
Subject: FINISHED basshorn plans!

Posted by [Adrian Mack](#) on Fri, 09 Apr 2004 03:06:25 GMT

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Just finalized the basshorn that I will build for my 18" bass driver (18-Sound 18LW1400). Response curve 1w/1m: Practically 25Hz response in eighth space! Its because I ended up adding a little more length to it while keeping mouth area small to get lowest Fc. Excursion is also lower now down to a lower frequency than before, more power handling and SPL :DA linkwitz riley crossover which is -6db at the crossover point, at 70Hz will get rid of the rising response curve and make it completely flat. Hornresp doesn't predice room nodes of course (only boundry reinforcement as extension of length and mouth area) so I might get more bass than in the above graph. 2.80m long, 2000cm² mouth. Close approximation of real exponential flare (areas correct for expo). Schematic: All wood is MDF, 25mm thick (=1"). External dimensions inc wood thickness is 100cm deep, 109.25cm high, and 53cm wide. Compact by my book :DThe 18LW1400 has a very stiff cone so it wont self destruct from throat pressure like some drivers do. Bassmaxx have also done work with the 18LW1400 and it survived all the tests, while other drivers the cones just crush (eg: Aura 1808). I think they are going to use the 18LW1400 in the new Bassmaxx B3. As I said before JBL 2242, Eminence Magnum 18LF and Omega 18 also have the same response curve in this horn so they could be used too. Adrian

Subject: Re: FINISHED basshorn plans!

Posted by [Wayne Parham](#) on Fri, 09 Apr 2004 04:01:53 GMT

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That looks like another excellent horn, Adrian. This one is really cooking, going down to 25Hz. And you're right, it isn't really all that large. I'd like to build one around a Magnum 18LF and give it a listen. I wish I didn't have so many things going on right now...

Subject: Re: FINISHED basshorn plans!

Posted by [Adrian Mack](#) on Fri, 09 Apr 2004 04:17:22 GMT

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I'm going to start building the basshorn in about a month or so anyway so I'll tell you what its like. Its my turn to cut all tricky angles now :P unless I pay somebody else to do it like Mike did. Has the midrange horn from the cabinetmaker come back yet? Any pics so far? Or are you waiting for the box around it to be finished first? Adrian

Subject: TEASER

Posted by [Wayne Parham](#) on Fri, 09 Apr 2004 05:34:12 GMT

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little teaser. I really like it, it sounds great and it's easy to build. I've actually found some unintended additional applications that are pretty exciting to me. As you know, I planned this for

speakers; You can use it as an add-on upgrade for existing speakers or install it right off the bat on new speaker systems. I've also drawn up plans for a cabinet that sits flush on top of a Klipschorn or Klipschorn clone. But something occurred to me when I was testing, and that was to use an Alpha 10 on this horn in a little mini-VOTT kind of cabinet of about 5 cubic feet, rear chamber port-tuned to 35Hz. Put a nice wood horn on top and make the cabinet shape so that it can be used against a wall or in a corner. That makes the horn smooth, and the large cabinet makes bass response deep. It has a shelved response, but with corner loading, not only does the midrange horn become smoother and deeper, but bass is assisted by the boundary conditions

pretty slowly. But the horn itself is done and now I've just got to document everything and write it up.

Subject: A heretical tip from a heretic.

Posted by [Bill Fitzmaurice](#) on Fri, 09 Apr 2004 11:02:26 GMT

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Leave the angled reflectors out. With a low pass at 150 Hz or lower they aren't necessary. Makes construction a lot easier, lightens the box, lessens materials cost. The purists will wail but trust me, they aren't necessary.

Subject: Re: A heretical tip from a heretic.

Posted by [Adrian Mack](#) on Fri, 09 Apr 2004 12:35:52 GMT

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Hmmm, I was thinking about the same thing. I've heard some say they couldn't even get measured differences with and without reflectors. I was thinking, maybe I should remove all reflectors but the bottom two? Because they keep the areas right for expo flare as in: I think I'd rather just have them all out though, but it makes the bit in the middle a lot bigger area than surrounding bits. But I dunno if it matters. Technically it should make my path length a bit longer I think if I remove the reflectors, so that's good (stays flat and just goes even lower according to Hornresp, all good!). So should I forget about all the reflectors and leave them out? If you say it'll be fine I believe ya. Hornresp doesn't seem to show much change anyway with a fatter 3rd segment... It will be so

much less effort to build. Adrian

Subject: Re: TEASER

Posted by [Adrian Mack](#) on Fri, 09 Apr 2004 15:24:27 GMT

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Nice horn! I thought the throat was square? The picture appears to make the walls of your horn look a little curved, although it's probably my eyes playing tricks on me :P Will the JBL 2012 or 2123 also work like the Alpha with a vented rear chamber to below 100Hz? What's the current low limit of the Alpha 10 unit? Maybe you could even rear load the Alpha 10 to 70Hz... something like 1.25m length with 2000cm² mouth using only a single fold with the mouth exit at the front, underneath the midrange horn. though I'm not sure if loading both sides of the driver with different horn types is a good idea, I guess it could be OK though just like loading one side vented and the other a horn, it works although I'm just speculating. Do current Pi Corner horns provide horn loading to 300Hz? Or are they direct radiator by then?

Subject: Re: Now I have to win those E120's

Posted by [Bill Epstein](#) on Fri, 09 Apr 2004 19:56:30 GMT

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Just as soon as you can explain how to build and cross this thing, I have to have it! Saw some JBL E120's on E-Bay would be nice. Missed out on the Tent Sale 2123's.

Subject: Re: A heretical tip from a heretic.

Posted by [Bill Fitzmaurice](#) on Fri, 09 Apr 2004 20:03:13 GMT

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Based on my results with folded subs I'd forget the reflectors entirely. The second option saves a lot of work and a lot of wood and will likely sound just as good. I would drop the upper panel that leads to the mouth a bit to make the flare more uniform. In my experience the whole concept of flat reflectors as postulated by Huygens is flawed. Reflectors are only necessary above 200 Hz or so, and then to work properly they have to be round.

Subject: Re: TEASER

Posted by [Wayne Parham](#) on Fri, 09 Apr 2004 20:11:57 GMT

My models and tests were done with the square throat. All my prototypes had square throats. When I sent plans to Bill Martinelli to quote, he sent a sample with a round hole in the throat plate. I suppose it could be done that way for ease of cutting, but it doesn't measure as good. The biggest difference is up high, they can't be run to 1.6kHz with the round throat. I kinda like the look of the square throat anyway. But I know cutting them is difficult unless you're using a CNC machine. The horn itself doesn't go below 150Hz, even in a corner. If not in a corner, it won't go below 250Hz. Really, as it is intended for vocal range, that's fine. I wouldn't do the vented-rear chamber with a Delta 10 or JBL 2012, and would use them with a sealed back for their intended use as a midrange horn. But the Alpha 10 is a pretty good little midwoofer, and it delivers deep bass. It occurred to me that it might be suitable for

style cabinets with short front midhorns and bass-reflex bass. It's cool looking, and should work well as at its price point, being somewhere around the cost of the higher priced Thermionics. In kit form, maybe even cheaper.

Subject: Re: Now I have to win those E120's
Posted by [Wayne Parham](#) on Fri, 09 Apr 2004 20:15:25 GMT
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use Alpha 10's. For a vocal range horn, use the Delta 10 or JBL 10 inchers.

Subject: Re: A heretical tip from a heretic.
Posted by [Wayne Parham](#) on Fri, 09 Apr 2004 21:16:48 GMT
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What I've always considered as a reflector is a boundary that is greater than a wavelength away from its source and greater than a wavelength in size. The reflected energy is directed away like a mirror of the angle of incidence, something like shown below. So I'd love to see an illustration of what you are talking about. At high frequencies where a boundary becomes a reflector, it would stand to reason that making the reflector so that the angle of reflection directs sound towards the mouth would be best if you wanted to promote HF energies. Or make the angles of reflection to direct sound into an absorbent material or device if you want to attenuate HF. Curved reflectors would seem to do a little bit of both, so I'm interested to see examples of what you're talking about. Maybe you're talking about something like the diagram below?

Subject: pics dont show up.....
Posted by [Adrian Mack](#) on Sat, 10 Apr 2004 00:09:47 GMT
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The pics arn't loading for me, can you recheck the link and correct them so I can see?

Subject: Re: A heretical tip from a heretic.
Posted by [Adrian Mack](#) on Sat, 10 Apr 2004 00:44:32 GMT
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I lowered that panel a little bit:Cant do much about the areas in the angled bit really, where length is above 40cm... but I think it'll be ok. It's a little more even than before. I get 2.8m dead down the middle, probably like 2.9m considering the length is more towards the outter bits so I'm happy with that.

Subject: Re: pics dont show up.....
Posted by [Wayne Parham](#) on Sat, 10 Apr 2004 03:50:55 GMT
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It's just a couple of photos I found by doing a internet search for "angle of incidence". I wanted to illustrate the reflector and found a few pretty neat little websites in doing so.

Subject: Re: pics dont show up.....
Posted by [Adrian Mack](#) on Sat, 10 Apr 2004 04:58:26 GMT
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Oh yeah they're showing up now anyway, dunno what was happening this morning. I remember seeing that diagram when I was in yr 8 or 9 highschool doing physics :P

Subject: Re: A heretical tip from a heretic.
Posted by [Bill Fitzmaurice](#) on Sat, 10 Apr 2004 12:29:27 GMT
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Actually John Sheerin has done some sims that show what happens in a round bend quite nicely. He'd be a good addition to this forum. At low frequencies, say 200 Hz or less where the wavelength is 5 feet long or more, the wave doesn't see the bend as an obstacle at all, so a reflector serves no purpose. Problems generally arise in typical cabinet sizes at 400 to 500 Hz, precisely where other designers have run into problems they've tried to cure with flat reflectors with varying degrees of success. Most have thrown up their hands in defeat when they couldn't get usable flat response above 500 Hz from folded horns, blaming their woes on the supposedly insurmountable 'mass rolloff' obstacle. This is really a cop out, as the Fhm calc has nothing to do with folded horns per se anyway, but if you tell a lie often enough sooner or later it takes on the ring of truth, right? At high frequencies/short wavelengths where the bend is an obstacle you don't want to 'bounce' shorter wavelengths off reflectors, as your illustration shows. This is what Huygens postulated, and he was wrong. If you imagine the wavefront as a group of particles across the width of the pathway, rather than one particle as you show it, what happens after they bounce off a reflector is that they lose their cohesiveness as a wavefront, emerging at various angles of phase and cancelling each other out, killing HF response. With rounded bends, specifically with large inner radii, the bend doesn't reflect at all, but instead serves as a true waveguide that allows the wave to pass through relatively intact, rather than being broken up. Again, I don't have an illustration of how it works, but Sheerin has some very good ones. Oddly enough, after he posted those at the AA forum, the outraged cries from one source in particular that my folded horns couldn't possibly work as advertised ceased. Still waiting to hear from Ed Dell on the question of permission to reprint my articles, otherwise I'm ready to go on the site.

Subject: Re: A heretical tip from a heretic.

Posted by [Wayne Parham](#) on Sat, 10 Apr 2004 20:24:31 GMT

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I've seen John's 2D models. They tend to show pretty much what you'd expect, that the angle of reflection mirrors the angle of incidence. So that tells me that any sort of reflector that directs sound towards the mouth will increase HF output, and those that don't, won't.

Subject: Round horn bend sim

Posted by [Bill Fitzmaurice](#) on Sun, 11 Apr 2004 12:33:47 GMT

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Wayne, I think you're referring to the pics on John's site that show waveforms passing through a 'square' bend off a flat reflector. Yes, the angle in equals the angle out- just like playing pool- but, if you trace the path of each of the point source particles that comprise the wave you'll see that once they reflect off the bend a large percentage of them will smack into other particles still on their way to the reflector, and those colliding particles would then take off helter-skelter every which way, rather than going towards the mouth in a cohesive fashion. This concept doesn't

necessarily duplicate precisely what happens when a wave is fractured into smaller wavelets at various angles of phase, but it's pretty close and should be easy to visualize. What I was referring to was a series of posts that Sheerin put on AA with sims of round bends, showing how they allow passage of a wavefront intact, without any reflection and thus fracturing of the wave into wavelets. This is one of his pictures, and it shows an entirely different scenario for passage of a wavefront as compared to a reflector. Assuming, that is, that I managed to get the URL right this time.

Subject: Two illustrations

Posted by [Wayne Parham](#) on Sun, 11 Apr 2004 19:57:30 GMT

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Movement of a pressure wave with wavelength larger than the duct cross-section looks like this: When wavelength is small in relation to duct size, propagation is more like this:

Subject: That's logical.

Posted by [Bill Fitzmaurice](#) on Sun, 11 Apr 2004 20:23:09 GMT

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However, I've found in practice that the opposite is true, and that HF transmission through a rounded bend is enhanced as the radii of the bend, particularly the inner radius, is made larger. Thus, while the longest wavelengths require neither reflectors nor radiused bends, as the wavelength is decreased the inner bend radius required for its passage intact through the bend must be increased. As an example, my DR250a loaded with a PAudio SN10 has a HF limit of 4kHz, with an inner bend radius at 2-1/4". The same driver in a larger cabinet of the same basic design with an inner bend radius of 3-1/4" runs to 5kHz. Conventional wisdom says it should be the other way around. So far as I know Sheerin is the only one who's done extensive theoretical work on what happens in round bends. In truth I've done very little, my route being to build the box first and then try to figure out why it works as well as it does. Either way we both end up in Rome.

Subject: The DR250a

Posted by [Bill Fitzmaurice](#) on Tue, 13 Apr 2004 02:23:48 GMT

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Here's a link to a picture of one. <http://hometown.aol.com/billfitzmaurice/myhomepage/photo.html>
<http://hometown.aol.com/billfitzmaurice/myhomepage/photo.html>

Subject: Re: The DR250a

Posted by [Wayne Parham](#) on Tue, 13 Apr 2004 04:40:32 GMT

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Interesting design, Bill! It appears to be a group of speakers in a small cluster array each driving a backloaded horn. Is that the case? Or is there a larger driver inside the horn that isn't visible, and the cluster array is midrange drivers?

Subject: Re: The DR250a

Posted by [Bill Fitzmaurice](#) on Tue, 13 Apr 2004 11:25:35 GMT

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The design is a front loaded 'W' folded horn, loaded with a ten inch woofer. Overall size is about 7 cu.ft., weight 35 lbs, intended usage electric bass/keyboards/PA. The visible drivers are tweeters arranged as two vertical arrays in a cross-firing configuration. This gives 45 degree off-axis horizontal dispersion within 3dB of on-axis SPL and 120 degree total horizontal dispersion within 6dB. The trade off to get this is a falling response above 8kHz, but in pro-sound applications this is not problematic. Link attached to SPL chart.

<http://hometown.aol.com/fitzmauricew/myhomepage/photo.html>

Subject: Re: A heretical tip from a heretic.

Posted by [Ron S](#) on Wed, 21 Apr 2004 05:19:25 GMT

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Have you built any of these yet. I have 64 18" drivers and although I built an LAB and it did go lower than my current MTL subs I would rather use the RCF drivers I own. Cheers

Subject: Re: That's logical.

Posted by [John Sheerin](#) on Tue, 27 Apr 2004 11:05:36 GMT

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Hi, This may be a bit late, but my original images are here: <http://ldsg.snippets.org/HORNS/images/roundbend/> I would not really say this is theoretical work - there is a lot of theoretical work on horn bends out there, but it seems to be mostly in the JASA which is harder to search or other even harder to get journals. Anyway, looking at my FEA's again, I'd say that for a given frequency, with relatively small horn cross sections, large round bends work well. For larger horn cross sections, reflectors work better. If you're looking at the

FEA's, the dimensions on the grid are inches, and as noted, the frequency is 5khz.John

Subject: Thanks for the input

Posted by [Bill Fitzmaurice](#) on Tue, 27 Apr 2004 20:00:36 GMT

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and good to see you over here where there's a pretty complete absence of flaming. Wayne hasn't come out and said so per se but there is a time lag here between posting and when the message appears, so my guess is there's some active 'filtering' going on. With any luck we won't have to deal with Romy or those of his ilk. Again, welcome aboard.

Subject: Re: A heretical tip from a heretic.

Posted by [Adrian Mack](#) on Wed, 28 Apr 2004 08:37:57 GMT

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Hi RonNot yet, but I will be doing it. I'll be posting results on this forum when it does get done, but it may not be for a month.CheersAdrian
