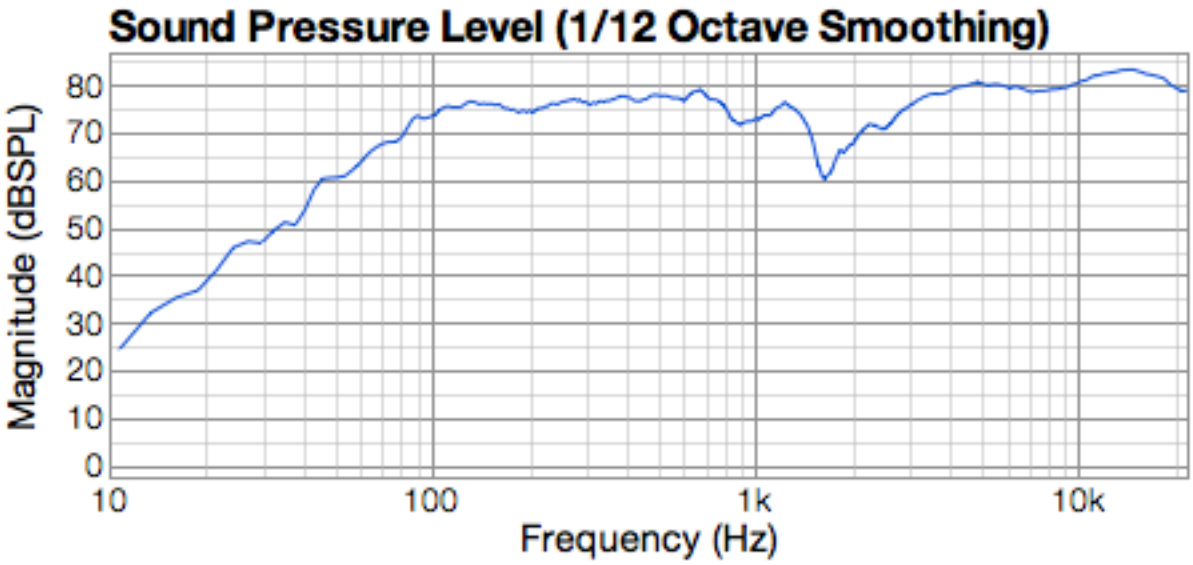
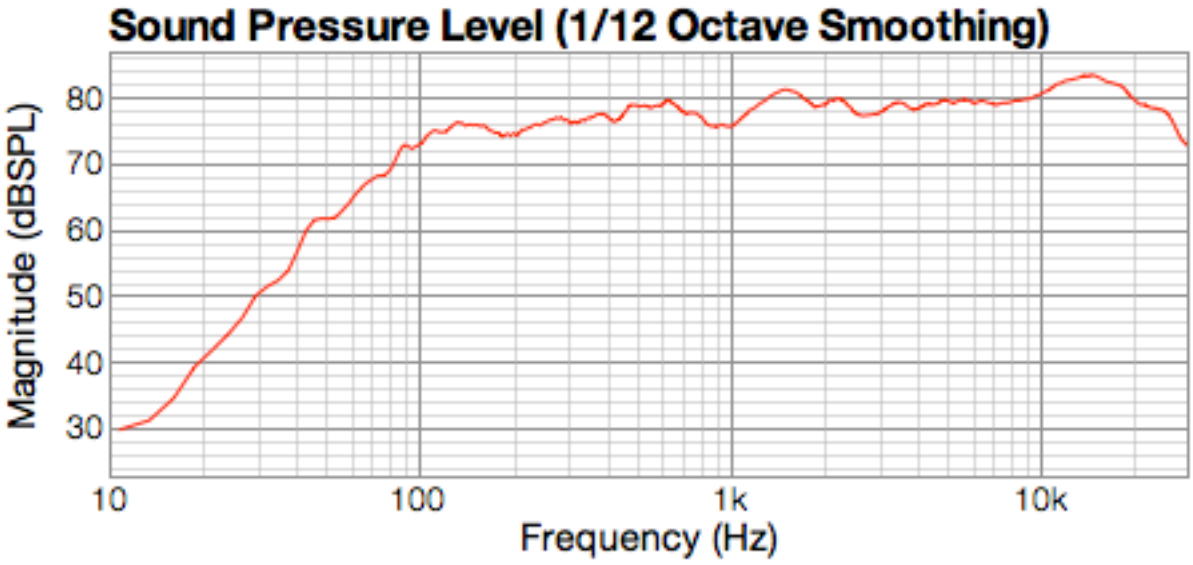
Eben Mannes
4/21/11
Transducer Theory

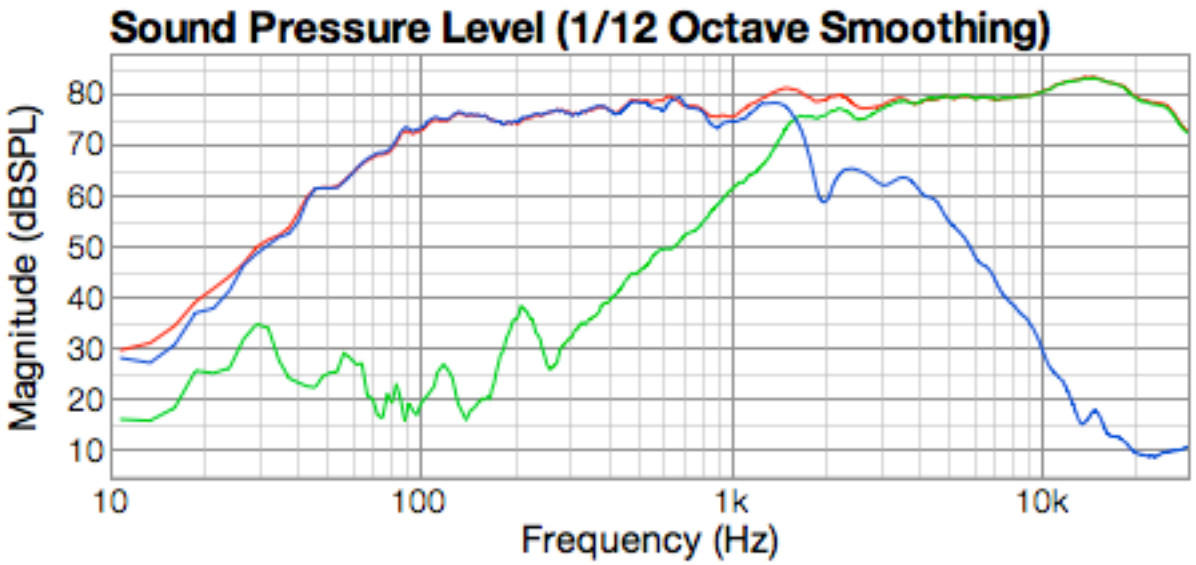
Testing Report: The Weathered Mannes'



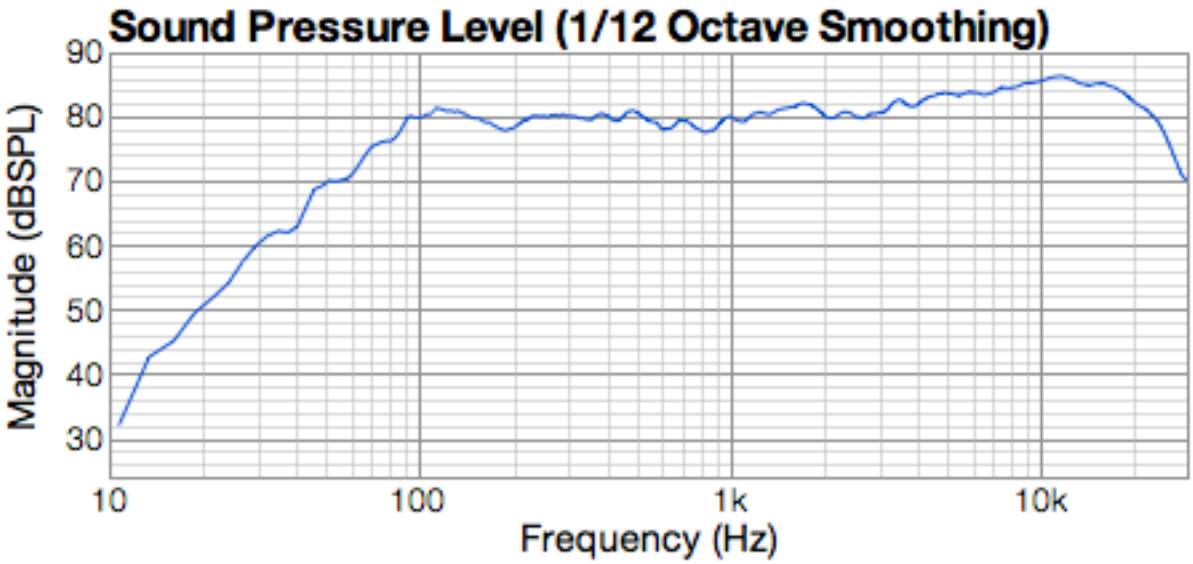
Above is the initial frequency response test of my speakers. The dip around 2 kHx is caused by the polarity of the tweeter being flipped. Simply flipping the polarity of the tweeter removes the dip giving a much more satisfying response.



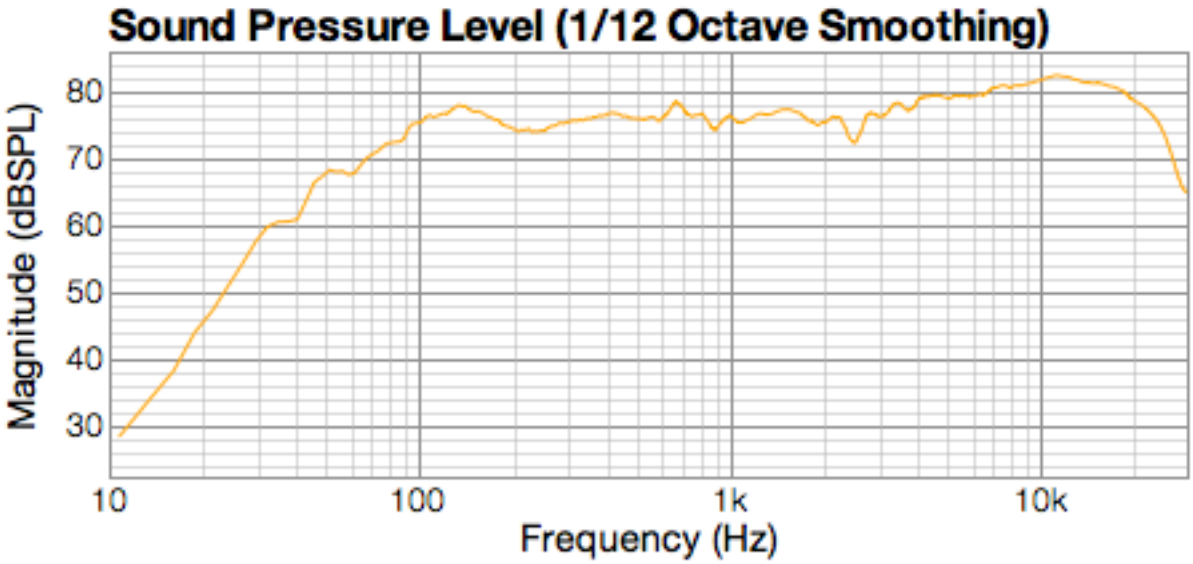
As you can see in the last graph of the first page, there is a less than ideal low end extension, and also a rise in the high end around 12kHz.



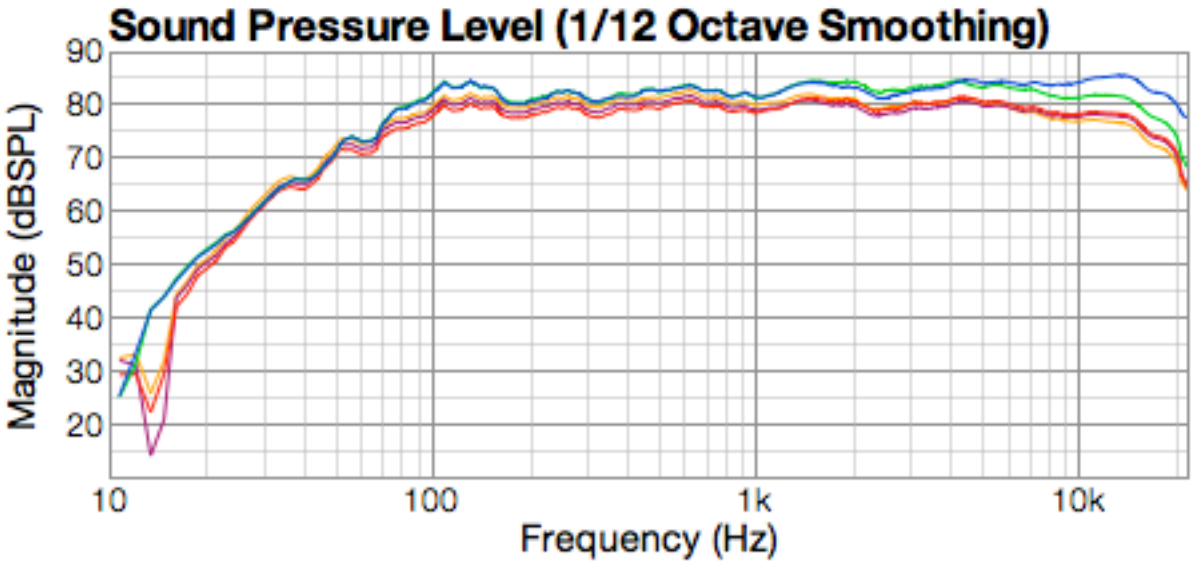
The small rise at 1.5 kHz is caused by the summing of shared frequencies power is being sent to for both the tweeter and the woofer. To fix this I changed the crossover point of the woofer from rolling off at 1.5kHz, to rolling off starting at 1kHz.



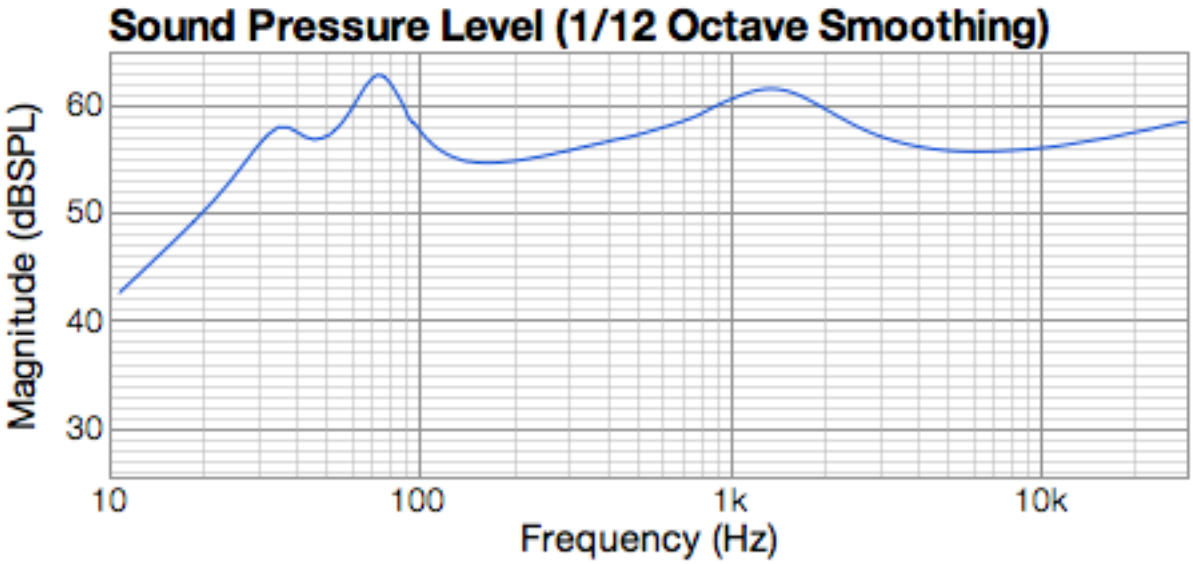
The blue graph shows the response after moving the woofers crossover point. This change lowered the rise about 1 dB creating a smoother stretch from 100Hz to 4kHz, after this I still had significant rise in high frequency. This high end rise gave the upper vocal range a very harsh sound. I tried a few different things to pad the high end rise.



The response above was after putting a 2 dB tweeter pad to lower the whole output of the tweeter. This brought the end rise down but also created a dip around 2.5kHz because the whole tweeter level was lowered, not strictly the area of rise. I decided to take out the pad and try a high end roll off instead.

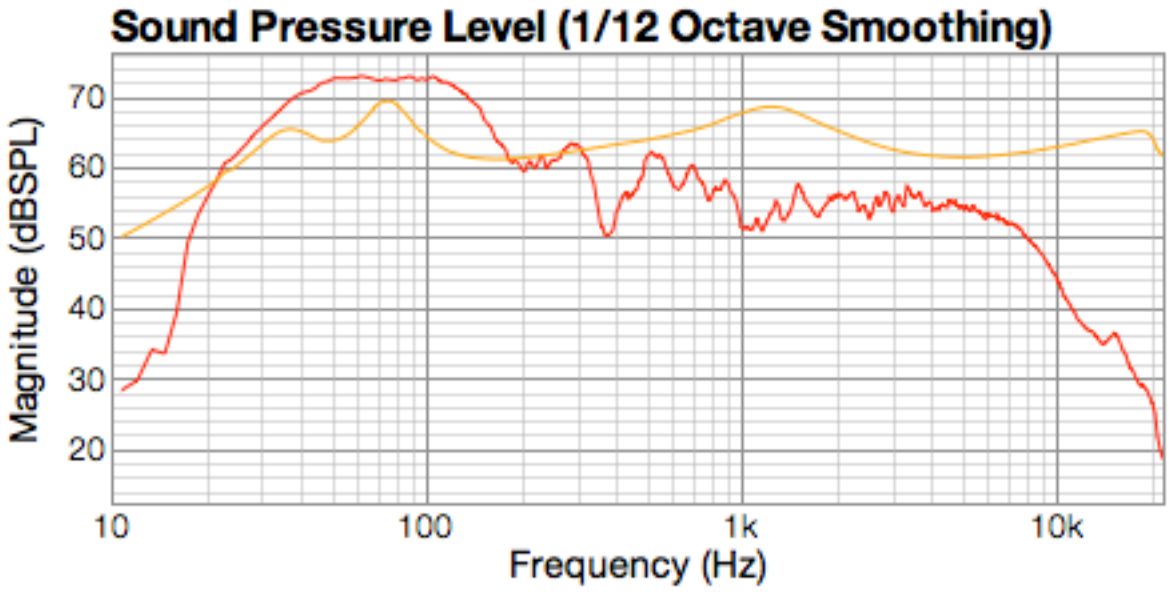


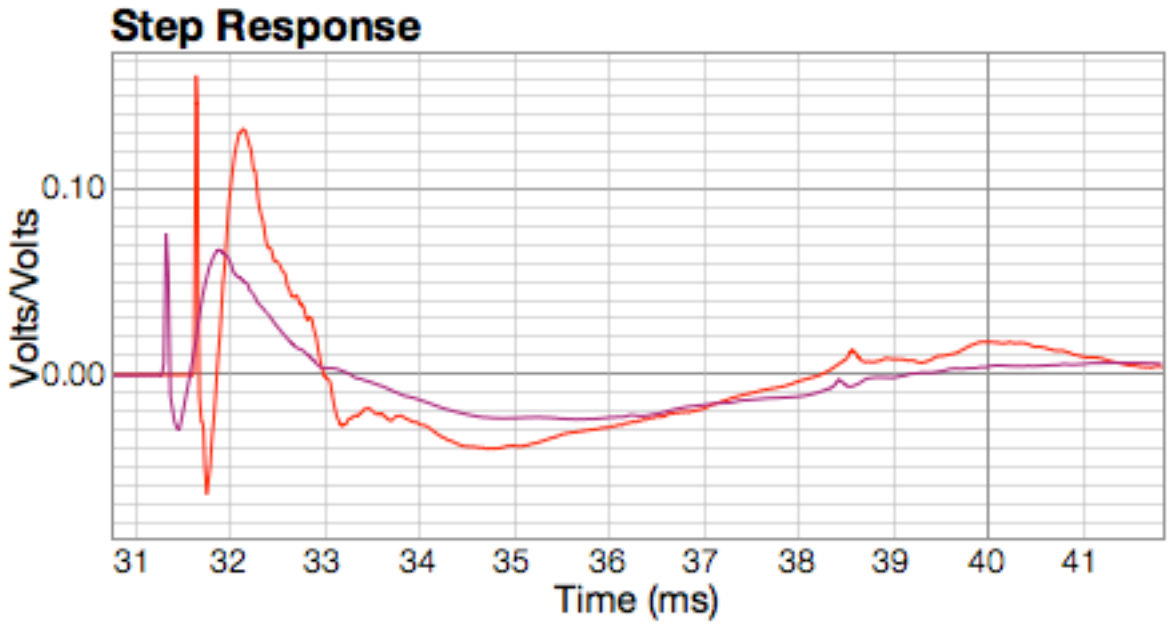
Above is the different slope roll-offs I tried layered on top of each-other. The red is the first slope starting at 8kHz. This was too much. I worked up and ended up at the blue line which gave an easy slope that preserves the high end up to 16 or 17kHz before rolling off more than 3dB.



As far as internal dampening I tried a few arrangements of different amounts of fiberglass. Before trying anything and listening to the empty cabinet I felt there was a lack of depth and a really open hollow sound to the speakers. To go for an extreme change at first I put a layer of 2” ridged fiberglass lining the interior back wall as well as the floor and ceiling. Listening with this amount of dampening, the sound seemed really dead with not much space at all. After a few different arrangements and amounts I settled on a layer on the back wall of only 1” and again, the floor and ceiling with the 2” thickness.

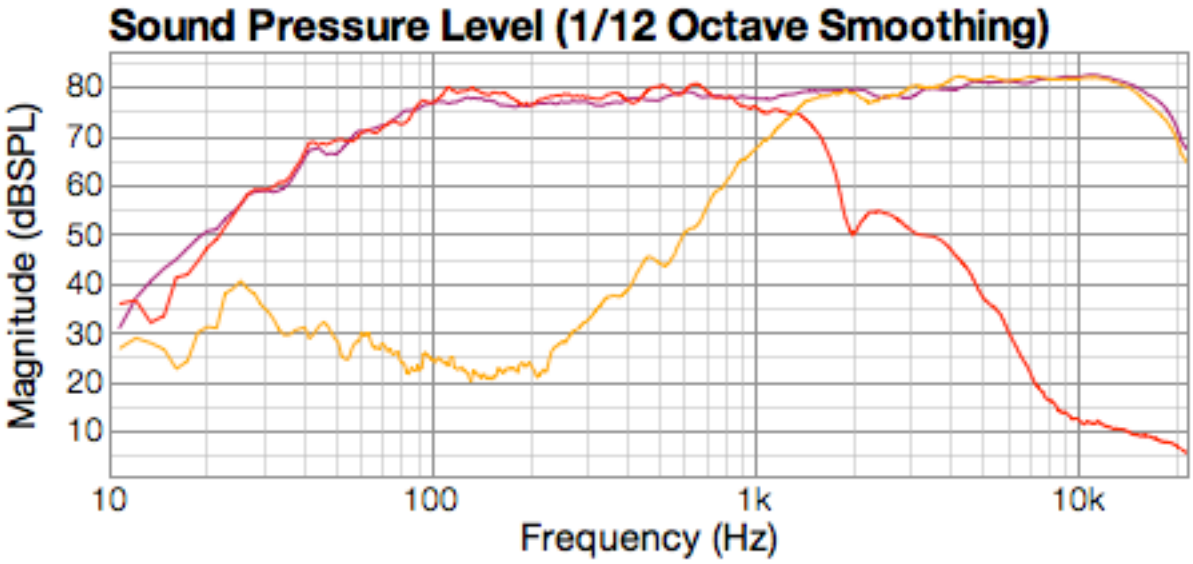
As far as port tuning goes I made a few changes to get the most low end extension that I could. When I began testing I started with a 4” long tube. The width of the port is 2”. I found I was not getting satisfying amount of low end with the 4 inch length. I cut it down to 3 1/2” and then down to 3 1/4. Below is the measurement of the port itself in red, and the impedance in yellow. The point at 50Hz between the two peaks in the impedance measurement is the current tuning of the port.



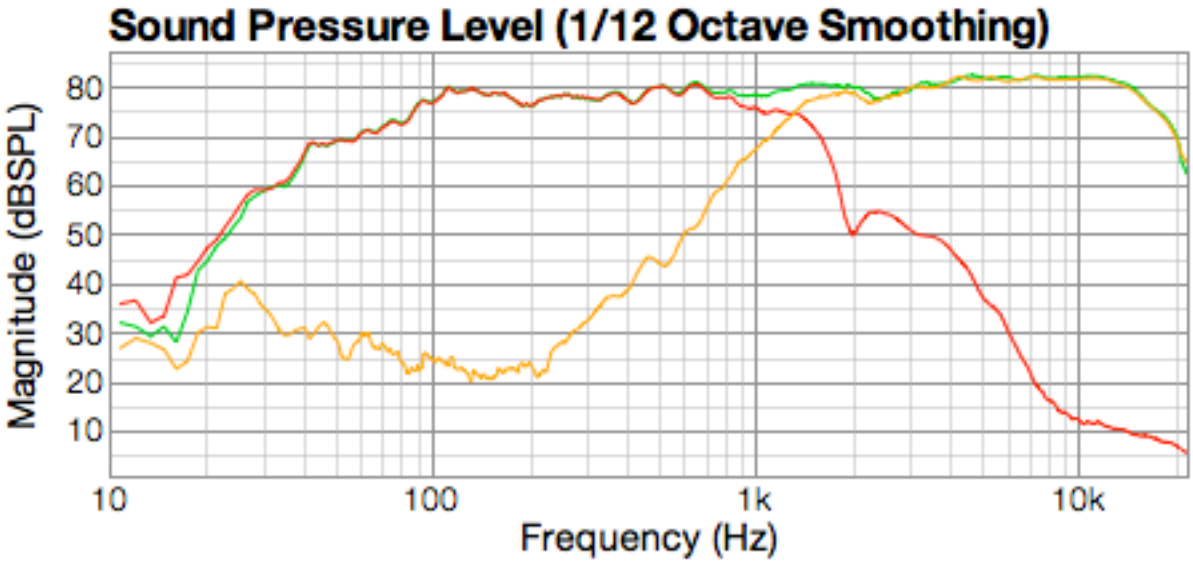


Above is the step response comparison between the empty enclosure and the final amount. The purple line is the damped speaker. The main difference is the slope of the line. The time difference between the impulse of the tweeter and the woofer stay relatively the same. Below are the visuals of the final measurements:

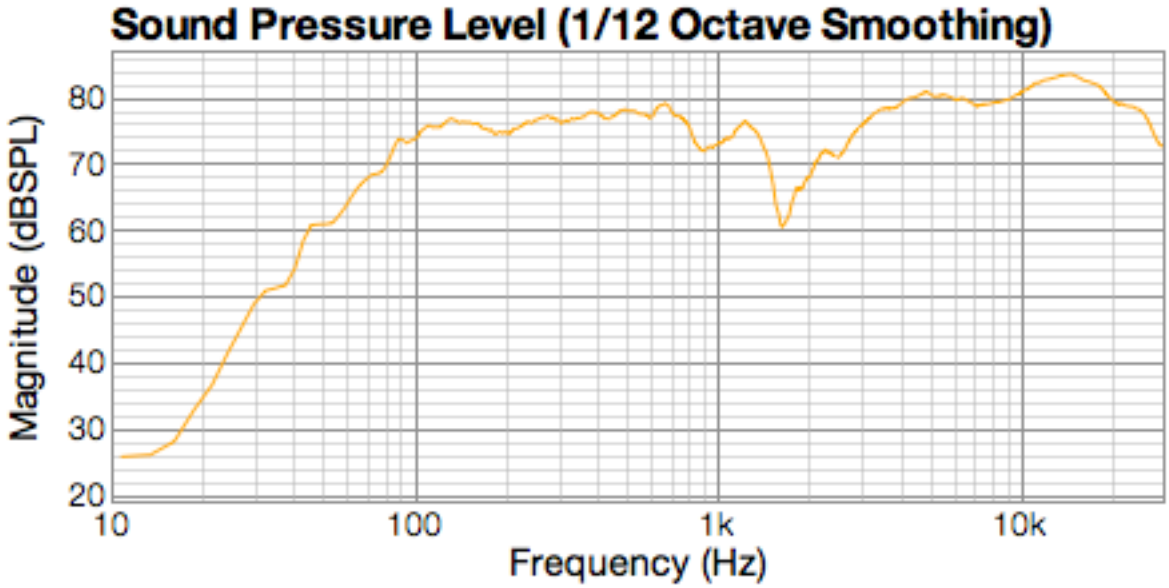
Speaker 1



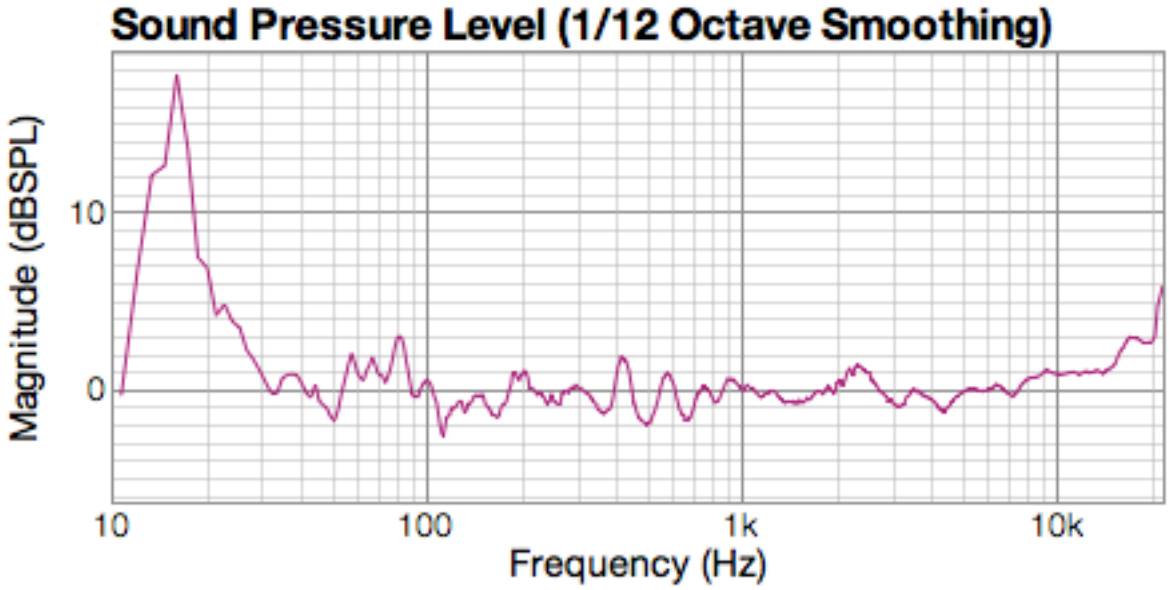
Speaker 2



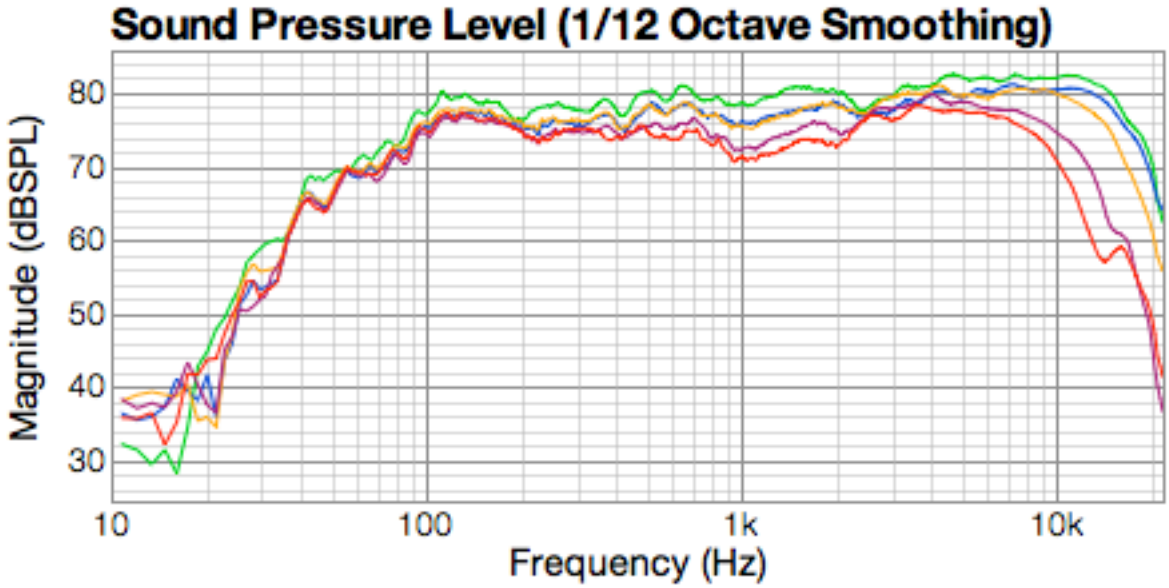
Overall with tweeter inverted



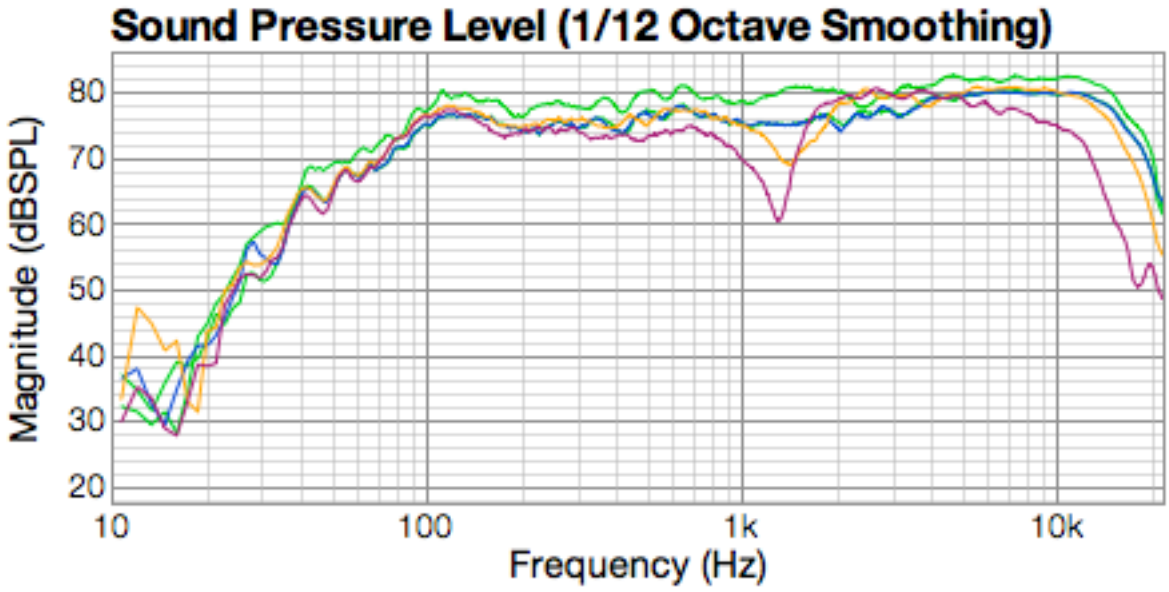
Left/Right Difference



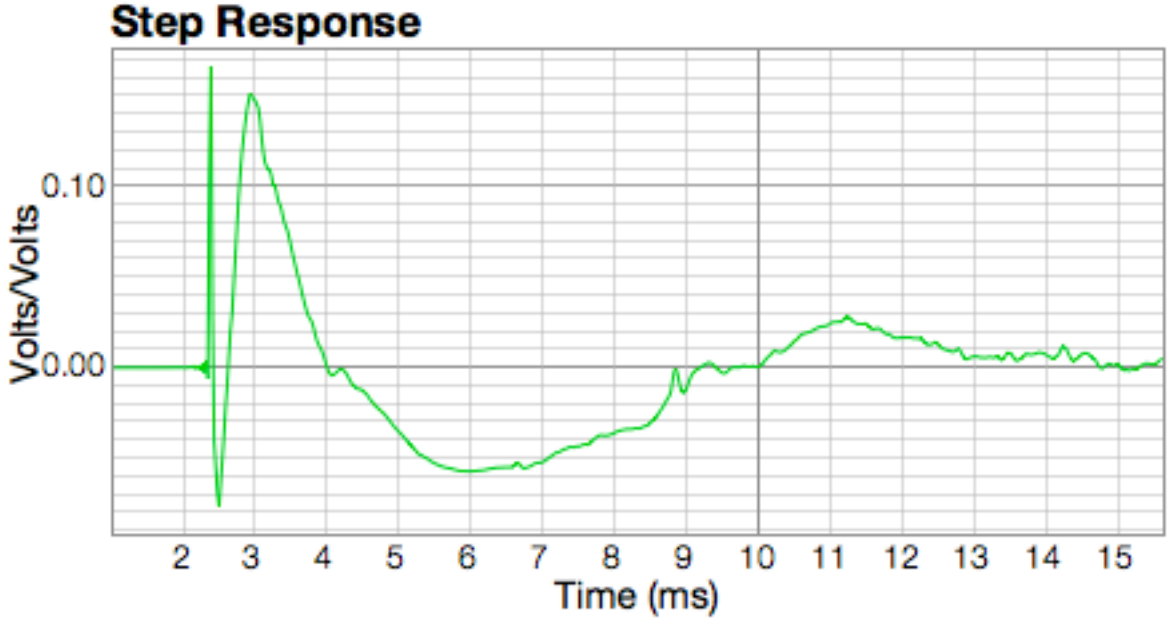
Horizontal off axis response



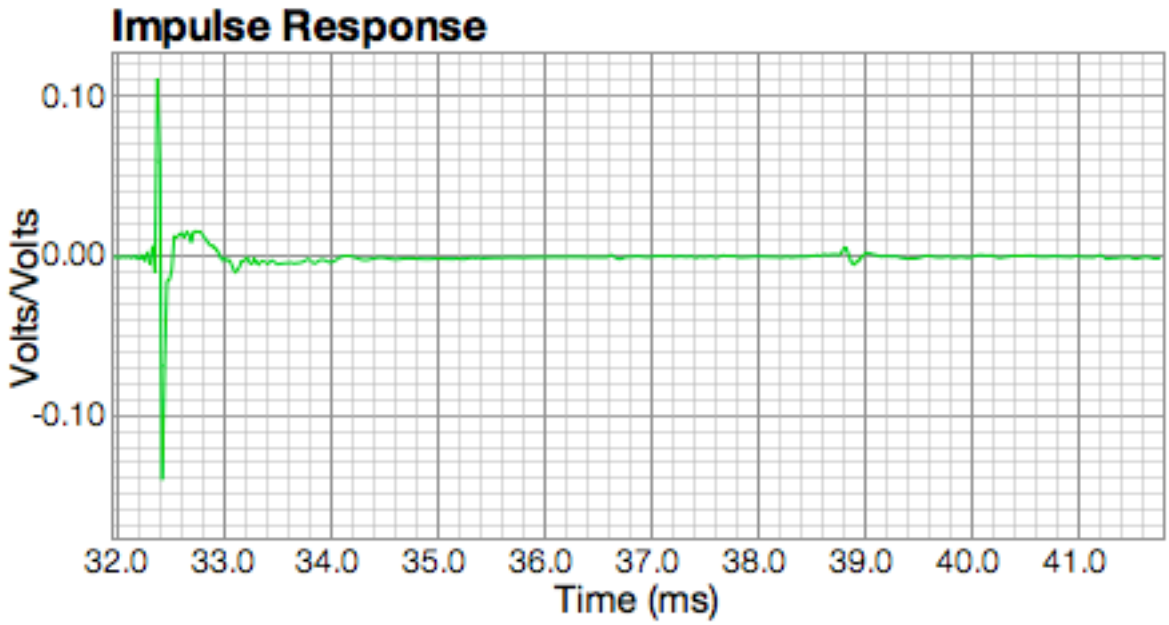
Vertical off axis response



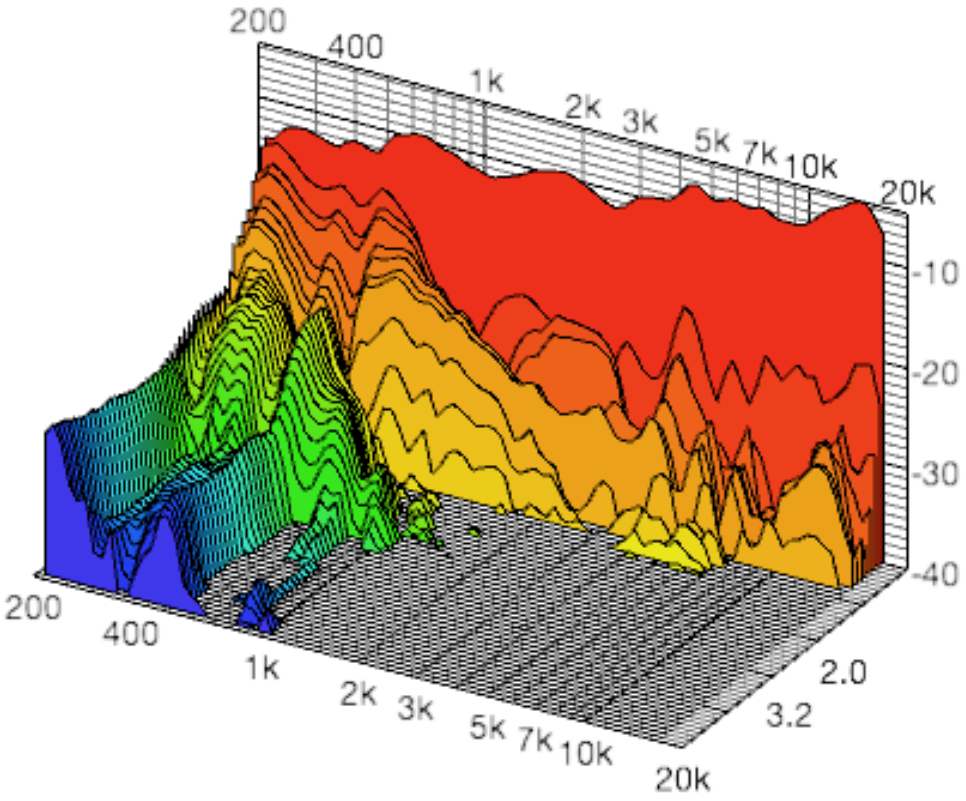
Final Step



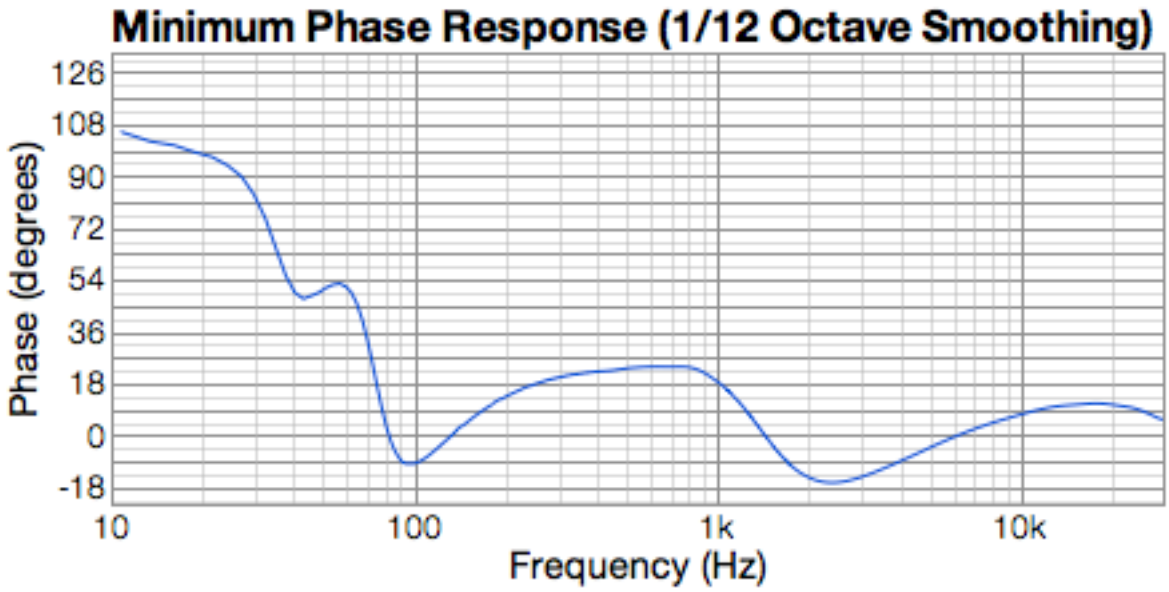
Impulse



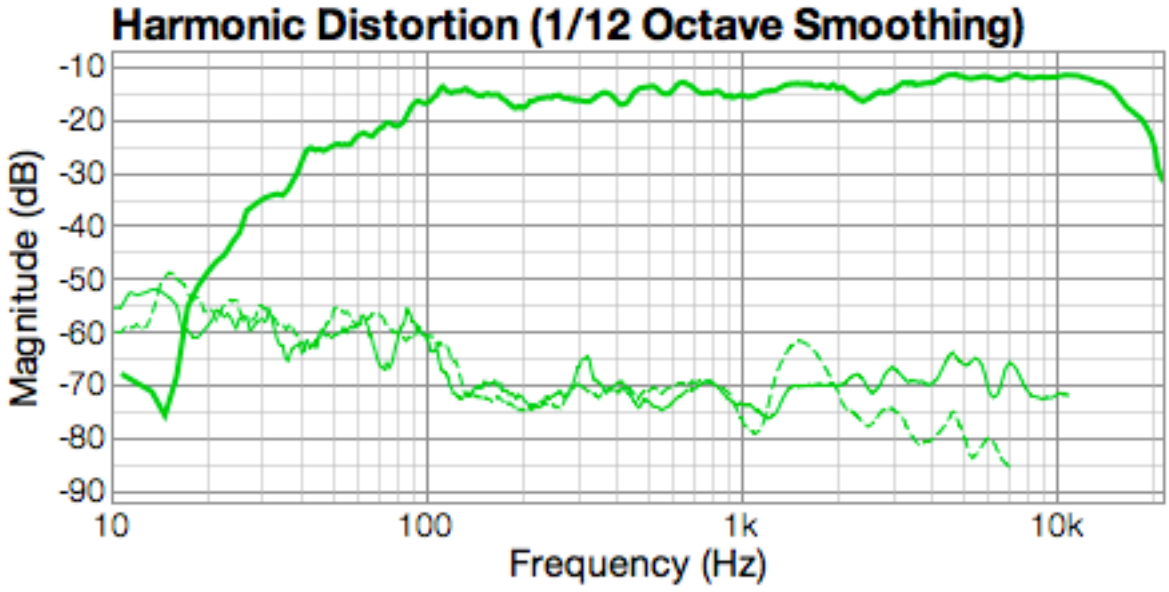
Waterfall



Phase

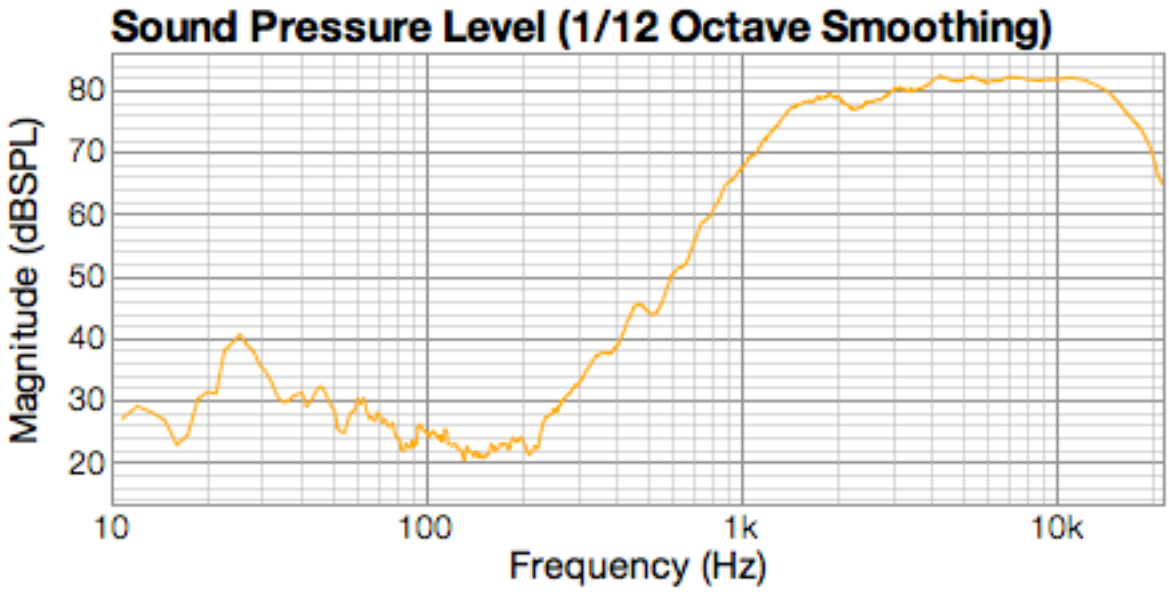


Harmonic Distortion

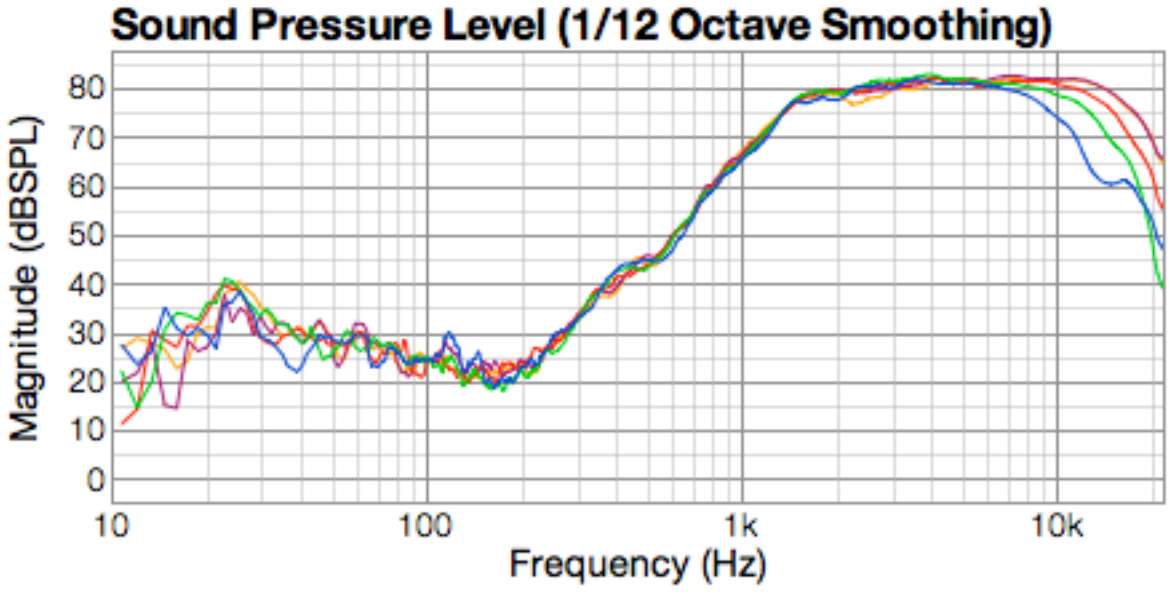


Tweeter Performance:

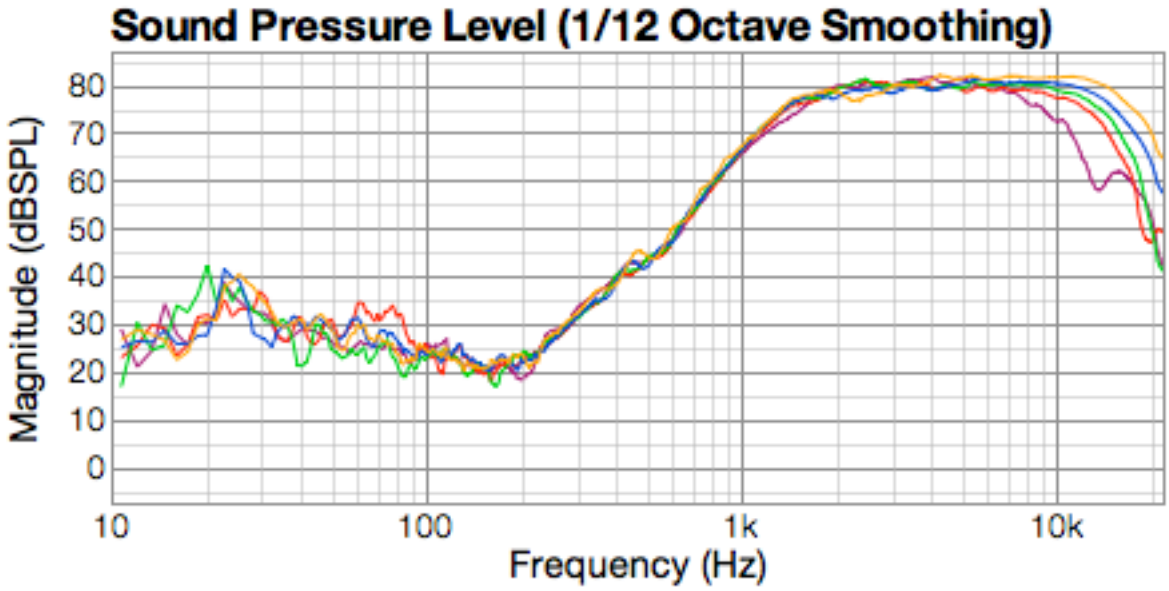
Frequency



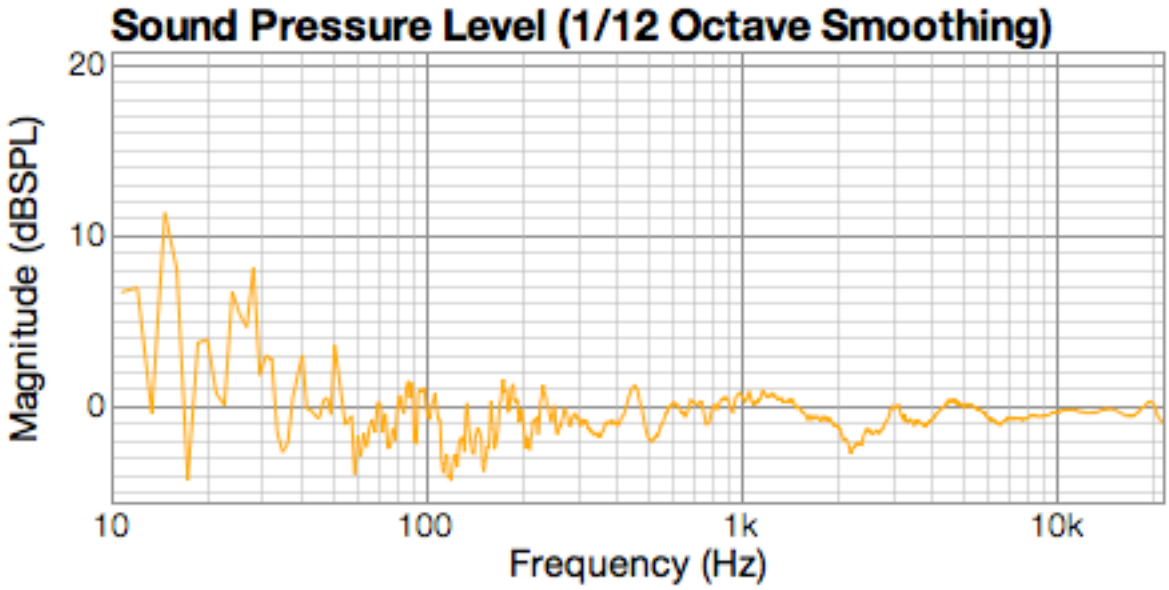
Horizontal off axis response of tweeter



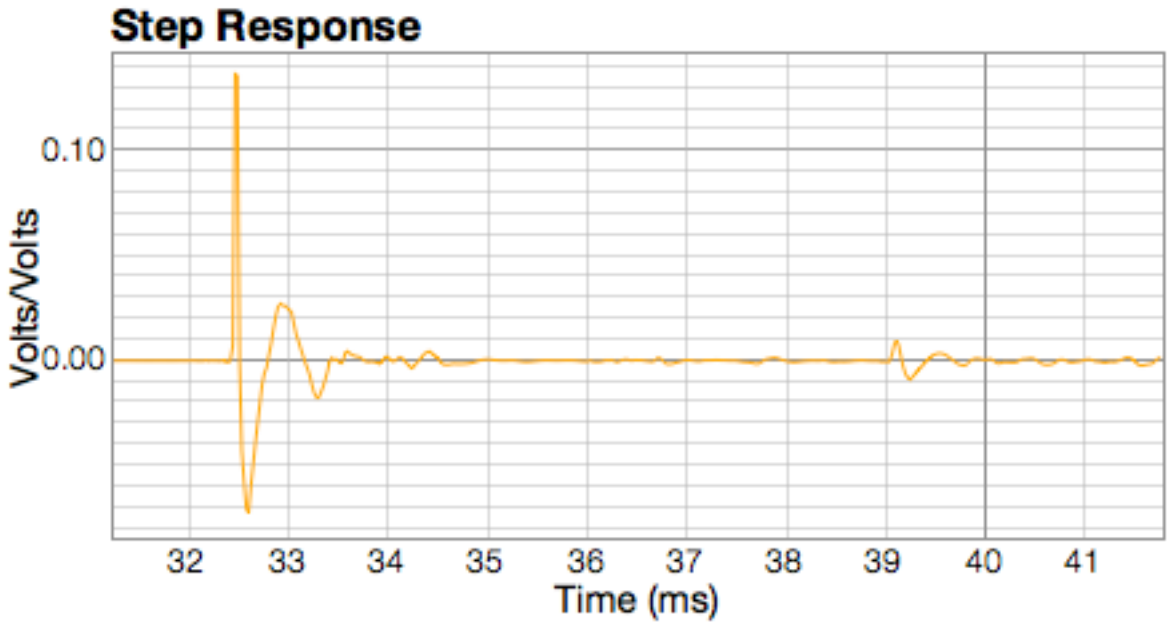
Vertical off axis response of tweeter



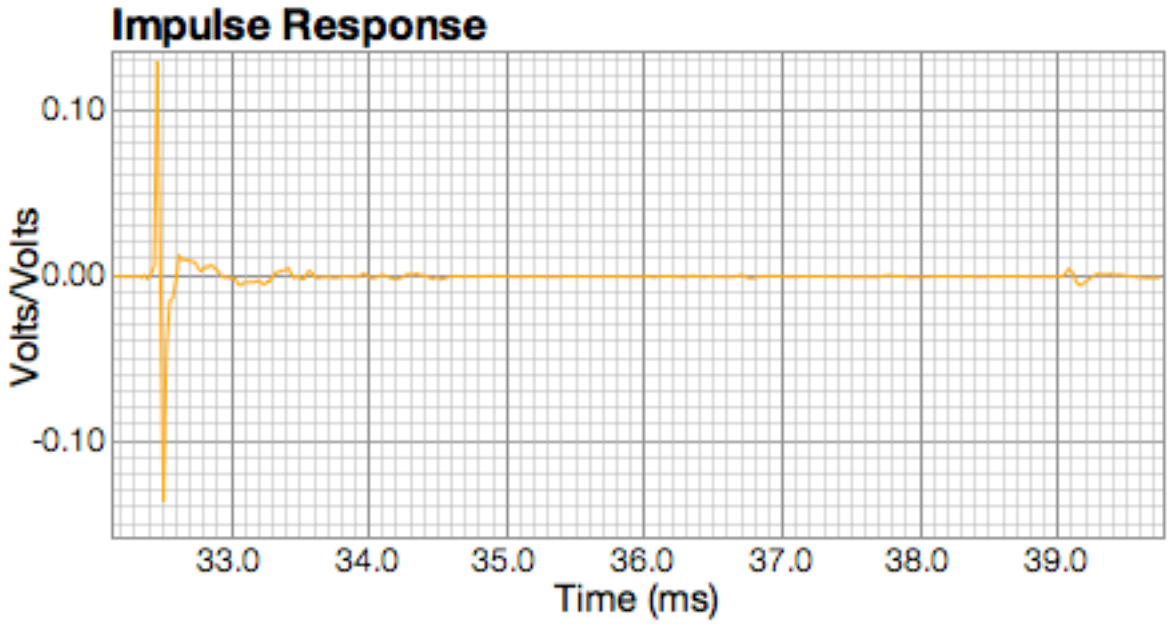
Tweeter difference



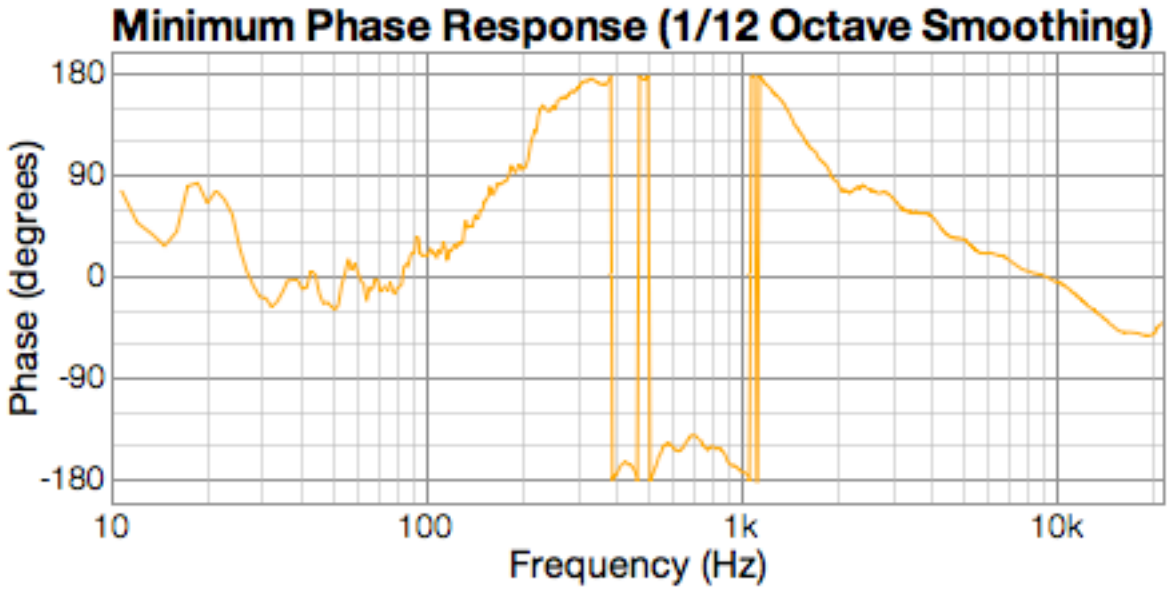
Tweeter Step Response



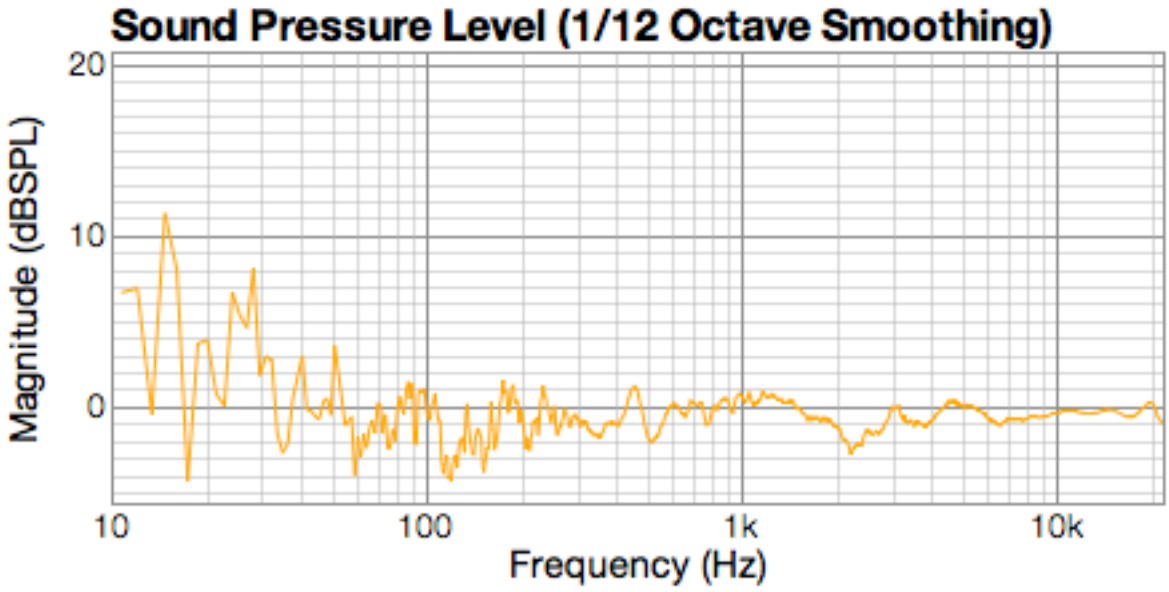
Tweeter Impulse Response



Tweeter Minimum Phase

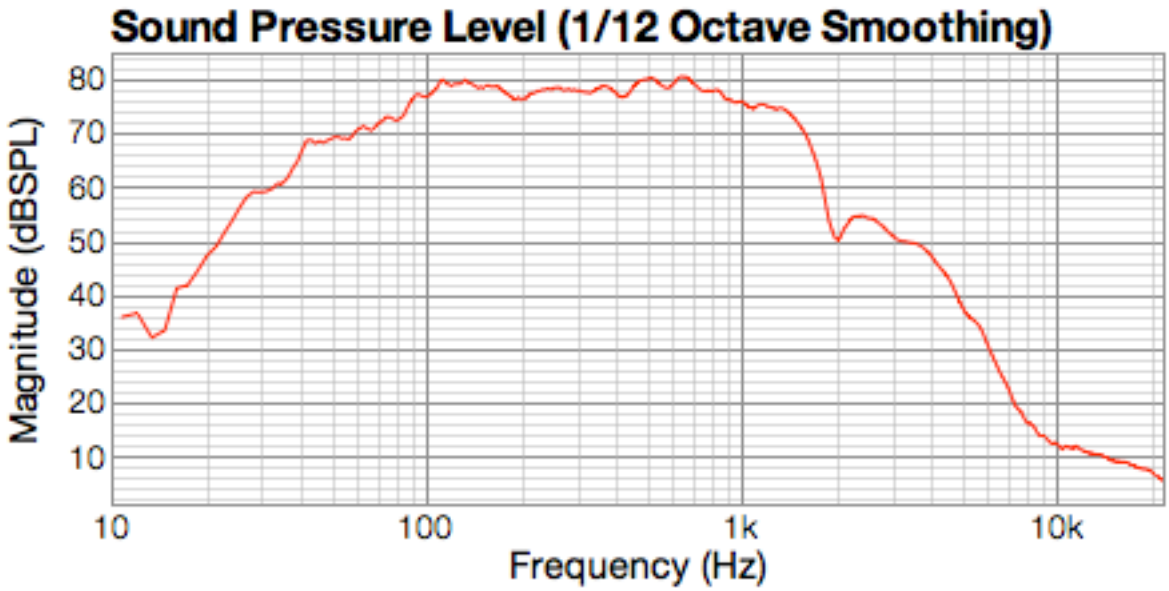


Tweeter distortion

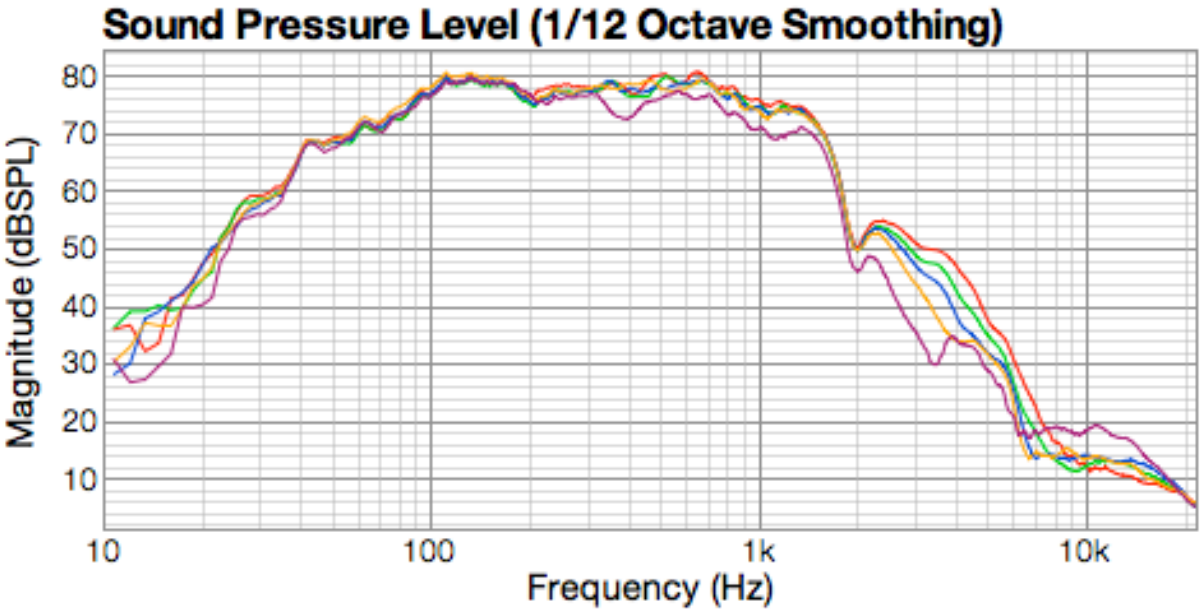


Woofer Performance:

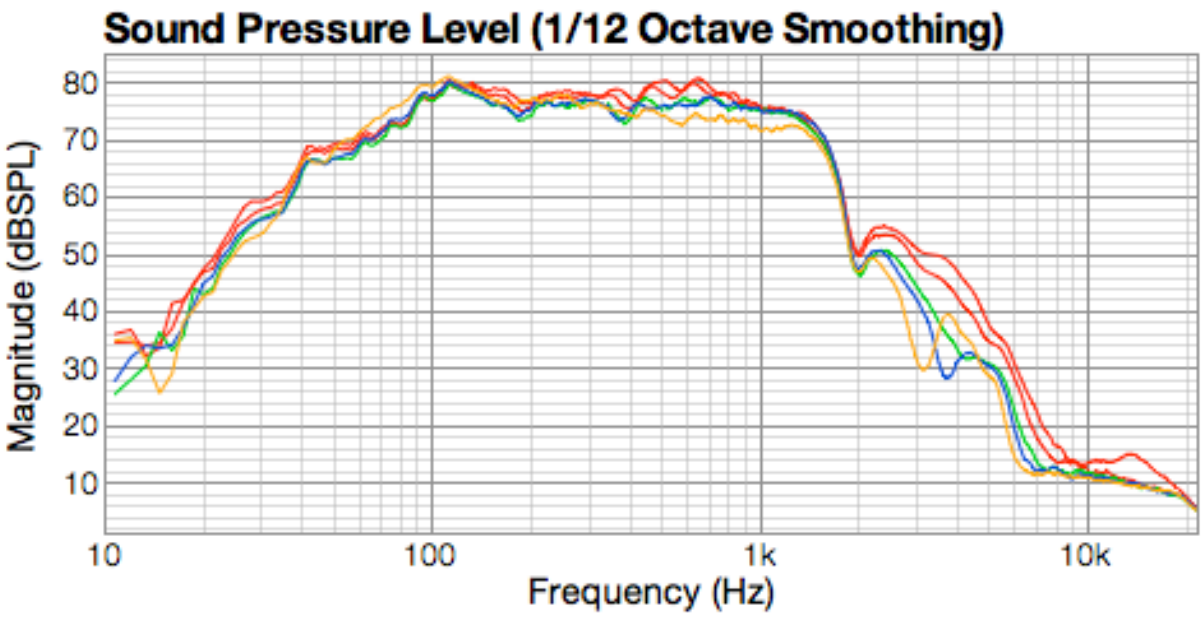
Frequency



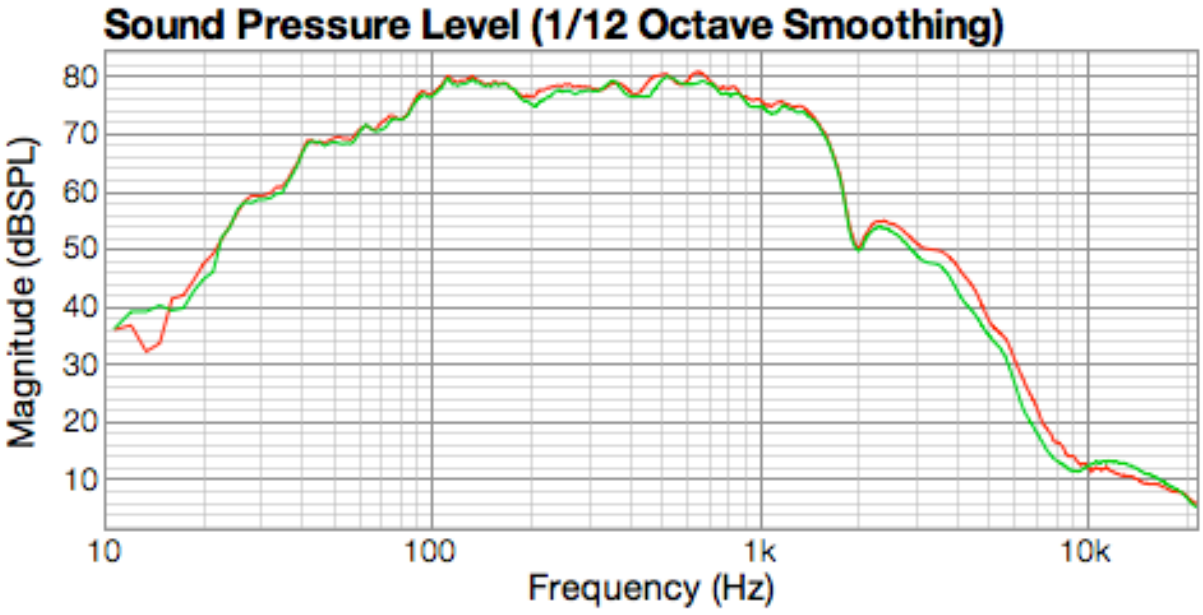
Woofer horizontal off axis



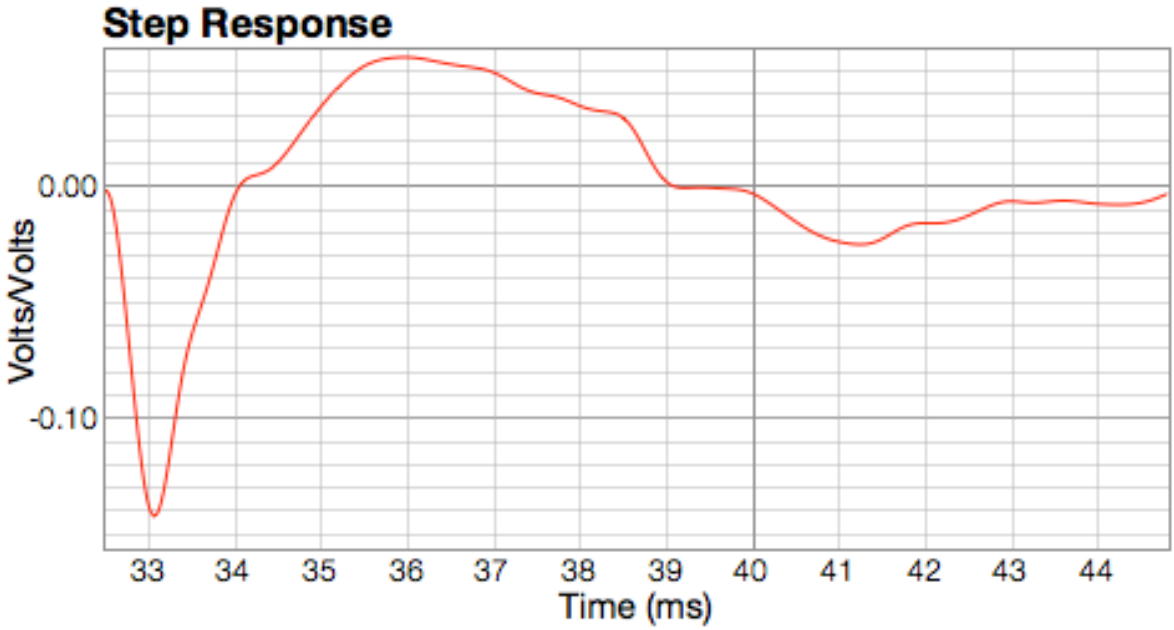
Woofer vertical off axis



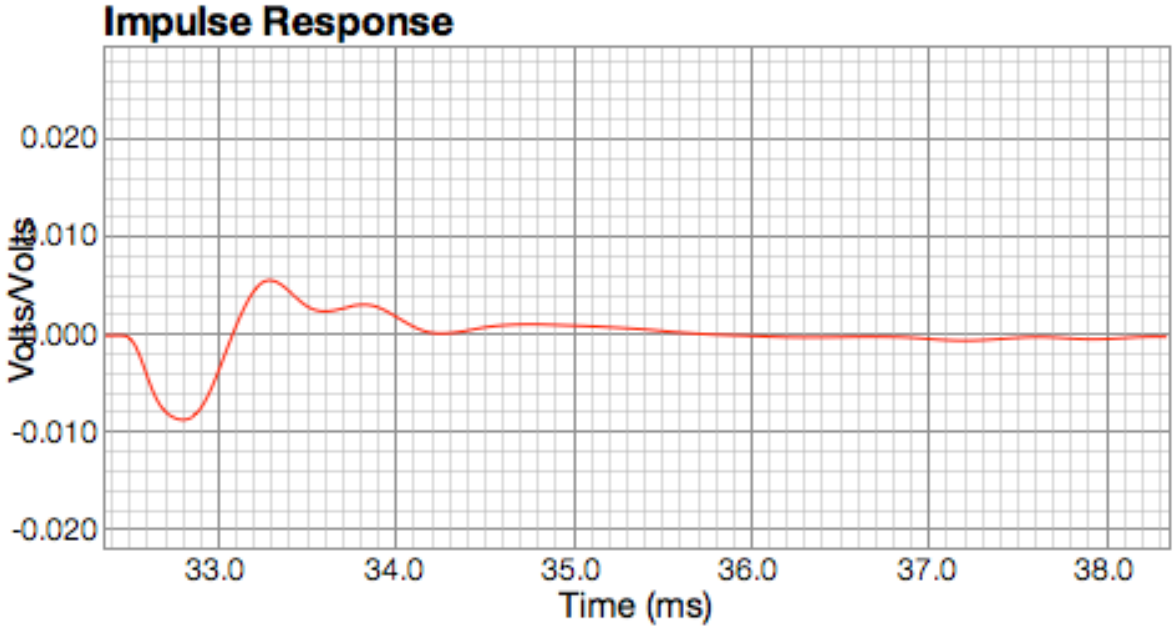
Woofer difference



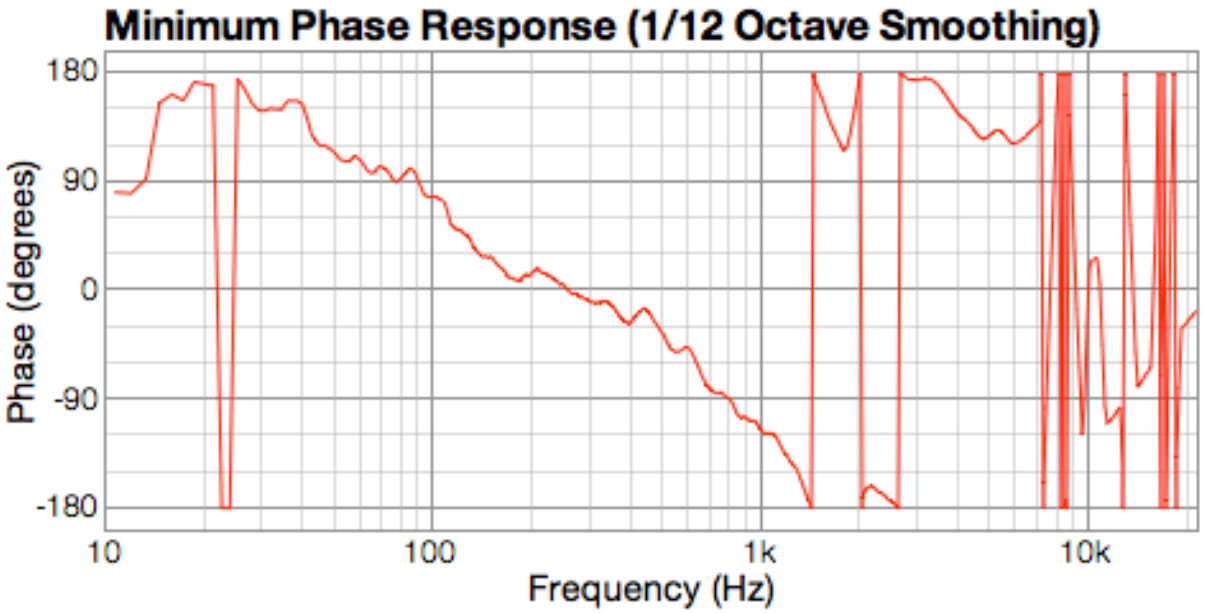
Woofer Step Response



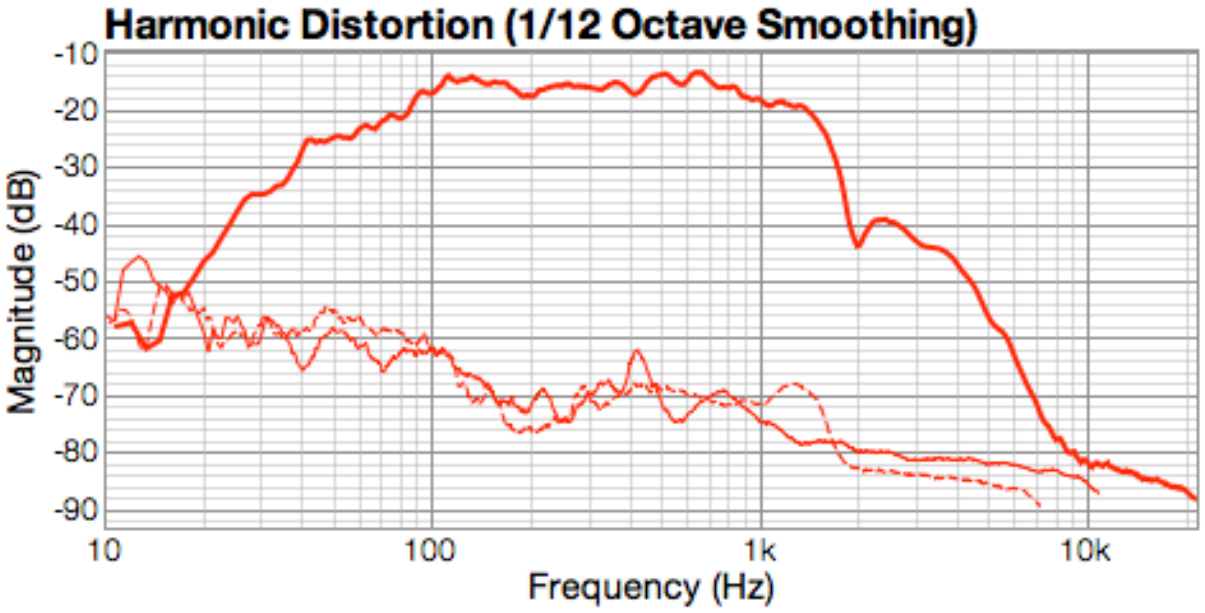
Woofer Impulse Response



Woofer Minimum Phase



Woofer Harmonic Distortion



Crossover Response: