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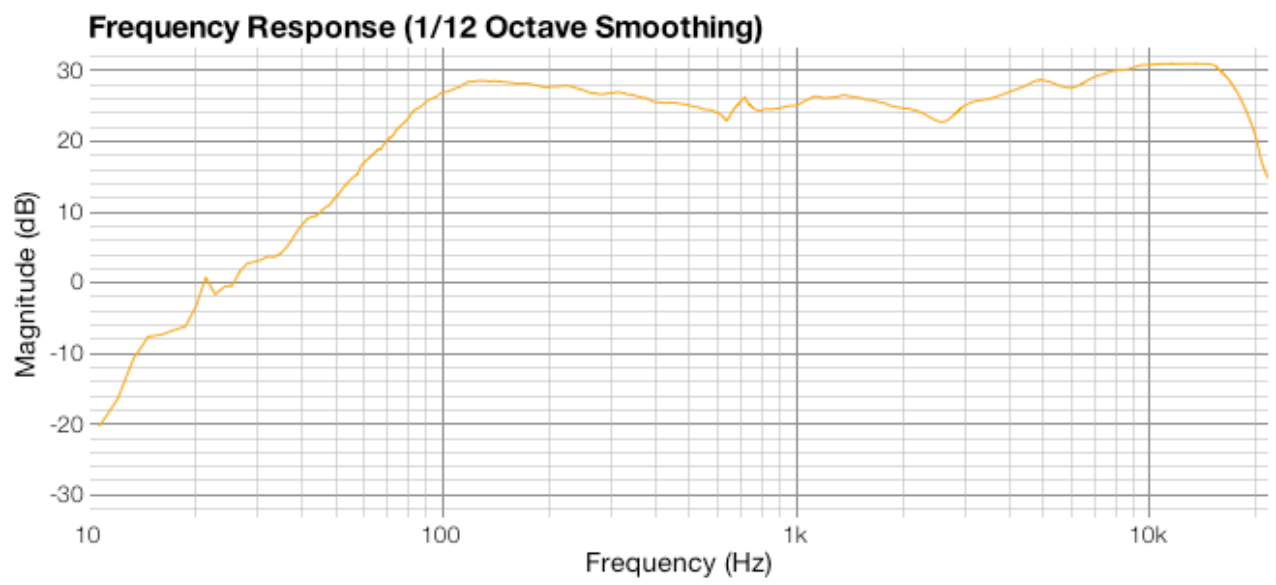
Testing Report
FA 4740
04/23/2012

Initial Test

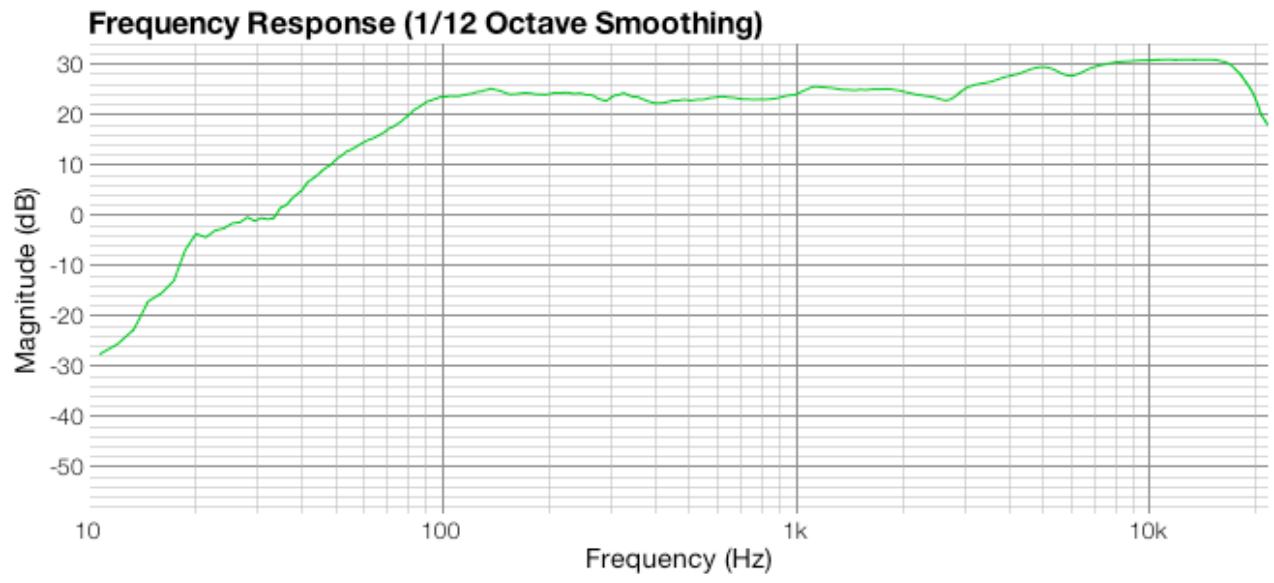
In my initial report, I estimated that starting the crossover at 1 kHz for the woofer and 2 kHz for the tweeter would give me an appropriate frequency response curve that did not deviate by more than ±3db. This was accounting for a pad to be introduced on the tweeter as it has a characteristic sensitivity of 91 dB as opposed to the 86 db sensitivity of the woofer. My initial testing showed this discrepancy to be obvious.



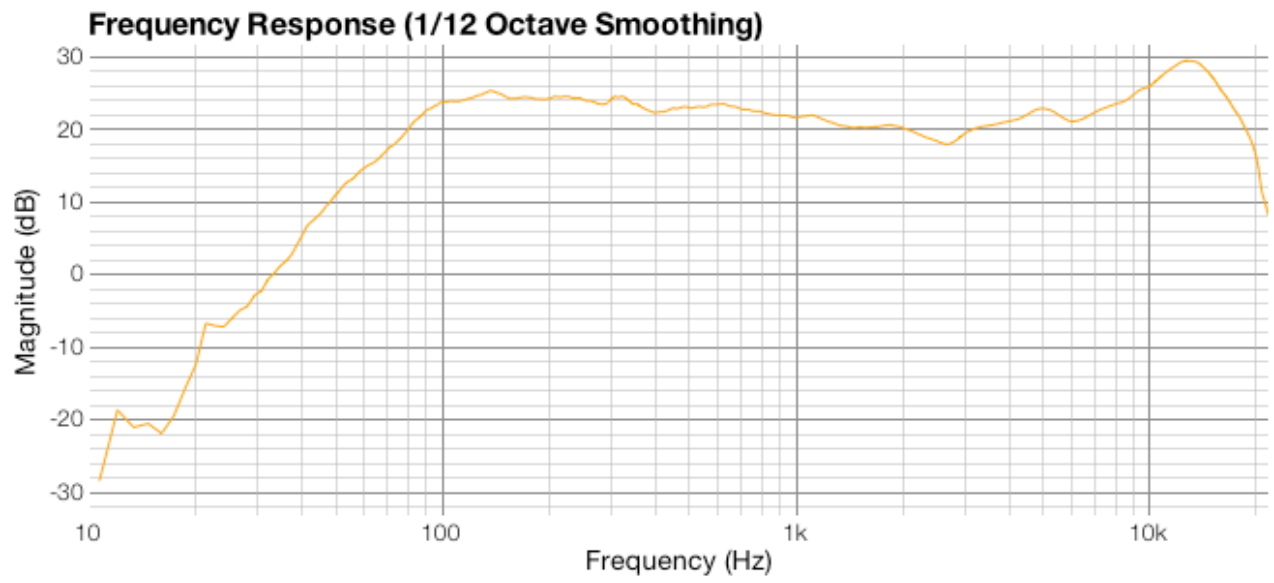
In addition to the difference in sensitivity, other noticeable problems include poor crossover summation and a spike between 600 Hz and 700 Hz. It was clear to me that quite a bit of work was to be involved to make a relatively flat curve.

Tuning

The very first thing I did in my tuning process was to add dampening material to my speaker box. The spike at 600 Hz shows characteristics of a reverberant frequency, so I thought dampening would fix it.

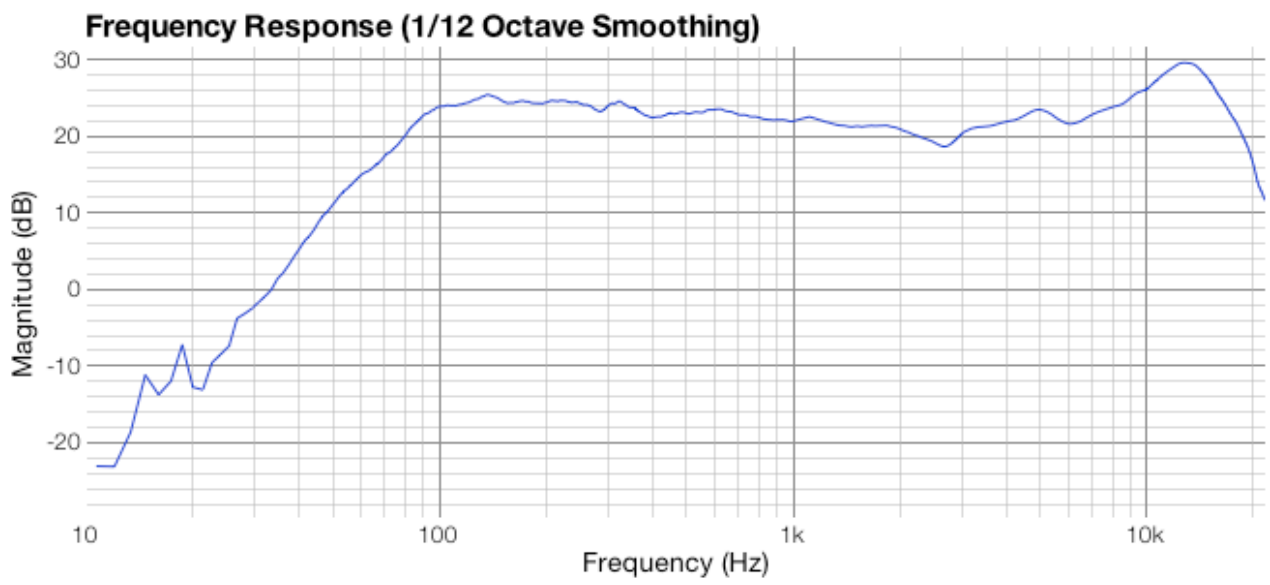


The dampening material inside the woofer enclosure not only took care of the spike, but also lowered the high bass frequencies between 100 Hz and 300 Hz. This first step did a lot in leveling out the frequency response. The next step was to try to bring down the high frequencies to match the low frequencies better. I started with a 6dB pad.

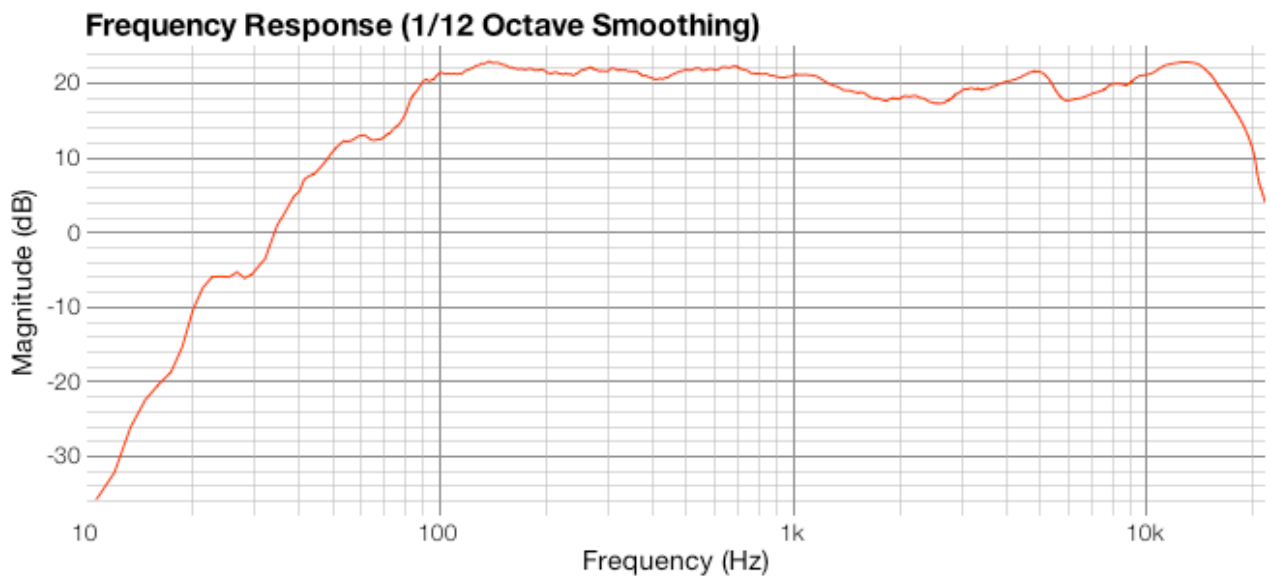


The pad succeeded in taming the high frequencies to a point, but it left me with a high peak at just over 10 kHz. The 6db pad was also too much of a drop, as the high frequencies that dropped, went lower than the bass frequencies. I first decided to move the tweeter crossover from 2 kHz to 2.5 kHz in

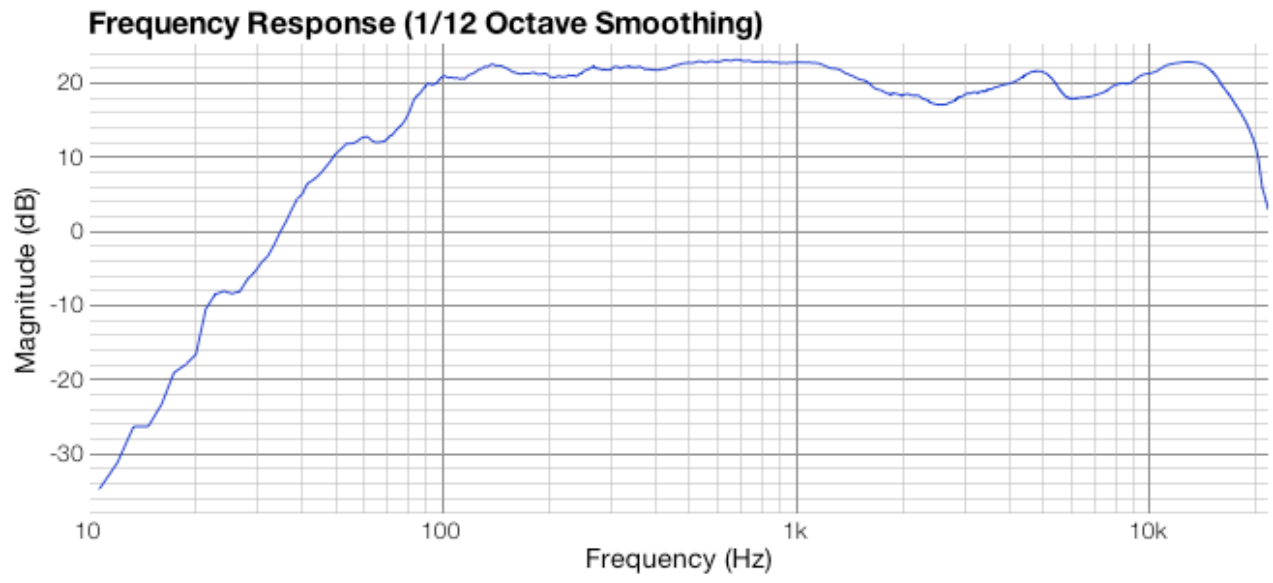
an attempt to improve the crossover summation and take down the peak some more.



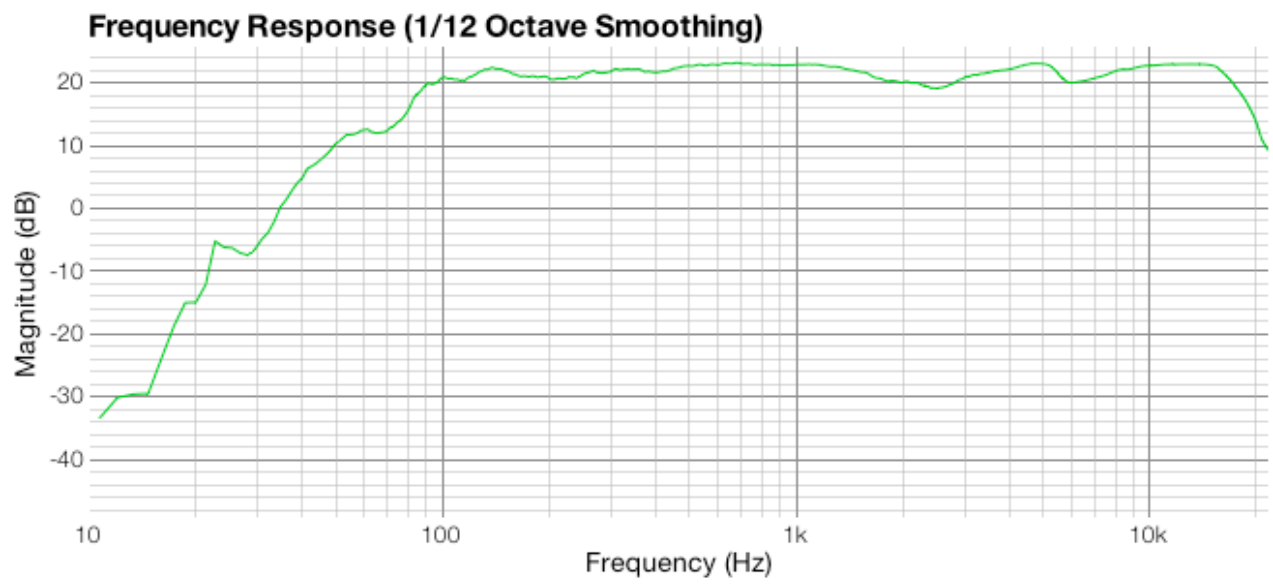
I was disappointed to find that moving the crossover did not change the response curve as much as I would have liked it to, so I moved it to 2.8 kHz. I also added the 6db high-shelf filter to lower the peak.



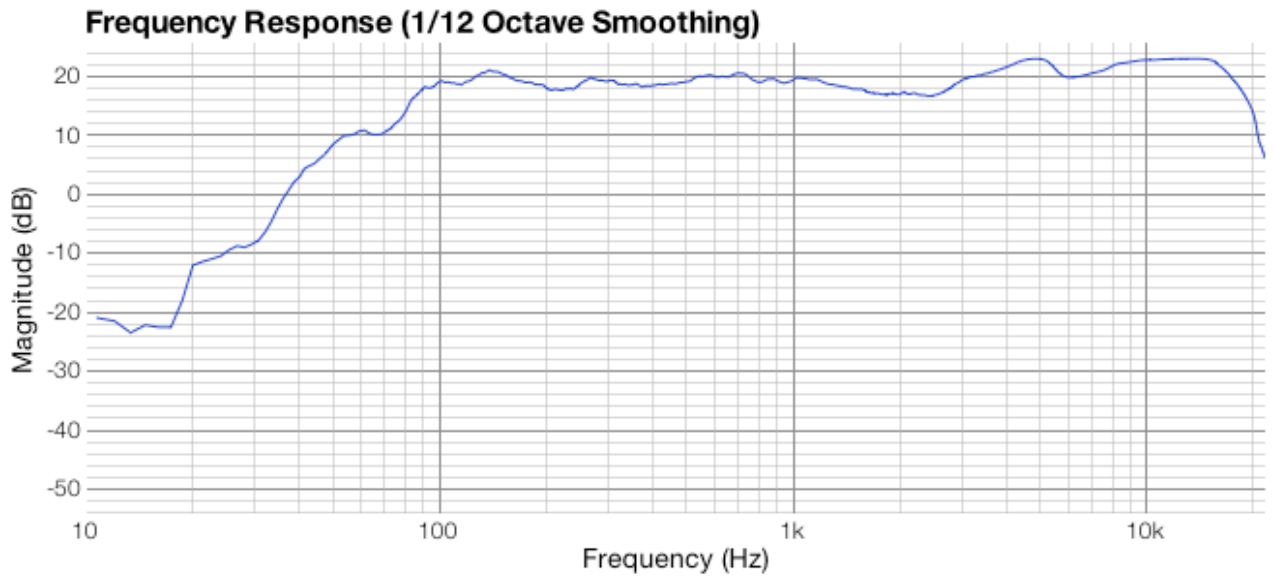
The changes made in this test gave the curve a better balance, but it still retains some summation problems as well as a nasty dip at around 1.5 kHz. I decided to move the woofer crossover to about 800 Hz to spread the distance and improve summation.



Due to a calculation error, I ended up increasing the frequency of the woofer crossover by about 300 Hz. This gave me a smoother response for that range so I decided to keep it. To improve the dip at around 2.5 kHz, I came to the conclusion that I should change my pad to about 3.5 dB, instead of 6dB.

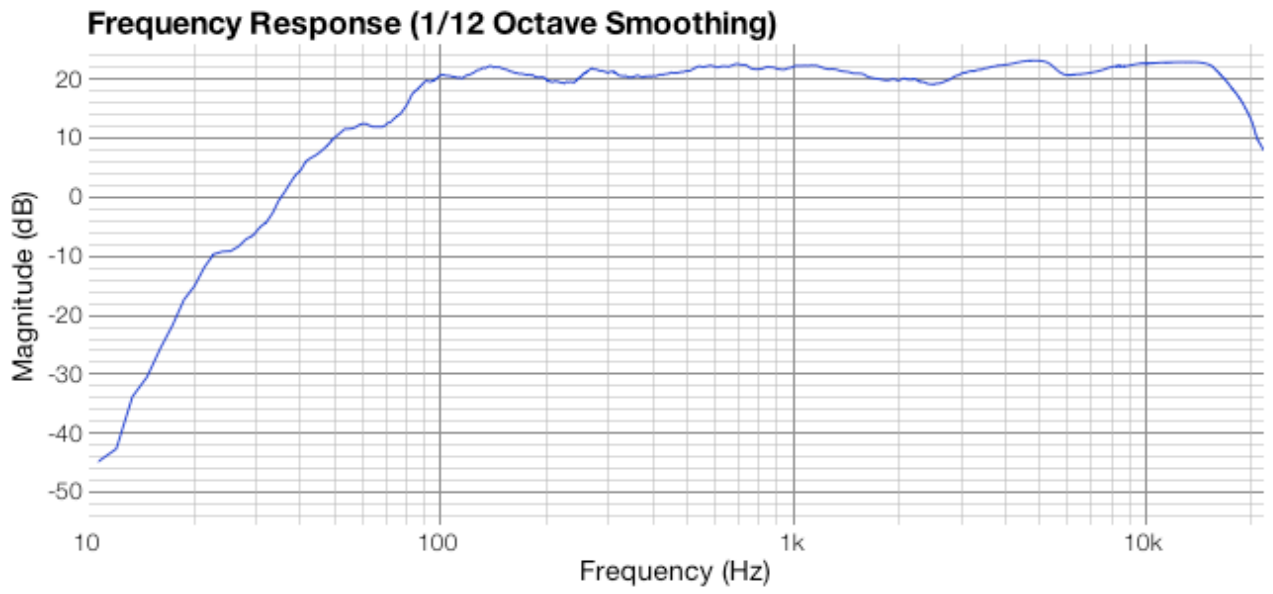


Already, the system was showing some major improvements. The dip at 2.5 kHz is less noticeable than before, but I was confident I could improve it still. By adding a baffle-step-correction filter, the overall level of the woofer could be brought down to match the tweeter.



The baffle-step-correction circuit, designed for a 4dB drop, did it's job and brought the woofer down. The only problem now is that it brought it too low, giving the tweeter a higher SPL again. The answer to the problem lay in the high-shelf circuit. I tweaked the circuit from 6dB to 7dB.

Conclusion



The 7dB high-shelf filter did the trick. The resulting frequency curve did away with all large dips and spikes. Though it still has some relatively sharp changes in places, it retains a deviation of

±1.5dB, well within my acceptable goal of ±3dB. The low frequency extension is not as low as I would have liked it to be, but given the size of my woofer, I still think it's pretty good. Overall, I am very satisfied with the final response curve of my speakers. I believe that they will be great for listening and more than suitable for mixing as long I keep in mind the lack of bass.