Subject: Re: Just Loaded in 4 Pis
Posted by Wayne Parham on Fri, 18 Sep 2009 01:55:18 GMT
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The reason we made the middle speaker sealed for the university studio was that, as a center channel, purely for aesthetics, it simply looked better to have the tweeter centered. I think sometimes psychoacoustics are as important to listening impressions as anything else.

We rarely make custom speakers (no need, I feel we have something for every application) but in this case, a slight modification was done for aesthetics. I don't normally do mods because it really requires a design/test cycle to make sure there are no unintended consequences but in this case, I felt there was little potential for side effects. The specific design considerations are described below.

aesthetic thing what side you put them on. You could use either one as a center and be just fine. But it did seem to me that the middle speaker would look better with the horn centered.

The thing is, you can't physically fit the port on the baffle if the horn is centered. I suppose you could probably put it on the back or use a handful of smaller ports in the corners or something but like I said above, that would require a whole new design/test cycle to find out what the effect of relocating the port would be. In a cabinet this size, standing waves are starting to fall into the Helmholtz frequency region and port position becomes important.

Removing the port entirely is a different matter because the back wave is absorbed. It's a simpler system that limits the chances of unintended consequences. The woofer's electro-mechanical parameters allow it to be put in a sealed cabinet this size without becoming underdamped, so it was a viable solution. I think it is even a slight benefit because it staggers bass tuning between speakers, which helps distribute bass sound (modal) sources better. They're using a sub in this studio, so that brings the count of bass sound sources to four, which should provide a nice smooth sound field in the modal region.

Here's some information that may be interesting for the perfectionists and audio snobs out there. I've mentioned this before, but maybe to glazed eyes. Or maybe I didn't mention it here, might have been in the Ewave thread on AK or the Horn/Waveguide thread on DIYaudio. Either way, I'll mention it again.

detail that has an offset tweeeter) is that the nulls are diagonal rather than directly above and below the speaker. Naturally, you might say, those of you who have studied and understand crossovers and the acoustics of multiple sound sources might expect this. But what you probably wouldn't have known (I certainly didn't until I moved the microphone around in about a thousand different XYZ positions) is that the nulls are thrown to the side, the maxima is not directly on the line drawn between driver centers. I wouldn't have expected this.

The nulls that form direcly above and below the speaker are mild. When you rotate the speaker

so the tweeter is directly above the woofer, the nulls forming directly above and below that axis are still mild. The maxima forms about ten degrees past that. So with the speakers positioned on each side and toed-in as they usually are, the null maxima can be pointed further outside the target listening area. The upper null is roughly in line with the edge of the upper corner outside. The lower null is down towards the logo.

Now then, the nulls are so far outside the pattern it really doesn't matter. You can't hear a difference, no matter what side the speaker is placed. So you really can place them as you think they look best. But even still, I know where the nulls are from measurement, so I try and direct them where they are the least objectionable. The lower null is down on the floor and directed towards the opposite speaker. The upper null is over everyone's head and directed at the ceiling outside the pattern, both vertically and horizontally.