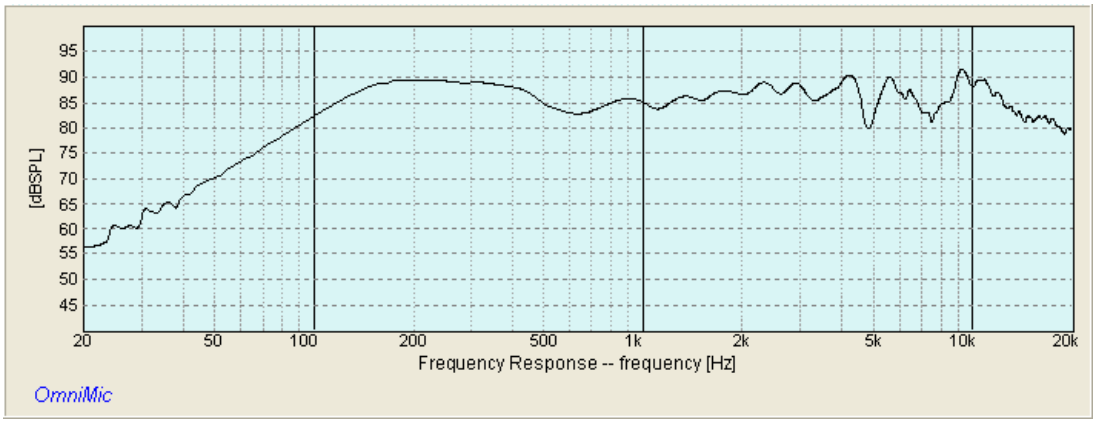

Fig 4 – Summed Response of CHP-70 with VRT18 wired in Reversed Phase

Fig 4 shows the final frequency response of the CHP-70 with the VRT18 ribbon tweeter. The VRT18 is not as smooth as I would like but for a budget ribbon, I cannot expect too much. What is important is how it sounds like. If it's horrible, it'll go into my dud bin.

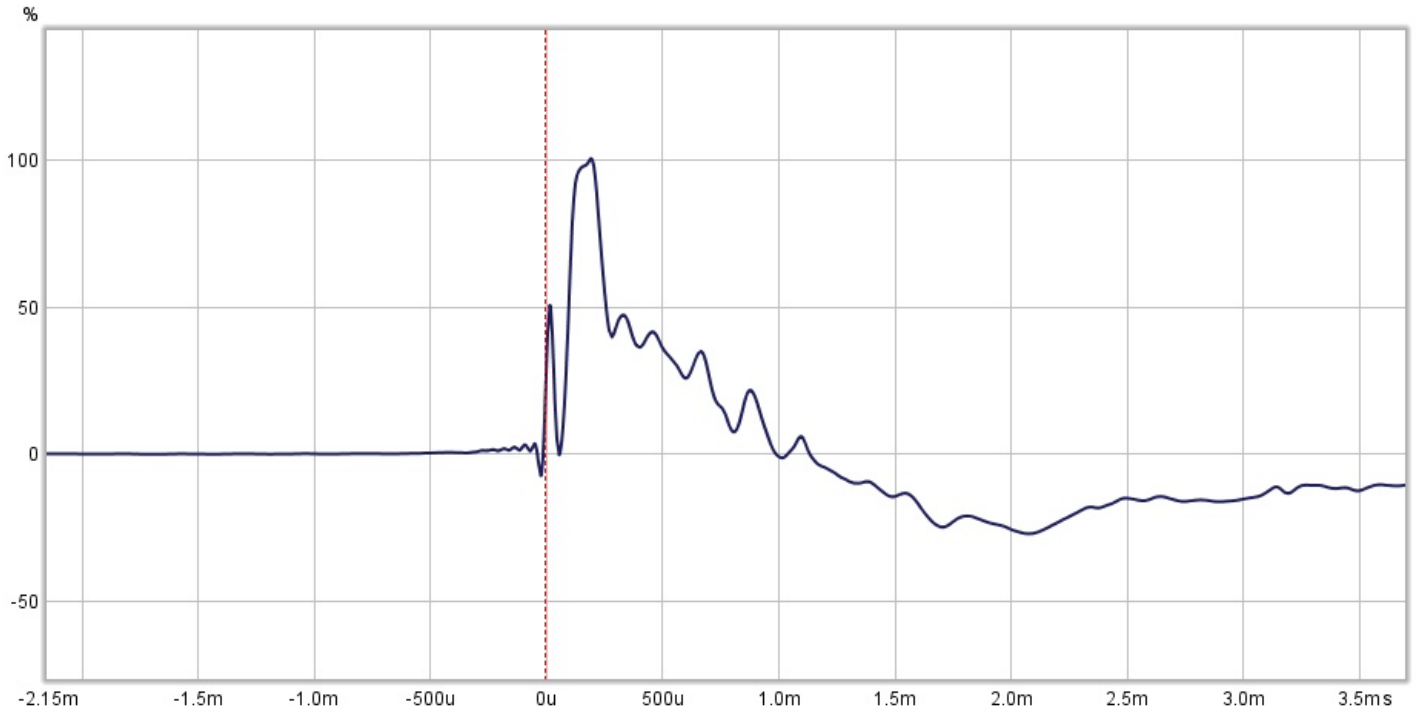

Fig 5 – Step Response of CHP-70 with VRT18

The step response is not too bad. The CHP-70 lacks the VRT18 by only about 125 microsec. All I have to do is to relief the CHP-70 forward by a few mm and the two drivers will be aligned.

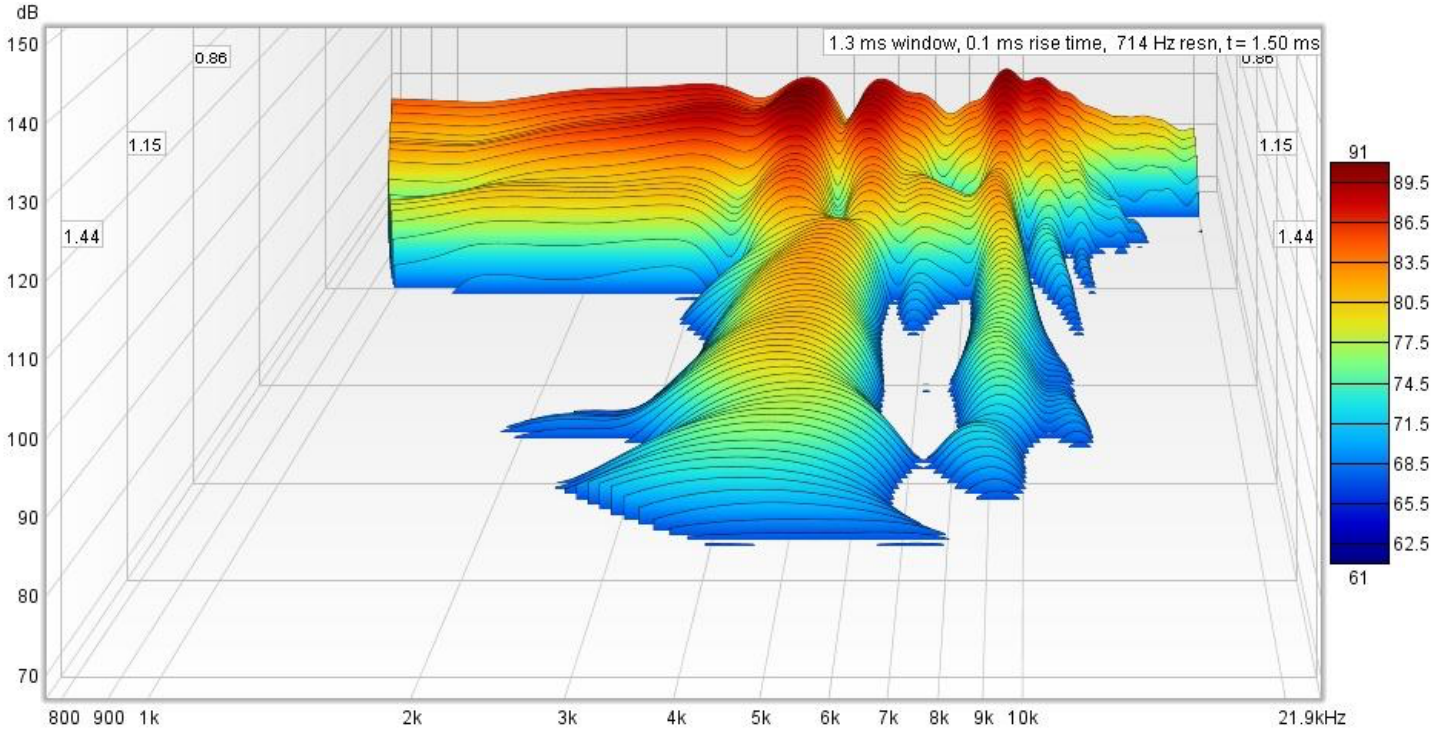

Fig 6 – CHP-70 with VRT18 Waterfall

The waterfall plot in Fig 6 shows long decay from 4kHz~5kHz. This is followed by another at 9kHz.

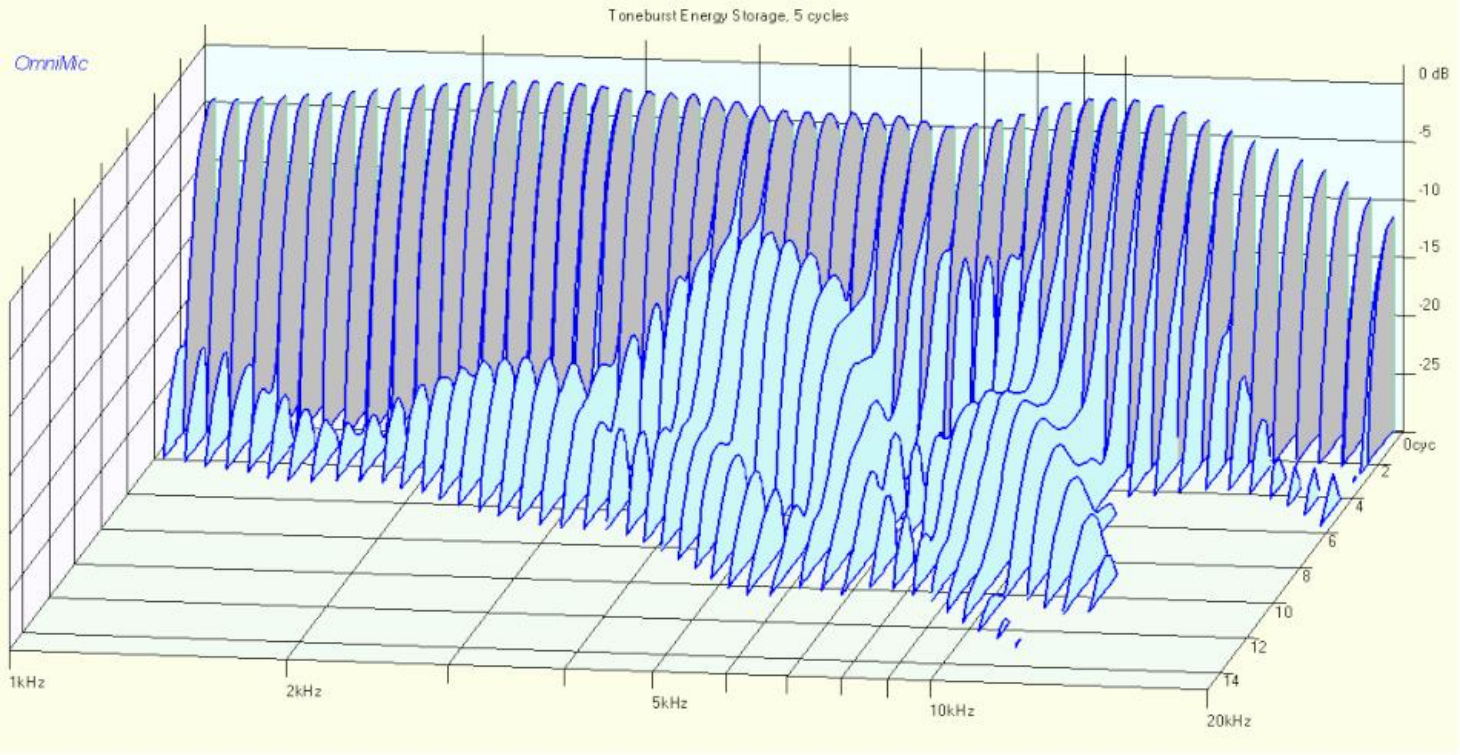

Fig 7 – Toneburst Energy Storage of CHP-70 with VRT18

Fig 7 is a different representation of the behavior of the CHP-70 with the VRT18. We can see the artifacts only start below -15dB. Almost all die out after 10 cycles.

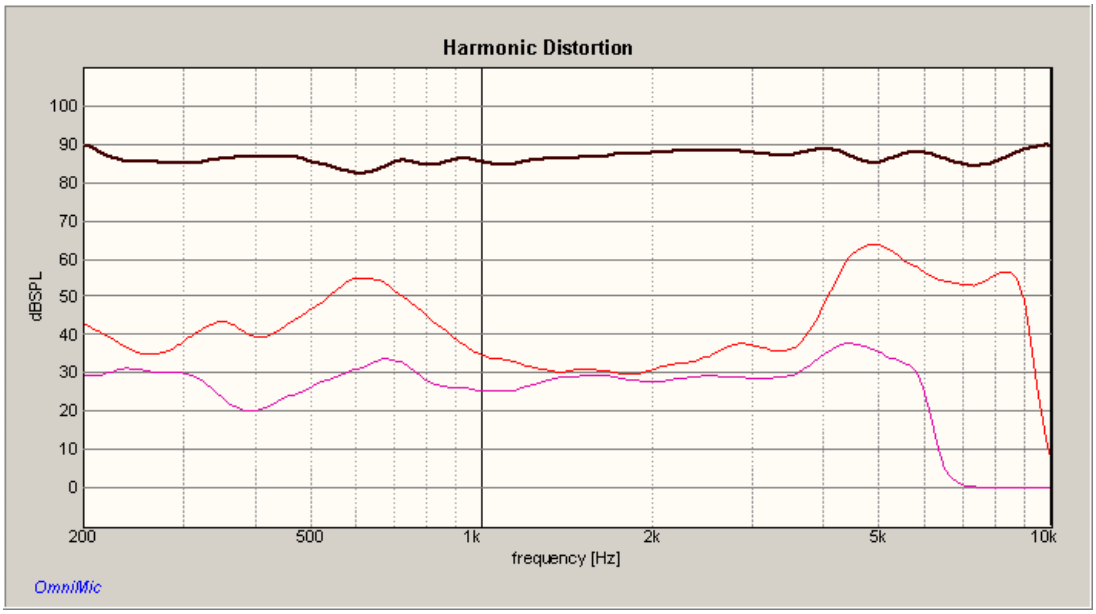

Fig 8 – Harmonic Distortion of CHP-70 with VRT18

The Red plot in Fig 8 shows quite high distortion. This distortion is harmless because they are 2nd harmonics. The peak at 600Hz is from the CHP-70 whereas the ones from 5kHz upwards are from the VRT18.

the Sound of CHP-70 with VRT18

Having done all the measurements, it's time to play some music. I listened to the CHP-70 and VRT18 combo with all sorts of music and frankly, I can't find any faults. The CHP-70 sounds wonderful. Vocals are superb. Super clear. I'm not surprised at the performance of the CHP-70 because I already identified the midrange quality when I heard it as a full range.

What I want to hear is the VRT18. Budget drivers are usually associated with low quality and there are good reasons for that. When I

heard the treble from the VRT18 ribbon, I couldn't believe my ears. It doesn't sound harsh. No brittleness, no brightness. It's an incredible performance for the price. It's a shame that these VRT18 ribbons are no longer available. I would have loved to use them with budget midwoofers.

Does the CHP-70 with the VRT18 sound better than the CHP-70 alone? Of course. We now have a tweeter doing the highs instead of relying on the cone breakup. But that doesn't mean the CHP-70 is not a good driver. On the contrary, it's an outstanding piece of engineering. It is how you use it and your expectations. That's why I test drivers.

Adding in the Bass

Now that I'm convinced with the quality of the CHP-70 and the VRT18, my final step is to add in the bass. Out came my 8″ Silver Flute Bandpass sub. For a start, I decided not to use an electronic crossover for the bandpass to the CHP-70. I just allowed the drivers to cross with their natural acoustic roll-off. Obviously I can't play at earth shattering levels because the CHP-70 has no high pass to cut off the bass. However, playing at 85dB should not present any difficulties.

After I adjusted the bandpass bass volume to match the CHP-70 and VRT18 satellite, the resulting music is fantastic. This is the kind of quality that I strive for. The Silver Flute bandpass doesn't just delivers bass. It delivers the kind of bass I want. I expect my bass to have definition. No bloom in the notes and fast. By fast, I mean the attack of the bass.

One problem I have with the Silver Flute bandpass is the sensitivity. It is lower than the CHP-70 by at least -3dB. This means I have to pad down the CHP-70 and VRT18 or biamp the bandpass with an active crossover. To avoid this, I replaced the bandpass for a direct radiating 8″ HiVi M8a. For a quick test, I used an active crossover to cross the M8a to the CHP-70 at 125Hz (24dB/oct) and what do you know, I found their sensitivity to be a good match. I don't even need to pad down the CHP-70 and the VRT18. The sound of the M8a with the CHP-70 is quite appealing. It is not as good as the Silver Flute bandpass but for listeners that are not too fussy, it is an excellent choice to accompany the CHP-70.

This concludes my evaluation of the CHP-70 and the VRT18. There are lots of potential in these two drivers. The CHP-70 can be used as a full range speaker which is what it is made for. But it can be also be used in a 2-way or as a midrange in a 3-way system. There are so many possibilities. As for the VRT18, it's a dead end unless they decide to manufacture them again. Personally, I have no issues with the quality and price. Maybe where they failed is in marketing and branding.

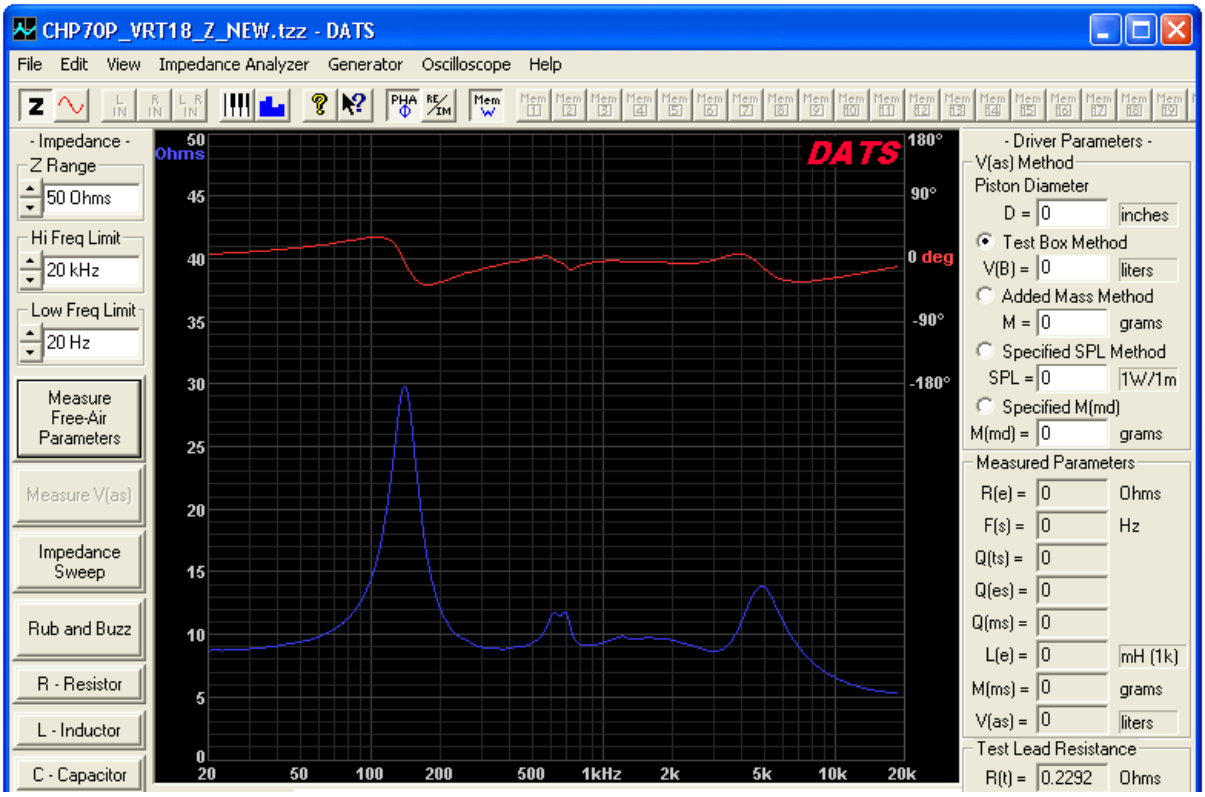

Fig 9 – Impedance plot of CHP-70 with VRT18

The impedance of the CHP-70 with the VRT18 is shown in Fig 9. It is an easy load for modern day power amplifiers. It does dip to 5Ω at 20kHz but that will not stress the amps. My main concern is the LCR on the CHP-70. It can drag the impedance down to 2Ω if one is not careful. That's why it's always a good idea to do an impedance sweep once the speaker is finalized.

Note:

Enclosure used is 1.7 liters Sealed Box stuffed with Polyfill.

Crossover is available on request. Free for DIY. Not for Commercial use.

Unless otherwise stated, all measurements were made with the mic at 36 ins, tweeter axis. Impulse Window=5ms. No smoothing applied.