
Subject: 3Pi speakers - various questions

Posted by [audiothings](#) on Thu, 20 Sep 2012 04:05:41 GMT

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This is for a studio I am helping a friend build. An ambitious project for both of us. The layout is as you see below. The monitors are floor standing, mounted flush with the wall. The wall is angled 30 degrees towards the engineer, and all surfaces other than the front wall and the floor are very heavily damped.

I already have a pair of Exodus Audio Tempest X2-15" subwoofers. According to the manufacturer they will work very well in an 8 cu. ft. sealed box. I want sealed boxes all around not only because I am a rank amateur at this and sealed boxes are more foolproof, but also because (I imagine) that the better transient response actually makes a difference to my work.

The Delta12LFA has a Qts of .47, and as I understand, it is suitable for a sealed box. I have come up with two options, and I would like your help in deciding between the two. Both options have the same woofer-tweeter distance as the 3Pi specs. I have indicated speaker-listener distance (5' 2") and ear level (3' 10"), and I would like you to consider these, while helping me choose. Option 1 has one large sealed box and is preferable to me for ease of building and handling, and option 2 has two smaller boxes.

Other thing - I would like to use them with a pair of Behringer iNuke Nu3000DSPs, one on each side, to power and manage the system. I plan to buy Wayne's crossovers to crossover between the woofer and CD, and the DSP on the amp to crossover between the sub and the 3Pi. I must have some control over the equalization, because I think that loading the speaker in the wall might require some bass management - I am thinking that I might have to accentuate the first octave (20-40 Hz) of the subwoofer and roll off some lows from the 3Pi, for better efficiency, if nothing else. I have read about running the mains full range and accentuating the first couple of octaves with subs - but in this case, I'd like to roll with this approach as it gives me options and a bit of control. This amp puts out 440 watts @ 8 ohms and 880 watts @ 4 ohms. Would 440 watts be sufficient to drive the 3Pi to 110 db?

Thank you for your inputs. And I must make it clear that there is no commercial interest in this - I really am building it for a friend

File Attachments

- 1) [piex.jpg](#), downloaded 4643 times
 - 2) [2piopts.jpg](#), downloaded 4581 times
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Subject: Re: 3Pi speakers - various questions
Posted by [Wayne Parham](#) on Thu, 20 Sep 2012 05:13:18 GMT
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That looks like an excellent layout. But I have a few suggestions.

First, keep the subs in separate boxes from the mains, so you can use them as distributed multisubs. This will help smooth room modes.

Second, don't run the mains sealed, but rather keep them ported. In fact, don't deviate from the plans at all. I don't say this to be arrogant, but just to prevent you from re-inventing the wheel. The alignment chosen is very smooth, provides good extension and limits excursion. And the layout of the midwoofer and port in the box prevents any standing wave nodes from creating anomalies too. So you really can't beat that system. A sealed box will just reduce extension and increase excursion, and neither are improvements.

Do not make the mistake of thinking sealed boxes provide better transient response. They don't - Room modes swamp all that. And forget anything people say about sealed boxes "integrating" better with subs. Indoors, room modes make point source integration irrelevant, because the

What you want, instead, is blending of multiple sound sources in the modal region. You want some extension in your mains, and you want them blended with other bass sound sources placed in various places in the room.

And finally, consider using the crossed-axes configuration described in the whitepaper below. Rather than having the speakers pointing straight at the listeners, have their axes cross ahead of the listeners. This will widen the area where stereo balance is good, which improves imaging considerably.

High-Fidelity Uniform-Directivity Loudspeakers

Subject: Re: 3Pi speakers - various questions
Posted by [audiothings](#) on Thu, 20 Sep 2012 07:51:29 GMT
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Quote:Second, don't run the mains sealed, but rather keep them ported. In fact, don't deviate from the plans at all. I don't say this to be arrogant, but just to prevent you from re-inventing the wheel. The alignment chosen is very smooth, provides good extension and limits excursion. And the layout of the midwoofer and port in the box prevents any standing wave nodes from creating anomalies too. So you really can't beat that system. A sealed box will just reduce extension and increase excursion, and neither are improvements.

Thank you Wayne. I have incorporated the above suggestions into my current design idea.

Quote:First, keep the subs in separate boxes from the mains, so you can use them as distributed multisubs. This will help smooth room modes.

As I mentioned, I have read your work, and that of Dr. Geddes. In this case, there are a couple of reasons why I am disinclined to take this route.

First - I am building the room according to a very specific design approach - the 'Non Environment' method, described by Philip Newell, in his book, 'Recording Studio Design'. This calls for all surfaces with the exception of the floor and the front wall to be fully absorbent. All surfaces are being treated with full absorption, down to below 50 Hz... I believe this is called a hemi-anechoic room. I do not expect the modal problems that are common to domestic listening environments, to be much of an issue here. This approach also calls for the speakers to be flush mounted in the angled, heavy wall, and I do not wish to deviate from these design fundamentals.

Secondly, and more importantly, there are severe space considerations. The room will frequently be occupied by multiple people and their workstations. Also, I have not represented much of the equipment and amenities, in my pic... We need all the space we can get...

With this in mind, could you take a look at the following redesign, based on your inputs? The internal volume of these 3pi's are identical to your specification, the only deviation being the usage of 1" MDF instead of the 5/8" board you have specified. I would specifically like you to look at whether the height of the respective drivers in relation to the ear level is appropriate.

Also, is 440 watts per channel @ 8 ohms sufficient to drive them to 110 dB?

Thanks again,

File Attachments

1) [howabouthis.jpg](#), downloaded 4310 times

Subject: Re: 3Pi speakers - various questions

Posted by [Wayne Parham](#) on Thu, 20 Sep 2012 12:52:08 GMT

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Surface treatments are useful for reducing reflections from about 300Hz upwards. But they do not work at bass frequencies, not at all. You can't get a surface treatment to work much below midrange. It would have to be very thick - like measured in feet - to work even down to 300Hz.

Are you using panel absorbers? That's the best way to get damping at bass frequencies. And even so, there will definitely be measureable self-interference ripple from the boundaries. Surface treatments won't work anywhere close to 50Hz - Maybe down to 300Hz or so if the absorbent wedges on your walls are very thick.

Honestly, the thing that helps the most in your setup is the fact that your speakers are mounted in the wall with the baffle flush (or nearly flush). This removes the possibility of reflection from the wall that would normally be behind the speakers, which is the most offensive reflection in the

lower midrange. But I still would prefer the subs be left separate because they're more flexible that way. You can place them in a Welti configuration (e.g. middle of each side wall), or just outside the mains to mitigate self-interference from the adjacent wall, for example.

Subject: Re: 3Pi speakers - various questions

Posted by [audiothings](#) on Thu, 20 Sep 2012 19:07:44 GMT

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Quote:Surface treatments are useful for reducing reflections from about 300Hz upwards. But they do not work at bass frequencies, not at all. You can't get a surface treatment to work much below midrange. It would have to be very thick - like measured in feet - to work even down to 300Hz.

Are you using panel absorbers? That's the best way to get damping at bass frequencies. And even so, there will definitely be measureable self-interference ripple from the boundaries. Surface treatments won't work anywhere close to 50Hz - Maybe down to 300Hz or so if the absorbent wedges on your walls are very thick.

Thank you Wayne.

We are lining the entire 4 (of 6) room surfaces with panels similar to the range of low frequency control devices such as panels from RPG (look under the "low frequency" tab), and the Primacoustic Maxtrap. We are also referring to other available documentation on control over the first three octaves, courtesy of the BBC. Control over the 40-120 Hz range is really important to me. Above this, imho, is "kindergarden acoustics", when it comes to absorption...

Regardless, this is still an unprofessional experiment, and I have built no more than three pairs of speakers in my life, and the real science is an alien language to me... so all contributions are welcome...

Subject: Re: 3Pi speakers - various questions

Posted by [Wayne Parham](#) on Thu, 20 Sep 2012 20:05:39 GMT

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I see, yes, those are panel absorbers, which are the most effective kind of damper for lower frequencies. The traditional absorbent wedges are great for HF but can't do much at LF, they're just not thick enough. But panel dampers are membranes that are large enough to absorb energy at lower frequencies.

Still, as I said earlier, the biggest thing you have going for you is the in-wall mounting. That removes any possibility of reflection from the wall behind the speakers, which is the biggest offender at lower midrange frequencies. And the panel dampers will certainly help with the room

modes. If you position the subs right (i.e. not directly below the mains), they'll help smooth room modes too.

You have all the right stuff here - Your system setup will be excellent!

Subject: Re: 3Pi speakers - various questions
Posted by [audiothings](#) on Fri, 21 Sep 2012 03:01:18 GMT
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Quote:If you position the subs right (i.e. not directly below the mains), they'll help smooth room modes too.

There is only one place in the front wall where I can place the subs, if not directly below the mains... flanking the center line of the room, as shown in the pic below...

I get only about 8" of usable depth, about 48" of width and up to 72" height. Do you think this would be a better place to put my subs?

File Attachments

1) [subpos2.jpg](#), downloaded 4285 times

Subject: Re: 3Pi speakers - various questions
Posted by [Wayne Parham](#) on Sun, 07 Oct 2012 16:43:19 GMT
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Can you put the subs just to the outside of the mains instead?

If you put them in the center, they'll act as a single source. Three feet of separation isn't enough, except to smooth self-interference from nearest boundaries which you won't have because of your in-wall mounting. So you could benefit more from more separation of bass sound sources.

If you put the subs outside the mains, they'll be separated enough to act as separate sound sources at lower frequency. Then, between the subs and the mains, you'll have four bass sound sources. That will help smooth room modes.

I think probably your best placement would be to have the subs at side wall midpoints. But this is really just a guess - without measurements, you cannot know for sure. One thing I can know for sure though, and that's that the more bass sound source locations, the smoother the modal range will be. So that's why I think I'd try to spread out the woofers, and not have the mains sitting right

on top of the subs, nor have the subs grouped together. Spread them around, put them in different locations seperated by several feet.
