Subject: The Bumma (tentative title)
Posted by badman on Thu, 17 Jun 2010 22:40:19 GMT
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Finally done from a build perspective is my waveguide, a 15" contour, 16.5" overall assembly. Made of resin, epoxy, plywood, styrofoam, casting cloth, and a few other odds and ends.

Crossover is being worked on, and I'll post more XO details as it gets refined. Currently the woofer has a 40uF 8 ohm zoebel and a .47mH series inductor. Tweeter has 2 impedance compensation notches, a damping resistor, and a 5uF highpass cap. The tweeter section in particular can use some effort as the first order isn't the best way to protect the driver. I will at some point put a parallel coil in but it may well be oversized to keep the phase shift out of the passband.

http://img580.imageshack.us/img580/4381/finishedosguides3.jpg

Subject: Re: The Bumma (tentative title)
Posted by Wayne Parham on Thu, 17 Jun 2010 23:18:15 GMT
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That's a beautiful horn!

I have found that first-order crossovers don't work well with compression drivers. They allow too much excursion below the passband, where the horn unloads. But since the horn is longer than the direct radiating midwoofer, you can take advantage of higher orders. You don't really want to align voice coils vertically anyway, because that would put the mouth of the horn awkwardly out in front. Besides, all the mechanical and acoustic slopes add in there and modify the overall transfer function anyway.

It's a juggling act of competing priorities. You can make crossovers that give the right transfer functions and phase to get the forward lobe right and provide EQ for mass-rolloff with first-order, second-order, third-order or even higher filters. About ten years ago, I even went to the trouble of modeling first-order, second-order and third-order crossovers in Spice, writing up a document showing the schematic and transfer functions of each. Notch filters, Zobels and other filter types (as well as the R/R/C network for mass-rolloff) are all examined as well. It's sort of a study / illustration / demonstration document specifically written for people building crossovers for matched-directivity two-way loudspeakers:
Speaker Crossover Document
Crossover Electronics 101 Handout (from the Crossover Electronics 101 seminar I do at trade shows)I think you've been all through that stuff before too. You may have seen these documents, in fact, now that I think about it, probably so. But I guess it can't hurt to link them in this thread for other readers that might not have.

Subject: Re: The Bumma (tentative title)
Posted by badman on Fri, 18 Jun 2010 15:27:55 GMT
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Wayne, thanks for the comments. Yes, the simple cap XO on the horn is insufficient, fortunately the response is already rolling off a full octave above where the horn unloads, so at normal home levels I'm not too worried. The current thinking I have is to use an overdamped 2nd order alignment to keep the phase wrap away from the passband. Something like 1.5mH with the coil models well. I'm definitely trying to stay on the simple side- the "natural" crossover point of the 2226h makes sense to work with as it allows me a fairly simple XO and the initial 24dB drop I get (modeled, but it should hold up) with a 5uF .47mH notch in place of the lowpass is very nice. The controlled breakup between 1-1.6k is damped slightly then the response plummets, the notch being well-tuned to the breakup at 3k. This all depends on that zoebel being there, without it, there's not nearly the beautiful transfer function I model with. We'll see how it holds up in the real world, probably this weekend.

The tweeter I'm still working on, we'll see what I get, but I'd very much like to utilize the 2226h and the above filter, as it's not often you get 4 parts to make a 4th order acoustic filter without much phase wrap.

Subject: Re: The Bumma (tentative title)
Posted by Wayne Parham on Fri, 18 Jun 2010 16:02:00 GMT
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I did the very same thing with the 2226 for a long time - Just a single series coil, which basically just shelved the high end a smidge. It is one of the crossover types listed in the Speaker Document (in my last post). I called it a "Pseudo-First-Order" filter because it wasn't really a first order curve, with all the other variables floating around besides just the inductance of the coil. The whole rolloff was from the driver, itself. Worked very well!