Subject: Premium Stage 4 Pi Owner, been away for a while
Posted by Colin on Fri, 20 Jun 2008 16:16:16 GMT
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Hi All,Its been a few years since I've been here, so thought I'd drop in. Back in 2001, I built a pair of Premium Stage 4 Pi (PSD2002, 15" Kilomax) and had been extremely happy with them. Well, between then and now, my wife and I have had two kids, I've changed jobs, and moved to a different house. Unfortunately, the layout of the newer house didn't permit me to have two separate rooms with one dedicated to home theater and the other for music listening. I still have a theater room, but the living room just doesn't accommodate the big Premium Stage 4 Pi's. Or at least my wife won't. Seriously, if I want music in my living room, at best I might be able to squeeze in some mini-monitors on stands and maybe hide a sub somewhere. My wife would prefer I get in-wall speakers So, I'm left trying to figure out what to do with this pair of Four Pi's. In my basement, in the theater room, they just don't sound nearly as good as they did in the previous house, at least not without some radical EQ. Maybe its because the electronics driving them are different, but more likely I suspect its the room acoustics. I used to drive them with a vintage Pioneer integrated amp, but that thing unfortunately died, and I found a new owner that gave me decent money for it even in that state. My home theater receiver is an B&K Components AVR101, which is/was considered by many to be a true hi-fi piece that just so happens to have a processor and 5 channels of 105Watts each of amplification instead of just two.Has anyone built Premium Stage 4 Pi's recently? I noticed from a forum search that almost no-one talks about using the Kilomax woofer much anymore. Is it because there are now better alternatives? Since I already have 'em, I'm debating tweaking them to try and get them to sound good in my theater room, just for music listening. Maybe its because I'm comparing them to my home theater speakers, which are ACI Emeralds and dual 12" ACI subs that I built years ago, long before the Stage 4 Pis ever came into the picture and while ACI used to still offer kits. Those sound fantastic to my ears down there for both music and movies, but the Pi's just don't.What would you do if you were me?Colin

Subject: Room modes
Posted by Wayne Parham on Fri, 20 Jun 2008 17:13:09 GMT
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Basements are usually very difficult to get sounding right because the walls are so rigid. Room modes are pronounced, making a resonant condition that sounds like singing in a shower. Some bass and midbass notes are way over-represented, others aren't there at all. Also, the walls are usually pretty reflective at higher midrange and treble frequencies, so those can be pretty shrill.The speaker is directional enough to help some at the higher end, reducing ceiling slap and if positioned right, early sidewall reflections too. But in a lively room, that's not enough. The rear walls reflect as much as anywhere else. And nothing that the speaker does can tame room modes. You'll have to damp the room to reduce those.I'd suggest panel absorbers, as they'll do a lot for you. You can make them like false walls, so they aren't in the way. Damping is one of the best ways to reduce room modes, and in a basement, I'd say it is a requirement.Another thing that helps smooth room modes is to add subs. It may seem counterintuitive to add subs in a room that

seems overpowered with a few strong bass notes. But careful placement of subs helps average the standing wave nodes that develop in a room. The smaller the number of bass sound sources, the more well defined the room modes are, creating peaks in certain places and nulls in others. By adding sound sources, there is some partial cancellation in the hotspots, and there is less total cancellation in the dead spots. So by adding subs, you can smooth the sound in the modal region and make the bass a lot more smooth.Smoothing room modes

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Subject: Re: Room modes
Posted by Colin on Fri, 20 Jun 2008 17:53:55 GMT
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Thanks for the response Wayne; what you say makes allot of sense. I'm just left wondering if it really applies to me.I should take a picture and post it so you could see my basement layout. The room is actually rather well-damped. Left side wall is floor-to-ceiling bookshelves full of books, the other wall has a very soft flip/flop couch which is basically a big fabric-covered foam absorber. I could perhaps treat the wall above it a bit more, but beyond that, not sure what else. The basement room itself is a VERY large room, but its divided into two sections with the listening area and the listening position in the back half. The listening/viewing position is a leather reclining loveseat in the middle of the room, which sort of acts as a bit of a room-divider, along with a bit of a proscenium "arch" which runs up each side wall, and approx 10 inches across the ceiling (likely a support beam). Floor is tight-weave carpet with a fairly substantial pad underneath. Seriously, I'm a semi-professional musician (weekend warrior, actually) and my basement's acoustic signature actually resembles some recording studios I've worked in. The fact that I can A/B the PI's with my home theater speakers, which in this room sound SO MUCH better, I'm left wondering if perhaps there is a problem with the PI's. The upper mids and highs on the Pi's just aren't nearly as clear and clean as the 1" Vifa D27 silk-domes and 5" Vifa M13 woofers in my ACI Emeralds. Is this newer B&C compression driver significantly better than the PSD2002? Does anyone build with the Kilomax woofer anymore? Is the Omega better?I'm also curious - has anyone ever considered/measured the resonance of the big aluminum heatsink on the front of the Kilomax, and what colorations it adds to the overall sound of the system?thanks,Colin

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Posted by Wayne Parham on Fri, 20 Jun 2008 19:56:24 GMT
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The heat sink on the front of the Kilomax is one of the reasons I stopped using them. I love the idea of pole piece wicking, but don't much care for the idea of putting the heat sink in front of the cone. In fact, I have a patent applied for a pole piece heat sinking device, but it removes heat out the back, not the front. The center part of the cone is an important region for sound radiation, especially at higher frequencies.As for the DE250, it's definitely smoother. The PSD2002 is a good driver, but the DE250 is better, in my opinion. The amplitude response is certainly

implementation of a DI-matched two-way speaker to date. It is mature and refined to the point I can't see any further optimization possible. At the risk of sounding immodest, I don't think there is a better DI-matched two-way speaker anywhere, at any price. I guess a person will always probably tend to favor their own "kids", but the measurements bear this out. I've put a lot of time

loudspeaker performance dataJust a few more words about room interactions:The key to damping room modes is sympathetic vibration of things that are big enough to absorb long wavelengths. The same things that tame higher frequency reflections don't apply to bass. That's why large panels work well, there is a lot of real estate to vibrate with the bass, and they are able to damp the modes by absorbing energy at low frequencies.An example that comes to mind is the futility of making bass measurements indoors. A profesionally built anechoic chamber is only truly reflection free down to the upper midbass, because the absorbent wedges that line the walls are completely ineffective at bass frequencies. They aren't big enough. That's why bass measurements are best done outdoors. A wide open space is the only truly anechoic environment.Room modes tend to reinforce bass at some frequencies and cancel them at other frequencies. The modes are different at different places too, so you may find the corners lack some bass frequencies and have plenty of others, but the exact opposite frequencies are lacking or over-represented in more central areas of the room. The room tends to form pockets, and depending on the rigidity of the walls, those pockets are well defined or if damped, they may be less so.Two kinds of speakers are less sensitive to strong bass modes. One kind is speaker systems that lack bass, the other is speaker systems with distributed bass sound sources.If a speaker lacks bass, then there isn't as much energy put into the room to begin with. I've noticed people with resonant crawlspaces or strong bass modes tend to favor single-driver speakers or mini-monitors with small woofers. They don't generate a lot of bass, and what's there is augmented by one or two room modes. Larger speakers would tend to sound boomy in some bass frequency ranges, with holes of missing bass in between. The smaller speakers don't sound boomy; The "boom" brings up the bass level a little bit, maybe makes them sound better.Satellite/sub systems are less sensitive to room modes too. There are more bass sound sources, and that tends to smooth modes by averaging. The satellites have woofers in them and so do the subs. In the modal range, these generally overlap, each making sound. If you place them well, there are more wavefronts combining, making a more complex interference pattern. Dense interference why the modes are less well defined.Think of the ripples on a pond when one or two rocks are thrown in, forming well defined rings spreading out from each impact. Throw in two rocks, and you'll see rings spread out from the impacts, cross each other, perhaps reflect off the side of the pond and back inwards. You can see each crest and trough of each wavefront, because they're well defined. When waves cross where each is at a crest, the peak is bigger, where each is at a trough, the valley is lower. Where a crest meets a trough, they cancel out. A leaf on the pond will rise up and down, riding the crests and troughs.Now think of the pattern that forms when rain falls, making multiple impacts. It is such a complex pattern than no discrete wavefronts can be seen. A leaf on the pond doesn't go up and down, it will jiggle around but it won't rise and fall on the edge of a wave because the waves are all lost in the dense interactions between one another. This is how dense interference smooths the average sound level, and how it helps make the energy distribution throughout the room more uniform in the modal region.The

loudspeakers. Of course, damping is important too. Damping and multiple bass sound sources are the best ways to smooth room modes.