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Subject: Cornerhorn implementations

Posted by [Wayne Parham](#) on Mon, 23 Feb 2009 19:07:10 GMT

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I'll try to answer your specific question first, and then move on to "the bigger picture."

The Omega 15 is a better woofer than the Delta 15. Not that the Delta 15 is a bad woofer, I find it very pleasant sounding, but the cast frame, larger power handling and overall build of the Omega 15 make it the better woofer. I find its electro-mechanical specs easier to work with too.

As with any high-efficiency woofer, the larger the box the deeper the extension, within reason. There comes a point where going larger doesn't help, and this point is dictated by electro-mechanical parameters. Boxes larger than this will be either underdamped and make a bass peak somewhere or they'll be tuned so low that the larger size isn't helping increase output at the lowest frequencies.

The Omega 15 works well in relatively small cabinets. It is best used in 2ft<sup>3</sup> to 6ft<sup>3</sup> cabinets tuned to 40Hz. It can also be used in slightly larger boxes tuned lower for deeper extension but at the cost of reduced output. In a moderately sized cabinet, it produces good bass response, perfectly suited for a midwoofer. As an example, a 3ft<sup>3</sup> cabinet tuned to 40Hz has f<sub>3</sub> of 50Hz and smooth rolloff to an f<sub>10</sub> of 35Hz.

The Delta 15, on the other hand, really needs a large box to even get moderate extension. Even in a 6ft<sup>3</sup> cabinet, the response curve is most suitable for use as a midwoofer. A Delta 15 in a 6ft<sup>3</sup> cabinet tuned to 30Hz produces f<sub>3</sub> of 50Hz and f<sub>10</sub> of 35Hz. It provides a slightly different shaped curve than the Omega 15 in a 3ft<sup>3</sup> cabinet, because the alignment is different. But overall output is about the same, even though the cabinet is twice as large. It can be put in inconveniently large cabinets too, like 20ft<sup>3</sup> tuned to 30Hz or even 30ft<sup>3</sup> tuned to 25Hz. Not that I'd want to use them for subs, but you get the idea. To tune them for use down low, they have to be huge.

Also don't forget how important it is to consider and work with the shifts seen in loudspeaker drivers. We tend to think of a woofer as having set electro-mechanical parameters, but that's not so. The characteristics change as a function of power, and even with age. A woofer that's designed to be used at say 100 watts, will behave much differently at that power level than it will when run with just a few watts. High-efficiency woofers tend to have stiff suspensions that have high resonant frequencies, and at low power levels, the resonant frequency and mechanical Q is even higher than designed for. This tends to shift them towards being underdamped at lower power levels, especially when new.

Ironically, very high power levels tend to shift them towards being underdamped too. This is because electrical resistance begins to rise, not because the suspension is stiff. Prosound high-efficiency woofers tend to have mechanical characteristics that shift resonance and Q down as power goes up and as they age. They have electrical characteristics that tend to shift Q up as power rises.

You can analyse this in greater detail, to quantify these parameters, but that's not the point. In the

end, I find that it is best to design for a slightly overdamped alignment that is tolerant of these kinds of shifts. That way, when the woofer is brand new, it won't be grossly underdamped. If used with a low power SET amp with high output impedance, same idea, the shift won't cause it to make a peak. Or if you really throw the power at it, a slightly overdamped alignment is friendly here too, in that it tends to shift towards being less overdamped rather than into being underdamped, causing a peak. It's easier to do this with a high-quality woofer with relatively low Q to begin with.

loudspeaker, Hoffman's Iron Law tells us high-efficiency woofers need large boxes to offer much extension. If you make the cabinets smaller, the low frequency cutoff tends to rise. So deep

just about deepest bass response. It can be, but some might argue it shouldn't need to be. A smooth gradual rolloff is desirable and ultra-low-frequency extension can be provided with subs, if needed.

advantage over other speakers in that directivity is nearly constant through almost the entire audio band. I know of no other configuration that can do this. From the Schroeder frequency up, the woofer pattern is set by the wall angle. The walls also help the midhorn maintain control at the lower end. Each subsystem provides uniform directivity, constant at 90°.

Imaging, placement and orientationBelow the Schroeder frequency, around 100Hz or so, the room modes begin to dominate. Instead of the wave travelling from the apex of the corner outwards, it transitions into acting more like a pressure vessel with standing wave nodes forming inside. This causes strong and weak areas to form within the room, with different positions being pockets for different frequencies.

Positioning and subsThe best way to address this, in my opinion, is by using multiple subwoofers. You could, I suppose, use large cornerhorn bass bins set in each of the four corners. They could be tuned for deep extension. The vertical pattern is 40°, so as long as the midhorn and tweeter aren't so high that the listeners are below the pattern, this is a viable option. So even the larger 8ft3 cabinets are fine in this regard. They'll provide extension to 30Hz or so, and four corner placement works well in many rooms. However, it is probably easier to make the bass bins

small and easy to place. You can put them where you find they work best.