Subject: Impedance rise in hons
Posted by Bob Coley on Sun, 13 Jan 2008 02:34:19 GMT
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I'm hoping to build a horn with a large peak right at about 52hz. If I'm successful, would I get a substantial impedance rise at 52hz like I would with a ported box? Is it possible to design a horn with a large peak at 52hz? From my experience most horns are pretty flat, but that's not what I'm looking for. This horn will be striclty for competition. That's why the 52hz is so critical as is knowing the impedance rise. Does anyone know how to calculate the impedance rise?

Subject: Re: Impedance rise in horns
Posted by Wayne Parham on Sun, 13 Jan 2008 20:58:03 GMT
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An electrical impedance rise can be because of acoustical or mechanical impedance in addition to purely electrical causes. In the bass range, the cause is almost always mechanical or acoustical. In a sealed box sub, there is a single impedance peak caused by the mass/spring resonance of the driver mass and the suspension spring plus the air load from the box. In a vented box, there are two electrical peaks. In a transmission line or horn, there are several impedance peaks. They are the result of several things, but mostly standing waves that setup along the line.

It is pretty easy to tune the system for a single note. What's hard is to make it uniformly highly efficient across a wider band. If you just need a single note to be efficient, you can tune a horn/pipe for that frequency and tune the rear chamber to peak at that same frequency. That way the system will be mechanically and acoustically resonant at the frequency you want to be loudest.

David McBean's Hornresp program will probably be very useful for you. You can download it at the link below.

Hornresp

Subject: Re: Impedance rise in horns
Posted by Bob Coley on Mon, 14 Jan 2008 00:47:13 GMT
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Hello and thanks for the great reply. I learned a lot from you Wayne.Here's where I'm at with design.I building this enclosure arounds a TC Sounds TC3000. QMS 6.1Res 4.63BL 27.1Mms (grams) 373.00Cms uN/M 136.00Sd (m^2) .0820Vas 127.60Fs 22.35Qes .330Qts .313nO 4.16E-03SPL (dB) 88.19This driver has quad 1.4 ohm voice coils that I plan on wiring for a .35

ohm load. That's why impedance rise is so critical. I want to a play one tone and one tone only (51 hz). I know that if I use 2 1000 watt RMS amps and wire it that way I will likely cause more than just hearing damage if I miss that target frequency. Anyway, below there should be a basic diagram of what I'm looking at building. All the dimensions are outside dimensions. The depth will be 17". I'm planning on using 3/4" MDF, but would open to doubling the outside wall thickness if needed. Some of your thought would be great.Thanks again and have a great day.

Subject: Re: Impedance rise in horns
Posted by Wayne Parham on Mon, 14 Jan 2008 02:23:51 GMT
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Some people call that a rear-loaded horn, others call it a scoop. Either name you give it, the front of the speaker radiates directly from the cone and the rear through the pipe. Only bass gets through the pipe but full range is radiated out the front. The front wave and rear wave sum together, so of the overlap range of bass and misbass frequencies, some combine constructively and others cancel. You can model this with Hornresp.You might also try a traditional front-loaded horn and see what you come up with. Since you only need one frequency, you don't have to care as much about mouth area so the horn might not have to be all that big. You'll want the length to

area and environment offset this some though, so you may find a slightly different length gives you an edge. You can play with that some in Hornresp and afterwards when you make a physical model.Also try different rear chamber volumes to set it for the biggest peak at 51Hz. Making the rear chamber smaller will raise the mechanical resonant frequency of the woofer cone, so you will want to set that for the biggest peak at 51Hz. Too large will increase output below 51Hz and too small will increase output above 51Hz.The throat area and front chamber volume will also have an effect on response, so play with those values. Smaller throats give higher compression ratios but be careful because too much compression will bend or tear your woofer cone at high excursion levels. The front chamber volume will act as a low-pass filter.Finally, the shape of the pipe will have an effect on response so try different taper angles. Since you are only trying to generate a single frequency my gut feeling is a straight pipe will be fine but try tapered pipes as well.

Subject: Re: Impedance rise in horns
Posted by Bob Coley on Mon, 14 Jan 2008 02:47:29 GMT
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Thanks Wayne. That is great information. I'll see if I can figure out how to use Hornresp tomorrow. I'll be sure to let you know what I come up with. Most people that get into SPL competitions use simple ported enclosures. I've had great results with horns for normal listening and I have a feeling that done right, a horn might be able to out-perform a ported enclosure in the SPL department as well. I've just never seen it done before. I chose 51 hz because that is the resonant freq of my vehicle.

Subject: Re: Impedance rise in horns
Posted by Bill Wassilk on Mon, 14 Jan 2008 17:32:26 GMT
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Since your only going for 1 frequency why not just build a 6th order bandpass box and have it peak at that frequency. The boxes would be a lot smaller and you could use more of them for the SPL's. That's why some bandpass boxes are considered 1 note boxes depending on how there designed.

Subject: Re: Impedance rise in horns
Posted by Wayne Parham on Mon, 14 Jan 2008 19:31:24 GMT
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I agree about checking into bandpass boxes. They might be smaller and could provide the SPL needed. On the other hand, if he doesn't need a large duct area then 5.5 feet could be folded into a pretty compact box. Could be six one way and half a dozen the other on overall cabinet size. Definitely couldn't get a real basshorn down to size but maybe a one note tuned pipe could be made pretty small. I think it would be worth looking at both options, Helmholtz resonators and quarter-wave pipes.