Posted by ppkstat on Sat, 19 Feb 2022 01:13:58 GMT
View Forum Message <> Reply to Message

Well this is definitely going to be a ride.

Here's the deal: I don't know how to build speakers. These are going to be my first ones but I am a fast learner and I tend to read a lot. I am going to built them with the B&C drivers. I managed to source 2 12PLB100s which is near impossible in Europe. Price is not half bad either I should have them in a couple of weeks if everything goes well. Most difficult part to source are going to be the waveguides I should get them somehow from Wayne.

I decided to start with the part that I am most familiar with which is designing the PCBs for the crossovers. They are going to be built with Jantzen Cross-caps, Jantzen 15ga Coils and a mixture of Dayton audio and Mundorf MRs for the resistors. I don't like the idea of surface-mounting through hole components, therefore I am going to mount these regularly and then use a thick EVA sheet to mount them to the cabinet (I am thinking something like a camping mat). I am seeing a whole lot of different versions of 3pi crossovers in the forums, I guess it went through different revisions. This is the version I found on the latest 3pi plans, I just hope I got the values right.

Here is the parts layout, dimensions are in mm. I won't be posting the schematics since I don't know if that's permitted. Connectors are going to be 6.3mm gold plated spade tab terminals for the drivers and the binding posts and there's also going to be a screw terminal for the Zobell resistor. I am a bit worried about coil interference, I spaced them a bit apart and used different orientations to minimize this. I really don't know how much of an issue this will be.

That's all for the time being and I am sorry for my English, it's not my native language.

File Attachments
1) crossover.jpg, downloaded 1199 times

Posted by Wayne Parham on Sat, 19 Feb 2022 16:45:11 GMT
View Forum Message <> Reply to Message

That layout looks good. The coils appear to be far enough apart and in different planes, so I think your crossover will be excellent!

Posted by ppkstat on Sat, 26 Feb 2022 00:27:06 GMT

View Forum Message <> Reply to Message

The 12PLB100s are here! Good times!

I wired them to do some quick testing with a function generator to see if they work. I even tried some music. This is the first time I am listening to a driver that is not enclosed. I almost burst out laughing, this is what disappointment must sound like.

File Attachments
1) 1645808359664.jpg, downloaded 1271 times

Posted by Wayne Parham on Sat, 26 Feb 2022 00:52:12 GMT
View Forum Message <> Reply to Message

So glad you got your drivers! That's awesome!

But - yeah - you gotta get 'em in the boxes or they sound pretty thin.

No box, no bass. :lol:

Posted by ppkstat on Thu, 10 Mar 2022 23:47:15 GMT
View Forum Message <> Reply to Message

First crossover is done! The second will soon follow.

By the way is there any way to test this with regular lab equipment? I connected a signal generator to an amp and connected it to the main terminals (IN+, IN-) and my scope to the tweeter/woofer terminals. The crossover seems to be working, it is attenuating or reducing the signal around 1Khz. The amplitude on the high frequencies appears to be lower than the lower frequencies but I am guessing that has to do with the load attached to the two groups of terminals (the Zobel was attached during testing). With my multimeter I am getting an open circuit across the IN+ and IN- terminals and exactly the same across 2+ and 2-. Across 1+ and 1- I am getting 12.1Ohms.

File Attachments
1) 1646955233712.jpg, downloaded 1131 times
2) 1646955233702.jpg, downloaded 1087 times

Posted by Wayne Parham on Fri, 11 Mar 2022 00:52:32 GMT
View Forum Message <> Reply to Message

From your description, it sounds like you have everything right. You really need to have the

The load has a large influence on the transfer function.

But the real test is an acoustic measurement of the assembled loudspeaker.

Posted by ppkstat on Tue, 15 Mar 2022 17:39:52 GMT
View Forum Message <> Reply to Message

Both crossovers are now ready. They came out great, they're also aesthetically pleasing. :lol:

With my limited knowledge I think they're working as supposed to. I connected 2 x 8Ohm 100W resistors (the regular type) across the woofer and tweeter outputs as a dummy load and did some testing. The function of the two boards is practically identical.

I am still surprised at how much the tweeter signal gets attenuated. I understand that this is to compensate for the difference in loudness between the two drivers. When fed with a 2V sine (P-P) at the crossover point (1KHz) I am getting a 1V sine at the woofer output and a 150mV signal from the tweeter! Naturally the tweeter signal increases in greater frequencies.

File Attachments
1) 16473653600083.jpg, downloaded 1133 times

Posted by Rusty on Tue, 15 Mar 2022 18:42:51 GMT
View Forum Message <> Reply to Message

Paying as much attention to the professional look of your crossover modules. I'm looking forward to your execution of the cabinets. They should looks pretty nifty when done. If your familiar with

Troels Gravesen of Denmark. https://www.youtube.com/watch?v=CYaikWl6IsY Your work so far reminds me of his excellent detail in craftsmanship. Keep the pics coming.

Posted by ppkstat on Tue, 15 Mar 2022 19:16:16 GMT
View Forum Message <> Reply to Message

Many thanks for your kind words! I am very happy to see people are actually reading this thread!

Unfortunately I don't plan to do any cabinet construction myself. I don't have the tools nor the experience to do something like this. All I can do is to make really good plans and find someone experienced here to do the work. I will pay the utmost of attention in anything in which I am involved in their construction, don't worry :lol:

Now in contrast to woodworking, I've designed and built several PCBs. That's the reason these came out better than average. But bear in mind that I am pretty much a beginner and inexperienced in all this. This is the first crossover I assembled in my whole life!

Again many thanks for your interest. Btw your YouTube link is probably not what you indented to post. But yes, I've seen Gravesen's work before.

Posted by Rusty on Tue, 15 Mar 2022 19:38:27 GMT
View Forum Message <> Reply to Message

God! Helen Reddy. Bet that was a head scratcher. No, that was in regards to all time bad music productions sent to a relative. I guess my copy memory had that hideous thing still there when I pasted. But great work on the fabrication of the crossovers. Tell your builder to look at the legitimate website.
http://www.troelsgravesen.dk/Diy_Loudspeaker_Projects.htm
For inspiration building the cabinets. And the Helen Reddy video for inspiration that music like that will never pass through it's assemblage. Whew!

Posted by Wayne Parham on Tue, 15 Mar 2022 19:40:44 GMT
View Forum Message <> Reply to Message

ppkstat wrote on Tue, 15 March 2022 12:39I am still surprised at how much the tweeter signal gets attenuated. I understand that this is to compensate for the difference in loudness between the two drivers. When fed with a 2V sine (P-P) at the crossover point (1KHz) I am getting a 1V sine at the woofer output and a 150mV signal from the tweeter! Naturally the tweeter signal increases in greater frequencies.

Lookin' good. That's exactly what it's supposed to do. The waveguide doesn't just provide directivity but also provides acoustic impedance matching, which makes it more efficient. So we increase on-axis SPL both by narrowing the beamwidth and horn loading. It's about a 10x increase.

Posted by ppkstat on Wed, 23 Mar 2022 16:21:42 GMT
View Forum Message <> Reply to Message

Having received the two waveguides yesterday I soon realized that these have to be sanded and painted. They're completely fine as they are but if you're going for the max aesthetic result its something that has to be done.

The instruction of Wayne was to sand just the face of these in order to remove the parting lines without touching anything related to the flare and throat. With this in mind I decided to make the following setup: wet sanding with wet/dry sandpaper on a marble block:

This produced excellent results! I did the bulk of the sanding at 400 grit. The parting lines were gone and then I did some more sanding to make it completely flat (not necessary at all but my OCD was killing me). I then smoothed it out by sanding at 600, 800 and 1000 grit. I could go much higher than that, essentially polishing it but there is no way paint is not going to cover the scratches made at 1000 grit. Below is an image of the treated vs the untreated waveguide.

I even measured the thickness of the face before and after sanding. Turns out I removed around 0.2mm of material. Not bad!

File Attachments
1) 1648051763100.jpg, downloaded 649 times
2) 1648051745251.jpg, downloaded 565 times

Posted by ppkstat on Thu, 24 Mar 2022 13:53:42 GMT
View Forum Message <> Reply to Message

I am having great difficulties finding suitable insulation locally.

The closest thing I can find is 5mm unfaced fiberglass sheet. This is around 2in.

Wayne is this going to be enough? I can also get 4mm and somehow glue two together to reach R13 thickness? I don't know if that's even a thing (or how to do it).

I have not abandoned all hope yet, I'll try to have a look on industrial supplies as well.

Apart from that there are several other options here, including mineral wool, Muhwolle, Acoustic foam, Visaton's polyester and Paintable Damping Material.

File Attachments

1) yalobamvakas-biostalis-shop-800x800.jpeg, downloaded 606 times

---

Posted by Wayne Parham on Thu, 24 Mar 2022 14:49:45 GMT
View Forum Message <> Reply to Message

The 5mm sheet will work just fine.

Posted by ppkstat on Tue, 19 Apr 2022 14:16:10 GMT
View Forum Message <> Reply to Message

Any thoughts on suitable mounting hardware for the 12PLB100s? I am trying to find suitable bolts and tnuts.

I am a bit puzzled about the size I am supposed to choose. The 12PLB100s have a thick gasket on front made from some cork-like material. Is the screw head supposed to sit on top of this material or is it supposed to sit on the metal body beneath the gasket.

Any information including specs for the hardware would be great!

As an update the waveguides are being professionally treated with a very thin glossy black coating. I will post an update when available. These are going to be mounted with M5 bolts and tnuts.

Posted by Wayne Parham on Tue, 19 Apr 2022 14:49:07 GMT
View Forum Message <> Reply to Message

I like using T-nuts, 10-32 size with button head or hex head screws. The screw head should go through the cork and apply clamping force directly to the cast basket frame. Also, when installing

the T-Nuts, don't just tap them in because that often just bends the tangs. See the notes in the link below:
Mounting Screws and T-nuts

Posted by ppkstat on Tue, 19 Apr 2022 15:06:23 GMT
View Forum Message <> Reply to Message

Thanks for the answer Wayne. 10-32 would be an equivalent of M5 over here, I can get the tnuts and try to locate a screw with a suitable screw head size.

PL is not available here so I had the idea of using gorilla glue for this purpose. It is self expanding and requires wet surfaces. I am reading in DIY forums that it's a good solution for gluing t-nuts.

Others solutions available here include standard epoxy glue and construction adhesives. Let me know your thoughts.

Posted by Wayne Parham on Wed, 20 Apr 2022 13:05:41 GMT
View Forum Message <> Reply to Message

The Gorilla glue will work just fine.

Posted by ppkstat on Wed, 20 Apr 2022 20:47:14 GMT
View Forum Message <> Reply to Message

I have located a knowledgeable cabinet maker here. When I finish with the plans I'll show it to them and hopefully move on from there.

These are sort of tricky to convert to the standards that are being used here. Imperial units have to be converted to metric and they have to be rounded in a way that the internal volume or proportions are not messed up and in a way that the maker can actually construct it with locally available MDF sizes. I've decided to use 19mm MDF which is slightly thicker than the original size (it's closer to 3/4). I will post the completed plans here in order to spot any possible issues before the construction.

However before that there is one area which is especially troublesome to convert and this is the bass reflex port. This 2 1/2in area is impossible to construct with any available MDF sheets here. It might be possible to construct it with a block of thick wood or by combining MDF sheets of various sizes and then probably taking off a millimeter or something but I'll have to discuss this with them. That aside cutting a hole with a diameter of 63.5mm is impossible. With that in mind I

had the idea to use a plastic port, specifically this

https://www.monacor.com/products/components/speaker-technology/diy-/mbr-70/

I had the idea to cut this with a saw to an appropriate size by using the tuning frequency (30Hz) and the internal volume of the cabinet which in my calculations ended up being 108cm3. Given that the hole diameter of this is a bit larger than the original (66mm) the length should be around 57.4mm(2.26in). I don't know if I'm even able to cut it to this exact size and I don't trust my calculations at all!

I really don't know what's the best solution here. Maybe someone has constructed the port in metric before?

Posted by Wayne Parham on Wed, 20 Apr 2022 21:15:20 GMT
View Forum Message <> Reply to Message

I like to use 18mm and 19mm Baltic Birch for some cabinets, so I know what you mean.

For port sizes - length or diameter - consider acceptable tolerance to be +/- 1mm. For cabinet dimensions, tolerance is +/- 1.5mm. As long as you stay within that range, you're fine.

You can use a plastic port if you want. No problem at all. But you can certainly stack wood panels with one planed down to make overall thickness 63.5mm, which as I said, could actually be 62.5mm - 64.5mm.

Stack blocks on the baffle until you exceed 63.5mm, and then plane off the top block until the overall is 63.5mm. Then glue and clamp 'em and drill through that to make the port. I'd probably buy a 2-1/2" hole cutter to drill with, just to make that easy. You can find one online and have it shipped to you.

Posted by hudelson2 on Sat, 30 Apr 2022 18:30:58 GMT
View Forum Message <> Reply to Message

I think you mean 50 millimeters or 5 centimeters, which is about 2 inches.

Posted by ppkstat on Sat, 30 Apr 2022 19:03:21 GMT
View Forum Message <> Reply to Message

hudelson2 wrote on Sat, 30 April 2022 13:30I think you mean 50 millimeters or 5 centimeters,

which is about 2 inches.
Of course you're right, sorry about that.

The waveguides are done! Here is a picture and I will post some measurements when I do find the time to do them. They look way better up close, it's very difficult to photograph reflective surfaces.

In other news I have gathered everything that's needed except the insulation. I have also tested the mounting hardware, the tnuts go into the wood very easily if you use an Allen head screw. I was trying with Philips before that and it was very hard to do. Some common epoxy will probably stick them fine, I don't thing there's a need for expanding glue. I will contact the cabinet maker when I finish with the plans and move on from there.

File Attachments

1) _DSC3254.jpg, downloaded 682 times

Posted by Wayne Parham on Sat, 30 Apr 2022 21:31:05 GMT
View Forum Message <> Reply to Message

They look fantastic!

Posted by ppkstat on Sat, 30 Apr 2022 22:00:08 GMT
View Forum Message <> Reply to Message

Thank you Wayne. They're really better up close. These were done professionally in a car paint place and they were baked as well. It was free of charge as well because a friend of a friend owns the place.

The funniest part was that on top of the paint for these a rather fancy lacquer was used. I instructed him to use the least amount of material possible and he used a lacquer that can produce a coating in very few microns, I really can't remember the number. He told me that they use that only on race cars in which even the smallest amount of weight counts. I found that both interesting and very funny at the same time considering the way it's used here.

Posted by ppkstat on Sun, 08 May 2022 02:02:47 GMT
View Forum Message <> Reply to Message

Because there were some very slight imperfections from the paintjob I decided to do some measurements in order to see everything is ok with the waveguides. TL;DR everything is fine, or at least what worried me at first had nothing to do with the paintjob.

This is the measurement setup. It's a somewhat nearfield measurement to minimize room reflections as much as possible.

This is the response. I tried both drivers and both waveguides but all the results are very similar to this.

What initially worried me was that 2-headed spike in the 14k-18k region. Mainly due to the fact that in Wayne's measurements it wasn't there (the rest of it looks almost identical). It also appears to be flatter in the 800Hz-2kHz region but I guess that's good. This 2-headed spike appears to be a property of the drivers - it's there even without a waveguide attached and ironically something very similar can be seen in the response of the DE250 provided by the manufacturer.

This is the tweeter going through the crossover.

And these are both responses plotted together and smoothed (var) in order to be more easily compared.

By the way these babies HISS 8o I was shocked to find that the DE250 when connected directly to my Hypex NC400 you can clearly hear them hissing and we're talking about an amplifier with a measured 105db SINAID 8o It goes completely silent when it goes through the crossover. Just for fun I also tried it with my Monrio MC205 dual mono and it was a hissing festival. Coming from

I am finishing up the plans, I will post an update here. I expect the cabinet construction to begin in the upcoming weeks.

File Attachments

1) 1651974112942.jpg, downloaded 639 times
2) 1.jpg, downloaded 625 times
3) 2.jpg, downloaded 620 times
4) 3.jpg, downloaded 615 times

Posted by ppkstat on Tue, 10 May 2022 00:30:12 GMT

The last speaker material is finally here!

The plans will soon follow.

File Attachments
1) 1652142503746.jpg, downloaded 586 times

Posted by ppkstat on Tue, 10 May 2022 19:36:27 GMT

On with the plans. Definitely one of the most stressful, if not the most, processes of the project.

This is the overall size compared to the original plans. The stock is a bit thicker (19mm - 3/4") and there's a very slight difference in internal volume (shown in the picture) which I think is negligible. This is due to rounding values from in to mm.

and this is the front panel plan both in mm and inches.

1)It's a bit alarming that I had to modify the size of both cutouts in order to accommodate the drivers. For the woofer the cutout is supposed to be 11 1/16" (281mm). The official drawing of 12PLB100 shows a diameter of 282mm so it cannot fit there. I took the liberty and designed the hole to be 284mm leaving a 2mm tolerance, I hope this turns out to be ok. The 10 ½" (267mm) width for the waveguide also appears to be small, I made this significantly larger at 272mm.

2)The distance between the two driver's centers ended up being 11" (279.5mm). Does that sound correct?

3)On the recessed parts:

I am not sure at all about the depth and width of the recessed parts. I will have to discuss this with the cabinet maker but two issues pop in my mind right now. The depth should be straight forward; however, I will use a 2mm EVA gasket for both drivers. This thing compresses but its difficult to estimate by how much. I made the depths for the parts to be 1mm shallower so when the driver is installed with the 2mm gasket it protrudes for about 1 mm. This way hopefully when it's tightened

it will sit flush. If it recesses too much, I can always install another 1mm gasket, I hope that works. For the width I really have no idea. The point here is for the width to be as wide as need for the driver to be installed but on the same time not wide enough for it to show the lateral 'inside' surface of it. How critical is this it will also depend on the finish I guess. I left a 3mm tolerance for the woofer and less for the waveguide, but I will give the waveguide to the cabinet maker to test it. Not for a moment I know how I will install a 10kg driver from the top by holding just the edges.

4)Support will be added behind the drivers. A 19mm depth ring behind the woofer this will have the size of the reassessed part but with a slightly larger external diameter (10mm bigger). Two 15mm depth bars will be added behind the waveguides in the place where screws are. These will also have the size of the top and bottom recessed parts. Everything is going to be mounted with M5 bolts and Tnuts.

5)The bracing will be of the 'window' type, made from the same MDF 19mm. I moved it as close as I could to the woofer support ring because it might interfere with the waveguide placement since a 5mm fiberglass sheet will be installed on top of it. Is this the best practice? It will actually be a bit closer to the waveguide than shown in the picture because I designed the woofer support ring to be a bit larger than in these plans shown here.

I would highly appreciate any feedback at this stage, this is really uncharted territory for me!

File Attachments

1) size.jpg, downloaded 574 times
2) front_panel.jpg, downloaded 580 times
3) re2.jpg, downloaded 472 times
4) re1.jpg, downloaded 572 times

Posted by Wayne Parham on Tue, 10 May 2022 20:58:19 GMT
View Forum Message <> Reply to Message

Looks really good so far!

You're right that the 12PLB100 driver is abnormally large. Just a smidge, but definitely larger than all the other 12" drivers we use. The cabinet shop had to re-work all the cutouts for the flat-pack kits that support the 12PLB100 midwoofer.

Posted by ppkstat on Tue, 10 May 2022 21:04:27 GMT
View Forum Message <> Reply to Message

Thank you Wayne. I understand that I did everything correctly which is very surprising :lol:

Would you mind to share your experience about the width of the recessed parts (what tolerance is preferred there)? I would also like to hear your opinion about point 5, that is the height of the bracing window.

Posted by Wayne Parham on Tue, 10 May 2022 21:34:18 GMT
View Forum Message <> Reply to Message

The main thing about the brace between the woofer and tweeter is actually that it be suitable for placing and holding a sheet of fiberglass insulation. It serves two purposes: 1. To tie the baffle and cabinet back together (and side to side) and 2. To hold a sheet of insulation. The insulation should span the cross-section, dividing the cabinet into two areas. Bass will pass right through the two areas but midrange will be damped by the sheet in the middle of the cabinet much more effectively than if it was just lining the internal sides.

As for the groove routed for the drivers, that's purely done for aesthetics. So as long as the divers fit, you're good.

Posted by ppkstat on Sun, 05 Jun 2022 11:57:29 GMT
View Forum Message <> Reply to Message

I commissioned the speaker cabinets to a local woodworker. He's very experienced with cabinet building as he produced all the local commercial speaker cabinets during the 90's and 00's before China entered the game.

The biggest deviation will be the bass reflex hole. This is going to be 64.5mm in diameter which is 2.54in. It's still within specs by Wayne's instructions but it's on the upper limit. In order to compensate a bit for this I asked him to make the tube 0.5mm shorter.

The construction will be on two stages. He is going to give the cabinet with the front plate unattached so I can do all the work needed. I am excepting this to end in about a month. I will then return the cabinet to him in order to attach the front plate and to paint it.

Posted by ppkstat on Wed, 22 Jun 2022 12:52:44 GMT
View Forum Message <> Reply to Message

I just got back from the woodworker. Everything goes according to plan and I should have the units to do the work next week.

Things that worry me right now:

1) Working with fiberglass with full clothing outside with Greek weather (which right now reaches around 38C (that's 100F).

2) Installing the woofer in the finished cabinet. The cabinet maker plans to leave a very small tolerance to the recessed part and I don't even know how to grab it to lower in to the hole (without damaging the cabinet and the paintjob of course). Maybe I will make a hook with some string attached to the mounting holes in order to lower it and then remove it somehow, I really don't know :lol:

File Attachments
1) 1655899587092.jpg, downloaded 525 times
2) 1655899587104.jpg, downloaded 522 times

Posted by Wayne Parham on Wed, 22 Jun 2022 16:18:48 GMT
View Forum Message <> Reply to Message

Looks great!

I empathize with you on the insulation. But you only have to do it once. :)

As for installing the woofers, I like to lay the cabinets on their backs and gently lower the woofers into position. It's easier to line up the mounting holes that way. Connect the wires beforehand, of course.

I often position the woofer at an angle - with an edge resting on the flush routed groove - and connect the wires. Then rotate it and lower it into position with the mounting holes aligned.

Thread the mounting screws several turns by hand. You want to make sure they aren't cross-threaded. If they are hard to turn - don't force them - investigate, perhaps taking them out and rotating the driver just a little bit to re-align the holes.

Posted by ppkstat on Thu, 23 Jun 2022 14:46:51 GMT
View Forum Message <> Reply to Message

A couple of things on Pi logos.

Wayne requires a pi logo to be present on every pi speaker and I think it's the least a pi speaker builder should do for their designer.

The issue is of course you can't just buy them at the grocery store. Initially I didn't know how they were going to be made but I knew I had to have the logo on a vector format. I asked Wayne and he supplied me the logo in a picture, apparently a scan of the original image which was made with paint.

I converted the image with an online converter, it's easy since its just black and white and the only thing that the algorithm has to worry about is the detection threshold. I then proceeded to construct them as 3D objects in Rhino, this is a 3D design software that I had no idea how it worked beforehand. It is heavily used in 3D printing apparently and it can produce an .stl file which is the thing you need in order to construct any of these things. This is the result, I was able to do it in an afternoon as a complete beginner, thank god for that.

I then explored different options on how to make them. The first solution was to make a 3d-printed cask and make them with 925 silver but it seems that laser cutting produces better results. So here they are in brass:

At this point these are going to be polished and then they're going to be platinum plated in order to get a decent color (grayish silver instead of this awful yellow).
Wayne when they are ready I'll send you a couple!

If everything goes well I am getting the cabinets tomorrow!

File Attachments

1) logo.jpg, downloaded 483 times
2) 1655994467448.jpg, downloaded 484 times

Posted by Wayne Parham on Thu, 23 Jun 2022 15:54:20 GMT
View Forum Message <> Reply to Message

That looks awesome! I love those brass logos!

Rhino is a great 3D modeler, almost as popular as AutoCAD. We used it to make the 12Pi hornsub drawings.

Quick story, just for historical Pi trivia:

stencil was used to mask the woodwork and allow us to apply the logo with enamel, prior to final finish using poly, lacquer or whatever. This is how we applied the logo on loudspeaker cabinets in the 1970s and 1980s.

Sometime in the 1990s, I scanned that stencil (or maybe a painted image made from it, I don't recall) and sent the image file to a shop that makes the vinyl logo decals we use today. They vectorized it for use in their CNC cutters.

I believe I sent that image file to you too, so you must have vectorized it as well.

Super groovy cool!

Posted by ppkstat on Fri, 24 Jun 2022 17:05:27 GMT
View Forum Message <> Reply to Message

The cabinets are here, the guy did a fantastic job! The bass reflex is a bit off but I think we can fix it.

File Attachments
1) 1656089592843.jpg, downloaded 467 times
2) 1656089592857.jpg, downloaded 381 times
3) 1656089592871.jpg, downloaded 472 times

Posted by Wayne Parham on Fri, 24 Jun 2022 17:43:57 GMT
View Forum Message <> Reply to Message

Those cabinets do look sweet!

What's off with the ports? Wrong diameter or length? They don't look like they're wrong, or if so, not by much.

Posted by ppkstat on Fri, 24 Jun 2022 18:43:27 GMT
View Forum Message <> Reply to Message

I am sorry, there was obviously an error with my measurements. Diameter is around 64.5mm which is the upper tolerance limit. Total depth (including the front plate) is around 64.

Posted by Wayne Parham on Fri, 24 Jun 2022 19:57:10 GMT
View Forum Message <> Reply to Message

Perfect!

Posted by ppkstat on Sat, 25 Jun 2022 00:18:30 GMT
View Forum Message <> Reply to Message

T-nuts installation is going smoothly!

After some tests I found that these small t-nut prongs, at least in mine, need pilot holes in order to go into the wood without bending. I used 1.5mm drill bit and just 2mm depth, all they need is just a little help. I am driving them down with an Allen screw and a washer. A Philips screw won't do, there's not enough torque. I am finishing this with some 5-min epoxy.

I am a bit troubled about crossover placement. I get that the best place would be the bottom, under a fiberglass flap. However I don't like this since I am afraid it's going to mess up the insulation near the port and I will have to mess with fiberglass in order to reach it. Would it be really bad if I mount it at the uninsulated side, vertically with 6 wood screws? Also Wayne if you do have a picture of a bottom-mounted 3pi crossover with insulation installed please share it here.

File Attachments
1) 1656116151260.jpg, downloaded 454 times

Posted by Wayne Parham on Sat, 25 Jun 2022 01:25:42 GMT
View Forum Message <> Reply to Message

I have mine mounted to the bottom, but you can certainly mount it on the side.

Good job on the T-Nuts! And you're right - those prongs want to bend unless you are careful. I like using epoxy on them just like you have.

Posted by ppkstat on Sat, 25 Jun 2022 22:57:17 GMT
View Forum Message <> Reply to Message

T-nut installation is done! I guess this is the last part on the list of things that can go seriously wrong :d A couple of them are a bit hard to turn, I am guessing this is ok.

This is a test fit (screwed in) of the woofer. It goes in beautifully.

File Attachments
1) 1656174028431.jpg, downloaded 520 times
2) 1656174028445.jpg, downloaded 489 times

Posted by Wayne Parham on Sat, 25 Jun 2022 23:38:43 GMT
View Forum Message <> Reply to Message

Looks really nice! I love that midwoofer!

About the T-Nuts - you said a couple screws are hard to turn - be careful with those, especially since the T-Nuts are now epoxied in place.

I often see this on builds, and it's usually no big deal. But you can make it a bad deal if you're not careful. So let's go through it really quickly. I just don't want your T-Nut threads to get damaged.

Usually, when I see threading difficult, it is due to one of two things:

1. The position and/or alignment of the T-Nuts is just slightly different than the holes in the midwoofer.

2. The threads have been slightly damaged by the process of installing them.

So do this: Try to run screws into the T-Nuts using only your fingers. This is best done when no driver is in place. It is just to see that the T-Nut and screw threads are in good shape. They should spin freely, all the way down.

If one doesn't, find out if it's the T-Nut or the screw. Try a different screw first, and if another screw goes in easily, then discard the difficult screw. It may have damaged threads.

If more than one of your screws go in hard - assuming the screws are new and in good shape - then the T-Nut threads have been damaged. I sometimes encounter this when screws are used to drive the T-Nut into place. That's a great idea, but you have to use several "sacrificial" screws because the screw threads become damaged after repeated high-torque applications, and a screw with damaged threads will harm any T-Nuts its used with.

So if the T-Nut threads are damaged, then use a tap to clean up the threads. If you don't have one, go to a hardware store and buy a tap and tap-wrench. They're inexpensive, and they'll clean up the threads and make 'em good as new.

Once all the T-Nuts allow screws to thread in easily, now we can check for driver mounting hole alignment. Set the driver in place and hand thread each of the screws. If one goes in a little hard, slightly rotate the driver to re-index it. By leaving all the screws loose - just a few turns for each screw - you can get 'em all started. Once you do that, you can probably safely tighten each screw without cross-threading any of them. That's obviously the goal.

Posted by ppkstat on Sat, 25 Jun 2022 23:53:03 GMT
View Forum Message <> Reply to Message

Thank you Wayne. I've already tried some of your suggestions, I think its an alignment issue. I will check again.

Posted by ppkstat on Sun, 26 Jun 2022 00:33:08 GMT
View Forum Message <> Reply to Message

I checked again. Unfortunately in 2 of them I cannot turn the screw by hand. Bear in mind that I can completely put the screw in and out with a screwdriver, it just takes a bit of force. So I guess these are damaged.

I will probably try to find a M5 tap here, I am just nervous because I haven't used one before. From what you write I understand that I will probably get away with it without doing anything but what's the bad case scenario? Is that that the screw might get completely misaligned and further destroy the remaining threads?

I did use several sacrificial screws for this. They there SS Allen screws and they were used twice at maximum. I guess I overtightened them.

Posted by Wayne Parham on Sun, 26 Jun 2022 01:03:03 GMT
View Forum Message <> Reply to Message

Don't panic, because I don't think you've ruined them. But don't force them either. Take the extra effort to go get that tap and use it on each of the T-Nuts. They're super-easy to use - just like threading in a screw - but the tap is hardened steel and has cutting edges that will remove any burrs and put the threads back in place. You'll be glad you did it.

Posted by ppkstat on Sun, 26 Jun 2022 01:26:25 GMT
View Forum Message <> Reply to Message

I am getting one on Monday then. They are definitely not ruined, I put a screw in and out several times with ease (when using a tool).

Posted by ppkstat on Sun, 26 Jun 2022 23:35:17 GMT
View Forum Message <> Reply to Message

Just a few closing questions on crossover placement. Really sorry about that.

The proposed way is to mount it in the bottom, under the insulation by making a flap like this:

This is the crossover and zobel in my cabinet.

This is the most space saving solution as the zobel resistor can sit beneath the back sheet of insulation (the crossover is too high to do so). Even this way there is not a lot of space available in the front of the speaker for the insulation to be glued and make a flap. There is just 7cm from the edge of the pcb to the support of the front baffle (bear in mind that the internal space is somewhat reduced due to these supports). Is it feasible in this size?

File Attachments
1) bottom_insulation_cuts.gif, downloaded 449 times
2) 1656286010891.jpg, downloaded 425 times

Posted by Wayne Parham on Mon, 27 Jun 2022 13:49:43 GMT

That's perfect. It'll work just fine that way.

You can put it on the side of the cabinet too, if you prefer. But I think the way you've shown above is easiest, and it works just fine.

Put a gasket underneath the Zobel resistor and the crossover PCB too. It will cushion them and prevent any possibility of buzzing. You can use cardboard, cloth or PVC sheet material.

Posted by ppkstat on Mon, 27 Jun 2022 13:56:49 GMT

Thank you Wayne! As for the gasket, been there done that. There is 2mm EVA tape underneath that Zobel. In fact, everything on the speaker has EVA. The crossover is going to be mounted on 1cm EVA (part of camping mat) because the pcb is through-hole and soldered on the bottom layer.

I also repaired the threads with the tap today. There's one that still has some difficulty to it no matter how many times I pass the tap. I'll live with that I guess and I will be extra careful during the final assembly.

Posted by ppkstat on Tue, 28 Jun 2022 19:33:30 GMT

Funny thing that always happens, problems arise only in the parts that you thought they were easy. I actually had difficulty in mounting the crossover. MDF doesn't take kindly tightening screws, even when the correct pilot hole is being used. I did screw the crossover correctly however because the PCB was bending I could not fully tighten it down. The screws went into the wood around 5mm. I just hope it will hold. I did some stress testing (:d), that is trying to take it of by force but it seemed pretty stable. We'll see how that goes I guess.

The insulation is also done. I hope I did everything correctly. In one of the speakers there is a gap of around 0.5-1.0 cm where the bottom back insulation meets the bracing board. I hope that's ok. The cable you see running is for the de250, obviously. I had the idea to put some duct insulation around it just in case it somehow bangs again anything hard inside.

And finally here is a video of the finished pi logos! My friend sent me this I don't have them here. Again, this is platinum plated brass. I am still thinking on how to mount these, I will probably use superglue.

https://youtube.com/shorts/3XT9GZYy36o

File Attachments

1) IMG_6204.jpg, downloaded 644 times

Posted by Wayne Parham on Tue, 28 Jun 2022 19:50:56 GMT
View Forum Message <> Reply to Message

I hear you on the screws into MDF. When I use wood screws on MDF, I limit the clamping force to "just a smidge" - 'cause that's all you can really expect from MDF. But then again, you don't need any clamping force for the crossover board. It just needs to be attached.

The insulation looks perfect to me.

And everything else does too! Good job!

Posted by ppkstat on Thu, 30 Jun 2022 18:27:24 GMT
View Forum Message <> Reply to Message

All the cabling is now done. I also masked them with some tape for the painting process as they are going to be professionally spray painted. I am going to the shop tomorrow. There's now light at the end of the tunnel.

Looking back at it, it was hard work, much harder than I initially though. Worst part of it is that it requires BOTH heavy and precision work. So you're tired from lifting, tightening etc and then you have to work with mm tolerances. It would be much easier if I just took my time but I really want to listen to them!

File Attachments

1) 1656613596897.jpg, downloaded 616 times

Posted by Wayne Parham on Fri, 01 Jul 2022 12:52:25 GMT
View Forum Message <> Reply to Message

Lookin' good!

Posted by ppkstat on Mon, 11 Jul 2022 13:50:32 GMT
View Forum Message <> Reply to Message

The speakers are going to be a bit delayed unfortunately. Due to supply chain issues there is a shortage on a specific component of the paint.

However the project is still somewhat alive as I received the stands today. These are custom made by sheet metal. I filled the tube with kitty litter but there's noticeable ringing. I hope it'll be ok. They weight around 25kg (55 pounds).

These are 21cm tall on the front side, they are inclined by 5 degrees. Including the decoupling solution these will be 25cm tall (10in).

These have M10 threads for spikes but I have a suspended wooden floor and therefore I ordered some rubber feet made by Hudson hi-fi designed for the specific load. We'll see how everything will work.

I should also have the logos by the end of the week.

File Attachments
1) 1657545825691.jpg, downloaded 596 times

Posted by Wayne Parham on Mon, 11 Jul 2022 16:03:56 GMT
View Forum Message <> Reply to Message

Those stands look fantastic!

Posted by ppkstat on Thu, 28 Jul 2022 13:29:56 GMT
View Forum Message <> Reply to Message

This adventure has come to an end.

This a close up of the binding posts. In retrospect I should have used a speakon instead.

These feet made by hudson hi-fi do a good job decoupling them from the suspended wooden floor.

And the pi logo in all its glory

This is the first speaker I 've ever built. Not bad for a first time I guess. Results aside to me the most valuable thing was to get some knowledge. 6 months ago I knew about nothing on how speakers are built or work. This is just invaluable.

File Attachments

1) DSC03031.jpg, downloaded 519 times
2) DSC03034.jpg, downloaded 521 times
3) DSC03040-Edit.jpg, downloaded 436 times
4) DSC03050.jpg, downloaded 530 times
5) DSC03054.jpg, downloaded 514 times
6) DSC03061.jpg, downloaded 523 times
7) DSC03065.jpg, downloaded 515 times

Posted by Wayne Parham on Thu, 28 Jul 2022 13:40:48 GMT
View Forum Message <> Reply to Message

Those are incredible-looking speakers. I love the color!

Nice job!!!

Posted by Rusty on Thu, 28 Jul 2022 14:16:16 GMT
View Forum Message <> Reply to Message

WOWIE ZOWIE! That commands a presence. I bet the sound will too. Your attention to detail is commendable. As the old baseball saying goes. You hit it outta the park! Please reveal your take on how they sound after they and you get settled in with them.
I like the Dali watch draped over the shelf too.

Posted by Barryso on Thu, 28 Jul 2022 17:32:26 GMT
View Forum Message <> Reply to Message

Wow! Spectacular looking.

Posted by ppkstat on Mon, 22 Aug 2022 21:02:06 GMT
View Forum Message <> Reply to Message

I'd like to thank everyone for their kind words, and Wayne for all the support. I cannot stress this enough especially for Wayne who answered all my stupid questions with great patience.

That being said I am back from vacation so its measurements time!

This is a nearfield measurement of the port, woofer and driver.

Seems pretty normal as far as I can understand except from the tuning frequency of the cabinet which seems to be around 24Hz. This is exactly the same on both speakers. I have no idea why they turned up like that since I followed every dimension with a 1mm tolerance. Maybe the added volume from the support rings or the less thick insulation?

In order to see if everything went well I tried to do a quasi-anechoic measurement of the speaker, indoors. I laid it on its back and measured it, my high ceiling (5m) would probably helped with this. Below is the response as I got it and then the same response with impulse response gating.

I then tried to merge this response with a combined port-woofer response but I failed completely. I could not match the SPL between the woofer and the port and the formula described in Jeff Bagby's whitepaper produces strange results. This might be due to the fact that the cabinet is tuned that low.

Ok now moving on to the in-room responses. BIG DISCLAIMER HERE. What you're about to see has nothing to do with the performance of the speakers, it's all due to my awful, untreated, listening space.

Here is the response from the listening position which is a couch. The are 3 graphs for the center, the left and the right of the couch in this order (1/12 smoothing).

RT60 is horrible averaging around 800m

and the spectro doesn't look very good either

There are several issues with the SPL response. In case you're wondering they sound as bad as they measure. The first issue is poor bass response, especially in the 30-100Hz region, which is followed by a bump. There is massive HF roll of above 2kHz and I think this is something that has to do with the space as I was measuring the same with my previous speakers. There is also a bump around the crossover region which I think also has to do with the space as it was absent on the measurements of the speaker lying flat.

What I do find strange however is that in the published 3pi response the 30-150Hz region is still 3db lower than the mid region. I don't know why this is the case, is this by design or a personal preference? :lol:

In any case the speakers in my listening space need a very heavy amount of equalization. I used EQ APO with a +4db Harman curve in order to get a more balanced result. Below you can see the result but I did the whole procedure a bit hastily. The definitely sound better this way though. These speakers seem to have an excellent polar response so I hope that they will be equalized well in the end. Red is unfiltered and blue is equalized. Subjectively, that boost in the 30-100 region makes a huge difference :)

These need quite a bit more work to sound correctly inside the room. Future attempts will include proper placement (symmetrical and away from walls), Dirac, room treatment and 4 subwoofers. The room is notoriously difficult to treat for several reasons. However, one of the first thing I will do soon is to construct some freestanding thick panels to place behind the speakers in attempt to reduce SBIR issues. I'll keep you posted!

File Attachments
1) nearfield.jpg, downloaded 666 times
2) 3.jpg, downloaded 659 times
3) 2 (1).jpg, downloaded 685 times
4) center.jpg, downloaded 551 times
5) right.jpg, downloaded 659 times
6) left.jpg, downloaded 655 times
7) spectro.jpg, downloaded 642 times
8) rt.jpg, downloaded 659 times
9) equa.jpg, downloaded 659 times

Posted by Wayne Parham on Mon, 22 Aug 2022 22:01:40 GMT
View Forum Message <> Reply to Message

Measured in-room, I think your response curves are pretty good. This is typical in-room response. Looks to me like all is working as designed.

In-room measurements show the room more than they do the speakers. But having a waveguide speaker really helps in that regard.

What isn't helped by the waveguide is the range you're talking about - the 30Hz to 150Hz region - which is entirely in the modal region. It's why we want to employ multisubs and flanking subs. The mains can't do much there by themselves, at least not without energizing room modes, which is generally counter-productive.

This gradual rolloff below 150Hz is caused by baffle step. Above 150Hz or so, the sound radiates mostly forward because of the size of the baffle. But below that frequency, the sound radiates omnidirectionally, so on-axis SPL is reduced. The sound energy is spread over a wider area at low frequencies, and that's what causes baffle step.

Some designers might "boost" the region below baffle-step, but they actually do it by attenuating the whole audio range above baffle-step. I prefer to go the other way, to use what I call "flanking subs" to provide extension and to bring up the energy below 150Hz. You can see it as a three-way speaker with the bass driver detached, in its own cabinet.

I mean, you could boost bass going to the mains. But then you have a single sound source - or two, if stereo - energizing the room in the modal region. This small number of sound sources creates well-defined room modes. The room has strong peaks and dips in the modal region.

Adding sound sources in the modal region helps to mitigate room modes. The room is energized in a variety of locations, which tends to smooth the modes.

You'll notice the big peaks and deep notches in the 60Hz to 120Hz range. Response is usually made smoother using flanking subs. That's the whole reason for having them. They reduce speaker boundary interference response (SBIR) anomalies, which are what usually causes the

roller-coaster in that region. And they also provide baffle-step compensation, which is what makes the speakers droop below 200Hz or so.

The SBIR anomaly is really pronounced in the measurement you showed with the speaker lying on its back. I see this often - it's kind of a textbook case for why to use flanking subs - because many speakers are pushed back directly against the wall behind them, or maybe just a foot or two away from the wall. This is a common placement for speakers, because it is a convenient use of space. Most people don't have rooms large enough to pull their speakers several feet out into the room. So it results in that tell-tale SBIR roller-coaster between 80Hz and 120Hz. Pull 'em out a little further and the notches shift lower, but they're still there.

SBIR is not the same as room modes, but they are both caused by reflections. Modes are standing waves whereas SBIR is self-interference between a direct wave and a reflected wave. The nasties in the 80Hz-120Hz region are primarily caused by SBIR in most cases. But higher-frequency room modes are there too.

So the point is you will really benefit by employing flanking subs and possibly one or two additional subs placed far away in a multisub arrangement. Flanking subs will mitigate baffle-step, SBIR and high-frequency room modes. Distant multisubs will mitigate lower frequency modes.

Posted by ppkstat on Mon, 22 Aug 2022 22:33:27 GMT
View Forum Message <> Reply to Message

Wow thank you for all the comments Wayne!

I had the idea that SBIR can be reduced by moving speakers away from back walls (which without a sub would be unfortunately around 2.5m). Thick absorption behind will also help.

But I am intrigued by your sub arrangement and want to know more. I had the idea that 4 subs placed symmetrically would be the best bet until the crossover region (let's say 80Hz) because they cancel out basically all the harmonics. What you propose however, If I am understanding right, is to place stereo subs behind speakers and cross them higher like 150Hz for example. How will the rest of 2 subs will be integrated in such a setup? I can't see how you can have two different crossover frequencies between two pairs of subs.

You should try to design some speakers with cardioid design :lol: No baffle step there! They're all the rage these days :lol:

Posted by Wayne Parham on Mon, 22 Aug 2022 23:33:47 GMT
View Forum Message <> Reply to Message

I like symmetrical multisubs, which is a Welti arrangement. You can use such an arrangement and also include flanking subs.

Place the mains with flanking subs outboard. They are just a little behind, beside and below the mains. They are stereo subs - as you say - with a gentle 2nd-order slope low-pass slope. With that slope, the crossover frequency is usually best around 100Hz, which then still has significant energy up into the lower midrange around 150Hz.

If you get very close to a flanking sub, you can hear muffled vocals. That's fine because it's very close to the main speaker it's flanking. It's a few feet away in all three dimensions, with your three Pi mains on 12" to 15" tall stands and your subs on the floor.

Then the distant subs are on the other side of the room. They get a traditional LFE signal, which tends to be fourth-order at 50Hz or 60Hz, something like that. It's an all-channel summed bass signal with steep slope and low crossover frequency. Place them symmetrically with the flanking subs.

You can also experiment with an asymmetrical arrangement, like Geddes prefers. Simply place the distant multisubs in a random location distant from the mains. Geddes tends to like one in a corner, and the other in a random location that isn't symmetrical or coincident with any of the other subs.

Both Welti and Geddes agree that once you get to four subs, location begins to matter less and less, provided they are all in different locations. So you have some "wiggle room" on the placement of the distant multisubs.

The distributed multisubs combined with the flanking subs and mains form a woofer array that can be arranged like what Welti or Geddes describes. Either way, the distant subs blend with the flanking subs and mains to smooth deep bass modes.

The ~60Hz crossover on the distant multisubs prevents them from smoothing modes above that point, but you really can't crossover higher without localization problems. Their main purpose is deep bass extension and low frequency modal smoothing.

The flanking subs also run down that low, so they blend as additional low frequency sound sources. But since they run much higher, they blend with the mains in the higher-frequency modal range. They provide smoothing above 100Hz, and they also provide baffle-step compensation.

It's a synergistic system approach.

Posted by Wayne Parham on Tue, 23 Aug 2022 14:09:36 GMT
View Forum Message <> Reply to Message

I meant to add some comments about the Helmholtz frequency in each of my responses above, but forgot. It was more important to me to discuss the use of flanking subs and multisubs, and the reasons for needing them. So I became involved in those responses and forgot to come back to box tuning. I'll correct that now.

Your measurement of the Helmholtz frequency looks correct to me. I don't get too focused on box tuning unless someone has adjusted dimensions. And even then, I'm not as focused on the Helmholtz frequency as I am on the possibility of anomalies from internal standing waves. Of course, if the Helmholtz frequency were shifted by a large amount - particularly upward in frequency - there would be adverse effects. So if a person were to forget the duct entirely - leaving just an unvented port hole - or do something else that shifted box tuning up a half octave, that would be bad. It would show up in the response curve as an underdamped hump. But I rarely see that problem.

I designed both the three Pi and four Pi speakers to have a slightly overdamped response curve. They aren't designed for max flat extension. This is partly for size and partly because I like the behavior of a slightly overdamped vented cabinet. It cannot shift anywhere close to having an underdamped hump, even as parameters have thermal shift at maximum power levels.

Such a system has a response curve that looks a little like a sealed cabinet, but with deeper extension from the same sized box. Its overdamping makes it look less like the traditional vented fourth-order curve and more like a sealed second-order. It also becomes very tolerant of parameter shifts. And being vented, it benefits from reduced excursion even with the added energy down low.

This design approach creates a speaker that rolls off gradually and works well with the flanking sub approach. It sounds good without subs - having plenty of useful bass - but it does lack the full depth of a system that includes subs. Sometimes, at shows, I switch off the subs and people don't notice a huge difference. It's not completely lacking in bass. But the system does benefit from subs, for all the reasons I described above.

As an aside, acoustic suspension advocates would argue that the transient response and group delay of a sealed system is better, but those are very dated arguments. To argue that phase shifts from the vent are a disadvantage that sealed cabinets don't suffer overlooks the very real influence of room modes. There is no phase benefit from a sealed cabinet when used indoors, because phase in the modal region is all over the place and different in every location. There again, that's why we use multisubs.

The published impedance curve of the four Pi shows it to be tuned to around 35Hz and the three Pi is tuned to around 25Hz. That's the approximate location of the impedance minima. If I were to look closer at the raw data, I might see that the exact minima is 24Hz for the three Pi and 34Hz for the four Pi. These two speakers might drift to 26Hz and 36Hz from thermal parameter shift or different amounts of damping material. It's fine all the way up to beyond 30Hz on the three Pi and 40Hz on the four Pi. I often even round up to those values when asked. If someone is pushing them hard for prosound or high-power home theater and they want to high-pass the mains, I would suggest those values for the HPF.

The target Helmholtz frequency for the four Pi design was 37.5Hz and the three Pi was 28.5Hz. But like I said, slight shifts downward totally don't bother me and this design approach - being slightly overdamped - allows for slight upward shifts too. As I mentioned earlier, what I am equally concerned with - perhaps even more focused upon - is internal standing waves. These cabinets are large enough they develop standing waves in the lower midrange.

As part of the initial design and testing, I modeled the cabinets with Martin King's spreadsheets and then made physical models to test with, all in an effort to ensure the positions of the midwoofer, port and damping material prevented an antinode being at the port or the driver, where it would create response ripple. After all the modeling, testing and cabinet modifications to dial it in, the internal standing waves were mitigated, and the Helmholtz frequency stood where it is now.

Posted by ppkstat on Tue, 23 Aug 2022 18:43:18 GMT
View Forum Message <> Reply to Message

Thank you Wayne. Everything makes sense now!

I really cannot understand why people think that subs are optional. If the goal of the system is to reproduce information accurately they're not optional, at all. They are a necessity, otherwise you can't get an accurate representation of the content in the first two octaves. There are several speakers on the market that they even struggle with the third!

2 is minimum, 4 is better. They will also have to be time aligned. There is excellent software for this today for free (like MSO) and a minidsp can tune them. Smoothing the the modal frequency is a bonus, but below 80Hz you can't do anything without 4 subs if you want a smooth response. You can't solve this with absorption in these frequencies.

Do you recommend plugging the port when using with subs by the way?

Another thing I wanted to mention. These speakers are sensitive, obviously but I had the idea that 10-30W would suffice to get good levels. Well in my space these will happily swallow a 100W and even more! Anything more than that is just too loud and I really don't wish to know what happens with 300W which is their supposed max rating.

Posted by Wayne Parham on Tue, 23 Aug 2022 19:29:58 GMT
View Forum Message <> Reply to Message

I agree with you generally about almost everything you said except the part about time alignment. This is impossible in the modal region.

hornsubs - because acoustic centers are far from the mouth. In that case, a delay line can be employed to keep everything in sync. It's not really important that they be "aligned" to the

Indoors, this isn't possible because of interactions with reflections that are nearly as loud as the direct sound. SBIR and room modes rear their ugly head. So since we cannot possibly have the sources and reflections in phase, we might do the next best thing. We can create a sound field at low frequencies that acts similarly to the reverberant field that exists at higher frequencies. That's created by dense interference. It's done by blending sound sources of lots of different phases.

So - no - don't plug your ports. Totally unnecessary and actually counter-productive. Just setup a flanking sub / multisub system.

To summarize:
If everything is in-sync and there are no reflections, a coherent wavefront can be generated. This is the best case outdoors, or in very large rooms and auditoriums.

If there are just a few sources and/or reflections, then well-defined lobes and nulls form. It looks like a checkerboard of hot and dead spots in 3D space. This is what the modal region acts like - if there are few bass sound sources - it's a worst-case scenario. You can picture it as choppy waves on water with high peaks and troughs, like what is formed from a single large item or maybe a couple of large items thrown into the water.

If there are many sound sources and/or reflections, then the lobes and nulls become so dense you don't really notice them. Picture it as rainfall on the surface of a pond. There are lots of little impacts, but there are so many it all blends together. This is how the reverberant field acts, and it's the next best thing to a coherent wavefront. Multisubs can create this too, changing the modal region into something that acts like a reverberant field.