Subject: Horn Throat Constriction
Posted by PointSource on Thu, 04 Jun 2015 23:59:40 GMT
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I wasn't sure whether to post in Speaker, or in Pro Audio, because the loudspeaker in question was intended for a live-sound pro audio application. Please move if required.

Anyway, I'm hoping to get some Horn Guru input about a project prior to any expenses.

I'm attempting to load a pair of cone drivers into the same midrange horn with predetermined dimensions. For both speakers to fit, the passages leading from each square throat to where they meet will gradually collapse to almost half the throat area in (only) one dimension. At the narrowest point, the passage width is about 1/4 WL of 1500Hz. Both passages will feed a common horn flare & mouth. I'm aiming for an upper Xover of 1.6kHz. What kind of harmonic distortion & cancellation might I expect from this arrangement?

Any input appreciated....

Subject: Re: Horn Throat Constriction
Posted by Wayne Parham on Sat, 06 Jun 2015 12:00:00 GMT
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It's really hard to say without measurements or even modeling. But I would expect that front volume to act as a low-pass filter, limiting HF.

Subject: Re: Horn Throat Constriction
Posted by PointSource on Sun, 07 Jun 2015 03:13:39 GMT
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I got the idea that it might work from some old Altec Mantaray HF horns, which would collapse in the horizontal before expanding again. If such can pass HF, then why not midrange / midbass? The total throat area is just under 20in^2 for each 10" cone, so the front chamber area isn't too large (was also thinking about filler). The passage collapses to 2.25" horizontally while the vertical remains the same as the throat height.

Of course, the Mantarays are expanding in the vertical thru the point of constriction, and the mid horn doesn't.

I'm exploring theoretical plausibility for the time being. If the negative responses outweigh the positive, then I've saved time & resources.

Subject: Re: Horn Throat Constriction
Posted by Wayne Parham on Sun, 07 Jun 2015 13:20:43 GMT
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It's just hard to say without measurements. If there is area expansion in the throat, I would expect it to act differently than if there is no expansion or if there is constriction. You also have the matter of two sound sources combining in the throat. This is a case where I think you'll want to make some physical models and test them.

Subject: Re: Horn Throat Constriction
Posted by PointSource on Sun, 07 Jun 2015 19:05:53 GMT
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I knew in the back of my mind what your answer would be: model, build & measure! I have to decide whether the concept is worth the effort & expense.

The 2 sources don't actually combine at the throats; the 2 passages combine in parallel at the start of the common conical flare section. Either way, the 2 wavefronts will expand & impinge upon each other.

The goal is to achieve the longest path length within the given enclosure dimensions, including the use of 180-degree rounded curves. In order for the wavefronts to arrive at the conical flare relatively intact, I've surmised (guessed) that the passage width needs to be about a quarter of the upper frequency's wavelength. I'm concerned that the initial narrowing may pervert the waveform too much.

I'm working on a preliminary mechanical drawing (the old-fashioned way on 1/4 scale graph paper). I can post a photo in the near future if there's any interest....

Subject: Re: Horn Throat Constriction
Posted by Wayne Parham on Sun, 07 Jun 2015 19:43:53 GMT
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Absolutely! Keep us posted!

Subject: Re: Horn Throat Constriction
Posted by PointSource on Fri, 12 Jun 2015 03:29:23 GMT
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Attached is one of 3 conceptual drawings for a pair of 10" drivers in a midhorn (chuckling wryly not permitted during presentation). This variation yields the longest path length of the 3. My concern is with possible effects of narrowing the passage width just after the throat (passage height remains same as throat height).

Convenient here would be a BF-style "W" horn, wherein the throat is divided into 2 narrow & equal passages, without the need to compress the wavefront. I would stack the 10s vertically, in that case. Avoiding copywrite infringement, we move on....

File Attachments
1) 2x10 Midhorn.JPG, downloaded 4281 times

Subject: Re: Horn Throat Constriction
Posted by Wayne Parham on Fri, 12 Jun 2015 15:58:16 GMT
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Two possible suggestions:
1. Use push-pull drive. If you're going to have two drive units, you might as well take advantage of this configuration.

2. Mount the drivers sideways to reduce (or possibly eliminate) the curve needed to feed the throat.

Subject: Re: Horn Throat Constriction
Posted by PointSource on Sun, 14 Jun 2015 21:57:23 GMT
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I thought the throats were in the baffles where the drivers were mounted, while the curved sections contributed to the overall horn path length. Is this not the case?

Subject: Re: Horn Throat Constriction
Posted by Wayne Parham on Mon, 15 Jun 2015 15:40:06 GMT
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Yes, the throat is really just the entry point, the place of smallest area. Behind the throat is a front

chamber, which is the area between the diaphragm and the throat. Beyond the throat, the horn flare makes a continually expanding area.

Subject: Re: Horn Throat Constriction
Posted by PointSource on Tue, 16 Jun 2015 04:08:32 GMT
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So, the lengths of the 2 passages don't contribute to loading the cones to a lower frequency in any way, due to the passages being narrower than the speaker baffle openings? Would vertical expansion thru this region offer any compensation? What if the horizontal narrowing were made more homogenous with the addition of an obstruction closer to the mounting baffle (see attached)?

Bottom line, I've challenged myself to find a way to make the speaker baffle openings in this (or a similar) configuration act like proper throats.

File Attachments
1) 2x10 Horn Mod.JPG, downloaded 2946 times

Subject: Re: Horn Throat Constriction
Posted by Wayne Parham on Tue, 16 Jun 2015 15:41:56 GMT
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They absolutely do contribute to loading the cones, and I would expect that one of the things they do is to increase acoustic loading at lower frequencies. The thing is it's hard to know without measuring or at least modeling. I'd model this device in Hornresp, or at least half of it (one side).

My intuition is the curved sections will act partly as front chamber and partly as part of the flare. They'll increase the overall length, which will help load at lower frequencies. If the overall area continually increases, they'll act more like "flare" and less like "front chamber." But if the area decreases, they'll act more like front chamber and less like flare. And in either case, the radius will affect the HF limit and probably cause some rolloff. You'll also have the combination of the two sound sources affecting HF performamce too.

But measurements trump intuition any day. You'll only really know what this device does after you've measured it.

Subject: Re: Horn Throat Constriction
Posted by PointSource on Wed, 17 Jun 2015 02:31:00 GMT
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It's tricky, trying to determine where the tipping point is by sheer intuition, but exploring the extent of intuition gives a better feel about whether to proceed with a physical investment.

My amateur intuition told me that I'd get the lower cutoff I needed (with the right driver), at the expense of some top end. I kinda knew that the constriction would cause problems. I'll tweak the concept a while longer; it doesn't feel quite right yet, tho it's close enough now for HornResp.

Everyone else's commentary is welcome as well...!

Subject: Re: Horn Throat Constriction
Posted by PointSource on Sun, 22 Nov 2015 06:06:43 GMT
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After kicking around my 2x10 horn design for awhile, I've given up on trying to get it to (theoretically) reach 1600Hz to mate with a coaxial 1" comp. Although I like the driver placement, I can't get away from the notion that I'm creating double front chambers prior to the 2 passages combining. Perhaps a better plan is to mate it with a larger format comp & cross in the region of 1kHz to 1.2kHz, then mount horn/driver on top.

I'm still hesitant to put any money into this project....

Subject: Re: Horn Throat Constriction
Posted by Wayne Parham on Sun, 22 Nov 2015 14:41:29 GMT
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I think horns are tricky enough, folded horns, even more so. I personally love folded basshorns, but prefer straight midhorns and tweeters.

Subject: Re: Horn Throat Constriction
Posted by PointSource on Tue, 24 Nov 2015 06:08:20 GMT
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Unfortunately, I can't get the FR I need in a 1x10 straight horn that shallow. The LF Xover target is 150Hz. I'd either have to go 4-way (no-way), or vent the rear chamber. I've been wondering lately if the Delta 10A has a high enough Qts & low enough Fs to get away with venting? I

currently own 6 Delta 10As, gotta do something with 'em! Over-excursion would be the main concern....

Subject: Re: Horn Throat Constriction
Posted by Wayne Parham on Tue, 24 Nov 2015 16:21:54 GMT
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Well, that's true. Straight horns can get pretty long at lower frequencies.

Subject: Re: Horn Throat Constriction
Posted by PointSource on Thu, 26 Nov 2015 06:49:58 GMT
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I have 2 other 2x10 arrangements within the same overall dimensions, if anyone's interested in viewing the next one....