Subject: 3 Pi Subwoofer Plans
Posted by audiothings on Fri, 27 May 2011 13:57:58 GMT
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Hello Wayne and All,

Thank you for this wonderful, selfless resource. I have already built the AK Econowave Standard, thanks in part to the work done by you.

Now I want to try a three way, with Eminence Delta 12LFA (100 Hz-1.x KHz), LAB 12 (25-100 Hz) and a yet to be decided HF section. Maybe a BMS 45xx into an SEOS-12 waveguide, if I can afford it. (Comments on this driver complement most welcome...) I will use a Behringer or equivalent external processor.

Eminence speakers are available locally and have pretty friendly pricing. (The $40 Dayton woofer I bought for my econowaves ended up costing me $140 by the time I paid for shipping and customs...)

Anyway, coming to the point, please may I have plans for the Pi 3 Subwoofer?

Thanks again,
Jai Shankar.

Subject: Re: 3 Pi Subwoofer Plans
Posted by Wayne Parham on Fri, 27 May 2011 14:49:44 GMT
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I've been looking at those SEOS horns, and they look like they have promise. Not sure if they'll be able to be a reliable source though. I'd hate to spend all the time required to design, test and optimize a design only to have spotty availability of one of its parts. The H290 does everything I want it to do, so I'm not sure it really makes sense.

good, calibrated measurement equipment and can take the time to optimize the crossover with a myriad of measurements, you probably won't be able to match this combination. But if you do want to take on the task, here are a couple links that might help you along the way.
Crossover optimization for DI-matched two-way speakers
High-Fidelity Uniform-Directivity Loudspeakers

Subject: Re: 3 Pi Subwoofer Plans
Posted by audiothings on Sat, 28 May 2011 05:22:28 GMT
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Many thanks, Wayne. So kind of you...

Quote:The H290 does everything I want it to do, so I'm not sure it really makes sense.

Wonderful... I should be able to score it right here... saving me a bunch of cash.
Quote:

How about if I put them in one large cabinet, with internal volumes divided as appropriate...? Please see attached pic. The Delta 12LFA should go down to 100 Hz in a sealed box... yes?

Quote:Unless you have good, calibrated measurement equipment and can take the time to optimize the crossover with a myriad of measurements, you probably won't be able to match this combination.

Is it going to be damn tough even with a flexible loudspeaker management processor? I do have a decent measurement mic and I have set up PA speakers in the past... (I mean, as a sound engineer 'tuning' the system...not as a loudspeaker builder)... I make a living in the music business... I don't mind putting in the extra effort to figure it out... AND I have guys like you to help me along the way. What say?

Before actually building, I will do some more research on driver spacing, vertical nulls, directivity etc., for now, I'd just like to be clear that there is no fundamental flaw in my idea...

File Attachments
1) eminence 3 way.jpg, downloaded 301 times

Subject: Re: 3 Pi Subwoofer Plans
Posted by Wayne Parham on Sat, 28 May 2011 15:02:08 GMT
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You can put the subwoofer in the same cabinet as the mains, and its vertical offset will help smooth the higher modes, which are mostly from vertical boundary reflections. However, there is another significant self-interference boundary, which is the one from the wall behind the speakers. If you keep the sub separate, you can place it just a little bit below and behind the mains, and that helps smooth not only the vertical modes but also the self-interference from the wall. Something like this:

As for the crossover design, it really is just a matter of getting the driver spacing and crossover phase right to make the forward lobe clean, and the vertical nulls set just outside the horn's pattern at HF. In theory, it's simple. In practice, it takes some work. There are a lot of good software and hardware/software tools available that make this job easier, but it definitely isn't a half-hour job. You should plan on spending some time working through the design, testing, measuring and retesting.
Crossover optimization for DI-matched two-way speakers, revisited

Subject: Re: 3 Pi Subwoofer Plans
Posted by audiothings on Mon, 30 May 2011 03:13:37 GMT
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Quote:However, there is another significant self-interference boundary, which is the one from the wall behind the speakers.

This should not be an issue if the speakers are mounted flush with the wall (in-wall)... am I correct? (please see pic). Of course, the resulting increase in LF will have to be dealt with by the speaker management processor...

Quote:As for the crossover design, it really is just a matter of getting the driver spacing and crossover phase right to make the forward lobe clean, and the vertical nulls set just outside the horn's pattern at HF. In theory, it's simple. In practice, it takes some work.

Sorry, but this was the part of the design I intended to mooch off your work... Since you have already done the math and the testing, I assumed that I would have to replicate your driver spacing and recreate your crossover in the digital domain, then roll off the low end as appropriate within the room... Have I gotten something wrong?

Lastly, as long as I maintain the prescribed volume, I can change the individual dimensions to suit my space, correct? For example, if I made the sub 14" deep and compensated for it in height? There will not be enough space for the port inside the box... but I have read somewhere that its perfectly fine to let the port extend outside the box...

File Attachments
1) inwall.jpg, downloaded 3185 times

Subject: Re: 3 Pi Subwoofer Plans
Posted by Wayne Parham on Mon, 30 May 2011 14:51:11 GMT
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Sounds like you've thought of most things, so I think you're on the right track. With the cabinet baffle mounted flush to the wall, you'll have no self-interference from that wall. And keeping driver spacing the same (in all three dimensions) will get you where you need to be (or extremely close) with respect to path-length verses phase, which is the biggest part of what sets the position, shape and size of the forward lobe.

I said "or extremely close" in the last sentence because there is one thing left to consider - the reactive nature of the drivers, themselves. If you don't use the same drivers and horns, then the electrical, mechanical and acoustic (in the case of a horn) resistance/reactance is different, and this changes things, sometimes quite significantly.

Subject: Re: 3 Pi Subwoofer Plans
Posted by audiothings on Tue, 31 May 2011 03:38:21 GMT
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Thank you Wayne.

Sorry I did not understand this part:

Quote:And keeping driver spacing the same (in all three dimensions)

Makes me feel pretty idiotic for asking this, but what are the three dimensions? In the ThreePi speaker plans you have sent me, the position of the woofer and horn is quite clearly defined as far as the placement along the length and width is concerned... what is the third dimension...?

Subject: Re: 3 Pi Subwoofer Plans
Posted by Wayne Parham on Tue, 31 May 2011 13:52:09 GMT
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The third dimension is depth, of course. If you are using the same horn and it is mounted to the same baffle, then that part will remain constant. But if you change horns or do anything else that would change the depth, you'll change the path length from source to listener.