Subject: Why 7pi? 7pi and listening room considerations
Posted by Psychoacoustic on Thu, 19 Feb 2009 07:22:45 GMT
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Background- wanted to try horns and so constructed DIY speakers using Selenium 220Ti on JBL PT-F95HF waveguide paired with Pioneer HPM-100 woofers. Quite satisfactory, though not life-changing sound. However, discovered CD and now prefer it to much-loved Yamaha NS-1000M. Wishing to pursue the interest in DIY CD designs brought me to PiSpeakers- the Pi7 appears from an amateur perspective to be 'all CD' (in comparison to (e.g.) Pi4). This is the logic for choosing the Pi7 as the 'next step' on a CD journey. Comments?Constructed a dedicated listening room 6m (20') X 3.8m (12.36') X 2.3m (7.64'). Any considerations with Pi7 and these dimensions? Is 12 ft too narrow to take advantage of the Pi7 CD design on the horizontal plane? One end of the room has built-in bass-traps and mid-high absorptions panels from Ethan Winer's design www.ethanwiner.com/acoustics.html.As you can see in the photo, four bass traps (plain wood colour) meet in the corners (LH side wall partially obscured by curtain, RH back wall under C.D.s), with two absorbers (cotton covered) in the centre of the wall. Any issues with the Pi7 back-firing woofer and the bass traps of this design? Thanks.

Subject: 7pi and listening room considerations
Posted by Wayne Parham on Thu, 19 Feb 2009 18:23:00 GMT
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cornerhorns and your room layout looks good for them too.

generate sound with uniform spectral balance throughout the entire room and it isn't just the top end of the spectrum, it's nearly the whole audio spectrum. The blend between midhorn and bass bin smoothes floor bounce and the higher modal frequencies too. In your room, I would expect

Imaging, placement and orientation

Subject: Re: Why 7pi? 7pi and listening room considerations
Posted by PaulW on Fri, 20 Feb 2009 22:23:22 GMT
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Hi, I use the 7's in a slightly smaller room than yours (width/length) but a bit higher and they do sound great. Just posted a review in the shopping area.RegardsPaul

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Subject: Thanks!
Posted by Wayne Parham on Fri, 20 Feb 2009 23:38:23 GMT
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Thanks for the review, Paul!

Subject: Re: Why 7pi? 7pi and listening room considerations
Posted by Psychoacoustic on Mon, 23 Feb 2009 00:12:28 GMT
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Paul, I've read your build thread NUMEROUS times. To someone considering the project, that kind of information can be a 'deal breaker'. Took notice of your room dimensions, too. Although there are quite a few who feel the JBL woofer is a better sounding unit, its a wee bit pricey- looks like I'll be opting for the Eminence job.Did you ever re-build the mid-horn housing? It looked fine from the photos.And cheers for the review- you sound a satisfied gent!

Subject: Re: Why 7pi? 7pi and listening room considerations
Posted by PaulW on Mon, 23 Feb 2009 01:35:19 GMT
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I've no doubt the JBL unit is better, but I had to draw a line on the budget somewhere and it was more important for me to get the best treble, so the B&C DE250 was a must have. Now if I was going for the 4 Pi, then I suspect the JBL would really come into it's own as it is doing more work. All the problems I now have in the bass region I suspect will be sorted out with better output transformers in my Bottlehead amps which will provide better and tighter bass control.I've not started the re-build of the mid-horn yet (a project for this summer as I'm still using my outdoor workshop) but the main reason is to put together a slightly larger flair, but also have it completely exposed, with just the drive unit enclosed in a box (any thoughts Wayne?).Yes, satisfied enough to want to listen more than tweak or build or change or.....Paul

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Subject: Re: Thanks!
Posted by Psychoacoustic on Mon, 23 Feb 2009 01:54:54 GMT

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Wayne, in response to jimbot enquiring the application of Delta 15, you wrote:Use the same

version for the JBL 2241, but tune it for 22Hz using a 4" long, 4" diameter portSome more questions to further clarify, if I may;In your testing and listening experience, would you consider the Delta Pro 15A model to be a performance compromise over the Omega Pro 15? (Purely budgetary motivated question, I can interpret the specs well enough).Regarding the larger cabs you suggested for the Delta 15- Presently I have 37" high bass bins- and they're TALL. Higher cabinets than this would put the mid/high drivers above seated ear level. With respect to the null axis, is this a problem? I presume the Omega Pro would also produce lower response in the bigger cabinet without changing the crossover- true?

Subject: Re: Thanks!
Posted by Psychoacoustic on Mon, 23 Feb 2009 01:57:09 GMT
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EDIT- should read (... I CAN'T interpret the specs well enough)! Bad typo.

Subject: Re: Why 7pi? 7pi and listening room considerations
Posted by Psychoacoustic on Mon, 23 Feb 2009 02:13:23 GMT
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Paul, thanks for the feedback. I can relate to the budget considerations- gets out of control easily, doesn't it? What is the motivation for leaving the horn flare exposed? Do you suspect resonances within the enclosed version? Just a thought- perhaps (e.g.) filling the horn chamber with plaster would address this.

Subject: Re: Why 7pi? 7pi and listening room considerations
Posted by PaulW on Mon, 23 Feb 2009 02:42:22 GMT
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No just fancy the more skeletal look really and using the same overall Birch ply finish as the bass unit.Paul

Subject: Re: Why 7pi? 7pi and listening room considerations
Posted by Wayne Parham on Mon, 23 Feb 2009 17:47:44 GMT
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There's no harm at all in having the horn exposed. Just make sure the rear chamber is at least 0.35ft3. As you know, the stock build has rear chamber behind the woofer extending all the way around to the sides of the flares. It doesn't have to be built that way though, the only thing that's important is that the throat cutout and flares be made as shown and the rear chamber be larger than 0.35ft3 Get creative if you like, make 'em a work of art!

Subject: Cornerhorn implementations
Posted by Wayne Parham on Mon, 23 Feb 2009 19:07:10 GMT
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I'll try to answer your specific question first, and then move on to "the bigger picture."

The Omega 15 is a better woofer than the Delta 15. Not that the Delta 15 is a bad woofer, I find it very pleasant sounding, but the cast frame, larger power handling and overall build of the Omega 15 make it the better woofer. I find its electro-mechanical specs easier to work with too.

As with any high-efficiency woofer, the larger the box the deeper the extension, within reason. There comes a point where going larger doesn't help, and this point is dictated by electro-mechanical parameters. Boxes larger than this will be either underdamped and make a bass peak somewhere or they'll be tuned so low that the larger size isn't helping increase output at the lowest frequencies.

The Omega 15 works well in relatively small cabinets. It is best used in 2ft3 to 6ft3 cabinets tuned to 40Hz. It can also be used in slightly larger boxes tuned lower for deeper extension but at the cost of reduced output. In a moderately sized cabinet, it produces good bass response, perfectly suited for a midwoofer. As an example, a 3ft3 cabinet tuned to 40Hz has f3 of 50Hz and smooth rolloff to an f10 of 35Hz.

The Delta 15, on the other hand, really needs a large box to even get moderate extension. Even in a 6ft3 cabinet, the response curve is most suitable for use as a midwoofer. A Delta 15 in a 6ft3 cabinet tuned to 30Hz produces f3 of 50Hz and f10 of 35Hz. It provides a slightly different shaped curve than the Omega 15 in a 3ft3 cabinet, because the alignment is different. But overall output is about the same, even though the cabinet is twice as large. It can be put in inconveniently large cabinets too, like 20ft3 tuned to 30Hz or even 30ft3 tuned to 25Hz. Not that I'd want to use them for subs, but you get the idea. To tune them for use down low, they have to be huge.

Also don't forget how important it is to consider and work with the shifts seen in loudspeaker drivers. We tend to think of a woofer as having set electro-mechanical parameters, but that's not

so. The characteristics change as a function of power, and even with age. A woofer that's designed to be used at say 100 watts, will behave much differently at that power level than it will when run with just a few watts. High-efficiency woofers tend to have stiff suspensions that have high resonant frequencies, and at low power levels, the resonant frequency and mechanical Q is even higher than designed for. This tends to shift them towards being underdamped at lower power levels, especially when new.

Ironically, very high power levels tend to shift them towards being underdamped too. This is because electrical resistance begins to rise, not because the suspension is stiff. Prosound high-efficiency woofers tend to have mechanical characteristics that shift resonance and Q down as power goes up and as they age. They have electrical characteristics that tend to shift Q up as power rises.

You can analyse this in greater detail, to quantify these parameters, but that's not the point. In the end, I find that it is best to design for a slightly overdamped alignment that is tolerant of these kinds of shifts. That way, when the woofer is brand new, it won't be grossly underdamped. If used with a low power SET amp with high output impedance, same idea, the shift won't cause it to make a peak. Or if you really throw the power at it, a slightly overdamped alignment is friendly here too, in that it tends to shift towards being less overdamped rather than into being underdamped, causing a peak. It's easier to do this with a high-quality woofer with relatively low Q to begin with.

loudspeaker, Hoffman's Iron Law tells us high-efficiency woofers need large boxes to offer much extension. If you make the cabinets smaller, the low frequency cutoff tends to rise. So deep

just about deepest bass response. It can be, but some might argue it shouldn't need to be. A smooth gradual rolloff is desirable and ultra-low-frequency extension can be provided with subs, if needed.

advantage over other speakers in that directivity is nearly constant through almost the entire audio band. I know of no other configuration that can do this. From the Schroeder frequency up, the woofer pattern is set by the wall angle. The walls also help the midhorn maintain control at the lower end. Each subsystem provides uniform directivity, constant at 90°.

Imaging, placement and orientationBelow the Schroeder frequency, around 100Hz or so, the room modes begin to dominate. Instead of the wave travelling from the apex of the corner outwards, it transitions into acting more like a pressure vessel with standing wave nodes forming inside. This causes strong and weak areas to form within the room, with different positions being pockets for different frequencies.

Positioning and subsThe best way to address this, in my opinion, is by using multiple subwoofers. You could, I suppose, use large cornerhorn bass bins set in each of the four corners. They could be tuned for deep extension. The vertical pattern is 40°, so as long as the midhorn and tweeter aren't so high that the listeners are below the pattern, this is a viable option. So even the larger 8ft3 cabinets are fine in this regard. They'll provide extension to 30Hz or so, and four corner placement works well in many rooms. However, it is probably easier to make the bass bins

small and easy to place. You can put them where you find they work best.

Subject: Re: Cornerhorn implementations
Posted by Psychoacoustic on Tue, 24 Feb 2009 01:42:03 GMT
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I sincerely appreciate the time you take to answer naive questions. You are an effective teacher. Other beginners will surely learn from applying the theoretical concepts you describe through this forum in a practical sense- i.e. understanding the ideas in the context of their projects. Digesting 'Pi speaker alignment theory', however, will take a bit more time!In summary, Omega 15 and bass cabinet as per plans; supplement the system with (multiple) sub-woofers. Got it.
