Subject: Another Hornresp Question
Posted by wunhuanglo on Sat, 21 Feb 2004 03:12:56 GMT
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Hi All!Hope you can provide some insight.I've been modeling a mid horn and got results that indicate very flat response from 150 Hz to 1000 Hz with a conical horn. That part seems great to me. The throat/Sd ratio is 0.5 which isn't out of line.It's a 6" driver that seems to need a 3L back chamber - physically that's no problem given the driver dimensions.What's bothering me is that the horn mouth has a radius of 10-1/8 (325 in^2) inches BUT a length of only 7 inches.This seems incredibly short - why does the response plot look so good?

Subject: Re: Another Hornresp Question
Posted by Wayne Parham on Sat, 21 Feb 2004 05:39:38 GMT
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field. If it is set for 0, you're modeling an infinite horn which always has a nice response curve. Generally, use in larger areas makes response more peaky. So worst-case is usually freespace response.

Subject: Re: Another Hornresp Question
Posted by Mike.e on Sat, 21 Feb 2004 06:13:15 GMT
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Is there any practical usage for the infinite horn setting? I know that the early horns used the infinite models ,more simplerbasshorn transporter-Cheers!Nice backplate!

Subject: Re: Another Hornresp Question
Posted by Adrian Mack on Sat, 21 Feb 2004 14:15:27 GMT
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I would check what Wayne said as well. Eigth space modelling or infinite horn modelling is definitly not what you want to do on a mid horn, it'll show a lot more bass than its really got. I bet that's what you've done. Set it to 2PI instead. 7" length is 1/4wl of 480Hz so this will be the lowest usable point. Depending on mouth dimensions, usable response may start at a higher frequency

than this, but the right dimensions will let you use it to 480Hz. I'm interested in what your doing - what driver are you using on this horn? I've used Eminence Alpha 6" driver on tractrix and conical horns with success from 300Hz-2KHz.

Subject: Re: Well, I'm modeling in 4 pi.....
Posted by wunhuanglo on Sat, 21 Feb 2004 15:27:48 GMT
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I'm modeling a 6 inch Davis driver in free space (4 pi)Sd 141CMS 7.87E-4MMD 11Re 6.16Bl 6.5Rms 1.91Le 0.61What's an "approximation" is MMD. The data sheet says MMS is 11.5 grams. If I let hornresp do its thing it want to come up with a 16 gram cone, which can't be right.

Subject: I guess what might be happening
Posted by wunhuanglo on Sat, 21 Feb 2004 15:48:54 GMT
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is that the driver is happy in a 5L enclosure (Vas 30L, Qts 0.4) so the "horn" is providing baffle assist to keep the low end up.Sound plausible?

Subject: Re: I guess what might be happening
Posted by Wayne Parham on Sat, 21 Feb 2004 16:50:40 GMT
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Hard to know without looking at the model. You might screen print the data entry screen and SPL graph; Lots of folks here have experience with Hornresp, so maybe one of us will have some time to look it over.

Subject: Re: Another Hornresp Question
Posted by Wayne Parham on Sat, 21 Feb 2004 17:00:20 GMT
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I like to look at the infinite horn response curve to get an idea what the horn might do if built largely oversized, or used in a highly constrained space. It's sort of like a limit for the horn, something that can be approached but never attained.Once you look at finite horns, you start

seeing its reactive nature much more, and the thing begins to show its response peaks. That lets you make some decisions about what to do to reduce those peaks, and where a particular horn is suitable and where it is not.

Subject: Possible answer
Posted by Adrian Mack on Sun, 22 Feb 2004 03:14:04 GMT
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I was modelling an Altec 409-8D 8" driver in Hornresp a few weeks ago and something happened that is similar to your situation. Horn length was only long enough to support a 300Hz Fc, but it had an 80Hz F3 with a 3db dip at 150Hz and a little hump at 80Hz when there was no back chamber. A 17L back chamber showed the dip rise to 180Hz and the hump rise to 120Hz making the new low end F3 100Hz, and efficiency in the 100-150Hz region raised overall by about 2db. Mouth size was a good 1600cm^2, similar results happened with a really large 2500cm^2 mouth, response was just flatter.My conclusion was that it was just acting simply as a closed box down that low (which it would anyway). But the driver was more different as it's got an Fs of 91Hz and a very high Qts of 1.54, so I thought that could be the answer. The high Qts tells me that any rear box volume is going to peak quite a lot at the closed box resonance. Modelling the closed box response of the driver in a simple box modelling program (like Boxplot) showed a good +4.5db peak at ~90Hz when in an infinitly large box (like an IB or dipole). In a 17L box (volume size equal to Vas), it shifted to the 120-130Hz region and peaking at resonance became even more pronounced at almost +7db. This corresponds to what Hornresp showed me comparing the horn with no back chamber (like a dipole, with Qtc equalling Qts and the resonance equalling Fs) to the horn with a back chamber of 17L, the inclusion of back chamber shifting F3 from 80HZ to 100Hz in the horn (because the 17L rear volume raises its Qtc, so F3 rises too). The increase of peaking at resonance from 4.5db to 7db accounts for the increase in efficiency on the horn of ~2 to 2.5db between 100-150Hz. The peaking of the back chamber was boosting the low end response around 100Hz, and this major peaking of the closed box combined with the horn response was enough to make the F3 be at 100Hz. Response was within +/- 2.5db from 100Hz to 1KHz, so the high Qts made the output usable to 100Hz (although it required a lot more excursion at 100Hz than at 300Hz). If Qts was a lot lower, say 0.30, then I seriously doubt this would occur and low end cutoff would be 300Hz, as a horn length of 30cm supports, providing mouth is of adequate size. However you have said your drivers got a Qts of 0.40, so something else must be going on. If Fs was around 30Hz then with the Vas of 30L and Qts of 0.40 you may see some more output down low, but its not peaking or anything so I wouldn't expect it to actually be flat down low, you could see a step from 480Hz (Fc of 7" long horn) and then the step giving more output down low but at an attenuated level (like an EBS ported box style response at the low end, 150Hz to 480Hz on your horn). Is this what it looked like?Perhaps you've got some of the parameters wrong? Mmd can never be less than Mms seeing that Mms=Mmd+Mmr, so maybe theres an error in your inputs. Mmr (air load) for a typical 6" driver with 125cm^2 Sd is only 0.8grams. For referance, here are some Mmr approximations for different driver sizes: Adrian

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Subject: Thanks, Adrian
Posted by wunhuanglo on Sun, 22 Feb 2004 03:53:02 GMT
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Sent you an email.

Subject: Midrange horn answers
Posted by Adrian Mack on Sun, 22 Feb 2004 06:02:53 GMT
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Cool, I can see what was happening now from those response curves and inputs you sent me. I threw Fs, Qts and Vas into a box modelling program using a closed box volume of the size you entered in Hornresp, which was 3L. It shows an underdamped response and peaks 3.8db at about 165Hz. As it turns out, this is one of the reasons you were getting more frequency response extension on the low end than you would get normally. A box volume of 19L for this driver gives a Qtc of 0.707 for the rear chamber so it doesn't peak at cutoff. Without changing any other horn parameters, compare the response in Hornresp with 3L rear chamber to a 19L rear chamber on your horn model. Efficiency between 100-300Hz is less, its 4db down at 150Hz compared to 400Hz (for anyone else viewing the thread, response was dead flat with the 3L chamber from 150Hz-500Hz and up to 1KHz as well, just a bit more wobbly). The 4db peaking is part of the reason for the LF boost. Also notice that the rolloff seems a lot shallower and to a lower frequency than before as well, because Fb of the rear volume of 19L is lower than Fb when its 3L, and both are a lot lower than horn Fc. The extra 12db/oct rolloff below Fb doesn't begin until a lower frequency. Excursion at low frequencies is also less now. While the horn now rolls off below 500Hz (about the 1/4wl frequency of its length) its not rolling off very fast at all, a meagure 3db/oct. Reason for this is efficiency. Remember that a horn cannot effectively reach maximum efficiency until its length is 1/2wl of frequency to be used (nor can it reach zero acoustic phase for that matter) although the horn will work when length is 1/4wl of lowest frequency. Notice that despite being on a horn, the 1w/1m sensitivity of it is only 90db 1w/1m, which really is nothing more than what the driver does in a simple acoustic suspension or reflex box. Horn length is very small at 7", actually it was 6.69" in the model you sent me (hence its rolling off below 500Hz and not 480Hz being my previous assumption). Since hornresp works in centimeters, lets use these terms instead. Length that you had entered was 17cm, increase this to say 30cm and have it calculate SPL curve. Notice that efficiency above 300Hz is now 4-5db greater than when it was 17cm long, and now frequencies below 300Hz are attenuated a lot more because of this. The "real" low end limit shifts to 300Hz from 500Hz now because 30cm is 1/4wl of 300Hz. The longer length is also increasing efficiency. Its now falling off more rapidly from Fc to Fb, where it is direct radiator below Fc. Compare efficiency at 300Hz now to 150Hz, its attenuated almost 9db now. To add to that as I mentioned before, passband efficiency is now 94/95db 1w/1m with 30cm length and not 90db 1w/1m when it was 17cm length. If it were a different driver with a smaller and lighter diaphragm designed to work above 500Hz, say a 3" or 4" driver, even some 2" compression drivers can work this low, then 7" would be the correct length to maximize efficiency. The driver that your using though with its 43Hz Fs etc is "meant" to be used lower than this and it doesn't work right when length is this short. To comment on the rest of the inputs, change front

volume to ~118cc from the 250cc that you had. Although different 6" drivers vary their volume under the cone because of different cone shapes, the volume of air under the Eminence Alpha 6" driver cone that I measured was 118cc, so we can assume your 6" has a volume "around" this amount. Any differences between different makes of 6" will be minimal anyway. Since the cone is shape which is just that, there isn't a fixed or single cross section area, so its hard to put a value into Hornresp. It cannot be bigger than Sd though, so change it to around ~80cm^2 for a 6" driver. It's got nothing to do with the LF cutoff which is the main purpose of this thread, but rather the HF cutoff, I thought I would mention it anyway. I'd make the throat perhaps a little smaller, say 55cm^2 to maximize HF efficiency. Hornresp does not predict this accurately though, but it's likely to be better when you measure the response if you actually build a horn for it. If you have calculated the SPL curve again after these changes you'll notice efficiency changes again. Changing throat and front chamber sizes/volumes will effect passband efficiency along with other things. If the throat is made smaller the horn will load to a higher frequency up to a certain point, then it becomes attenuated again by out of phase reflections between the cone and mounting plate. You can see that the volume between cone and mounting plate forms a resonant chamber acting like an acoustic lowpass filter for the high frequencies. Then there is other things to consider as well such as distortion from throat resistance, too small a throat will choke the low end and it all becomes non linear. There is a specific range of values to maximize efficiency, bandwidth and distortion products. Don't trust what Hornresp predicts on the top end though, it's model isn't accurate enough for this. To me this doesn't seem like the best driver for a horn. It's Fs is too low so efficiency is compromized a lot. 94db 1w/1m from a driver/horn is low considering many horns boast at least 100db 1w/1m. If you make length much longer than 30cm, the response curve starts to generate a lot of ripple. If you make it 57cm long or 1/4wl of 150Hz, it makes horrible ripple with the tallest peak being 8db. You need to look for ones with a higher Fs (hence lower moving mass) which will also have higher efficiency, motor strength governs this too. This is why I choose the Alpha 6 driver for my midrange horn. Remember that the horn lowers the Fs of the driver so you can get more low end out of a low qts/high fs/high eff driver in a horn than you could in a closed or reflex box, which for a driver with these specs would have a very high f3 by comparison. Adrian

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Subject: Thank you so much, Adrian
Posted by wunhuanglo on Sun, 22 Feb 2004 16:24:03 GMT
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I sincerely appreciate all your help in looking at this for me.I was trying to use some front chamber volume to smooth the response, so the 250CC was based on a guess that the average cone height is 1cm. For an Sd of 141cm I was approximating the "free" (as in I can't do anything about it except a phase plug) chamber volume at 150cc. I then added another 100cc based on a 1/4" (.75 cm) spacer.What i didn't understand was you comment "so change it to around ~80cm^2 for a 6" driver". Wouldn't I still consider the entire cone area as contributing to the front chamber volume rather than just the area projected under the throat?Thanks again.Charlie

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Subject: Re: Thank you so much, Adrian
Posted by Adrian Mack on Mon, 23 Feb 2004 08:35:47 GMT
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Hi CharlieNo worries about it. The cross sectional area of the front chamber varies depending on where abouts you measure it. The diaphram is a cone shape, so as you move in toward the dustcap the cross section area gets progressively smaller. 80cm^2 isn't really accurate either, seeing as it will be a range of values (cross section area at the surround will be bigger than cross section area nearer to the dustcap). I use this number though just because its somewhere around the middle of the possible values. It doesn't matter anyway for what you want to enter into Hornresp seeing as it doesn't predict response at the top cutoff accurately. I've found in the past that spacer's between the driver and mounting plate are generally a waste of time when you do the measurements. Extra volume in the front chamber isn't needed when your doing a horn like this. I would forget about it, and mount the driver directly onto the mounting plate and whatever air that is trapped underneath the cone will be your front chamber volume. Adrian

Subject: mack
Posted by Mike.e on Tue, 24 Feb 2004 02:34:26 GMT
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Hello AdrianCould you please list your thread links?the ones for -midrange horn discussion-HF horn discussion-BI radial / other horns and design choices,dispersions.since pi moved,and i dont have the links since i formatted pc,need to find again.Cheers!

Subject: Re: mack
Posted by Wayne Parham on Tue, 24 Feb 2004 06:39:31 GMT
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items:"Adrian Mack""midrange horn""tractrix""conical"I know that each of those will give you a lot of links, but you will be able to identify some of them by their subject titles. Just click through a few and I'm sure you'll find the things you're looking for.Sorry the search feature isn't more advanced, and looks only for exact matches. But that's the most used type of search, so I suppose that's a good one to have. Chris R. is looking over the code and may donate some time; I also will probably put some time into the deal, but I have about a zillion things to do first.