Subject: Re: H290C Horn/Waveguide
Posted by Wayne Parham on Thu, 09 Aug 2012 15:38:12 GMT
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Some have asked why it is important to maintain 90° beamwidth in the horizontal, and why 100° or more is less desirable. For example, one of our friends here recently evaluated another similar waveguide/horn with ~100° coverage. The other horn was touted as a 90° waveguide, but all measurements pointed to it having at least 100° beamwidth in the horizontal. It became somewhat of a point of contention, with the other horn/waveguide proponents reverting to an argument of "how much does it matter anyway?"

So what is the difference between 90° beamwidth and a little more, say 100° or 110°? What's wrong with a slightly wider pattern in the horizontal? How much does it really matter?

If the speaker were outdoors or in a very wide open space, I would find nothing wrong with the wider pattern. With no boundaries to worry about, I almost don't care what the coverage pattern is. But indoors, in a home hifi environment, the whole point of controlled directivity is to reduce early reflections from the nearest walls. I mean, why bother with having a waveguide/horn at all if your coverage pattern allows a significant amount of energy to be reflected off the side walls?

The sound radiated by a horn/waveguide doesn't end abruptly at the beamwidth "edge". Beamwidth is defined as the angle between the directions on either side of the forward axis, at which the intensity of the sound pressure level drops to one-half the value it has on the forward axis. That's only -6dB down, so sound definitely radiates outside this coverage pattern.

The goals are to provide uniform coverage within the desired beamwidth and to limit radiation outside this angle, to reduce unwanted reflections. So if I were to have to choose between being a "smidge" inside or outside the goal, I'd definitely lean towards being slightly tighter than wider. I'd rather have constant directivity through an 80° horizontal arc than 100° beamwidth for this application.

One shouldn't go too far with this, because too-narrow beamwidth is unnatural too. The square corners of our living spaces make 90° beamwidth a very natural coverage angle. But again, we certainly don't want coverage wider than 90°, because that increases reflections and reduces the benefits of controlled directivity. So I think a good target for horizontal beamwidth is to stay in the 80° to 90° range.

This is particularly important in a constant directivity cornerhorn. The bass bin and midhorn are

horn, a source constraint boundary rather than a reflector. But the tweeter horn/waveguide is

waveguide beamwidth be 90°, matching the angle formed by the room's corner. A wider beamwidth would illuminate the walls and cause excessive reflections.

Even in a matched directivity two-way speaker, the extra beamwidth is unwanted. When the forward axes are crossed, toe-in at 45°, the edges of the pattern run parallel to the adjacent walls, just like cornerhorns but usually a little further away. The wall behind the speakers isn't

usually all that far though - often just a few feet - and you really don't want a lot of off-axis energy to reflect off that wall. Using a 90° horn/waveguide ensures that sound directed at this wall is at least -6dB, even at a grazing angle, and more attenuated at larger angle of incidence. So this is the best configuration, in my opinion.
High-Fidelity Uniform-Directivity Loudspeakers