Subject: Symetrical Array (and crossover issues...) Griffen? Craig?
Posted by Greggo on Fri, 19 Oct 2007 14:58:23 GMT
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If I was just interested in a line array from 90hz on up, and was going to use 3-4 drivers tightly spaced on each side of a very narrow planar or ribbon driver (I know, they don't exist yet, but I may do something to change that) what issues would you focus on and how would you approach solutions. For example:1)Most builders of line arrays seem determined to get their crossover points to the tweeters as low as possible. Why not push it out to 3.something kHz to avoid the areas where we are supposedly the most sensitive to crossover affects (1.5-2.5 kHz is the last range that was defended by someone else in a manner that made sense to me)?2) I am becoming a fan of controlled directivity designs, waveguides and horns design to have their main axis cross in front of the listener to minimize side wall reflections and have controlled dispersion up top that matches the lower end of the tweeter with the upper end of the woofer. Is it possible to model such effects from the horizontal double driver approach, one small mid-bass on each side of the tweeter so as you go out to one side of the listening sweet spot there is more lobe induced cancellation that creates an effect similar to a waveguide?3) Would something like the hi-vi B3S be a good starting point as you could do two vertical lines, one on each side of the tweeter line, and keep the c-t-c around 3", and then if you could find a tweeter with an assemply (maybe you remove the flange and mount from the magnet and/or rear assembly of the driver of less than 2" wide then you have a less than 5" c-t-c which I believe would allow a crossover point between them all of somewhere around 3kHz before serious lobing would set in on axis (not sure if I have these effects straight)4) In one of Rick's posts to this forum he mentioned that advantage of using a line of inexpensive mid-bass drivers on each side of the tweeter line would include things like doubling of mid-bass cone area to further limit excursion and distortion, and lowering of side wall reflections. The latter point intrigues me the most as it does seem to fly in the face of line array dispersion benefits such as very wide even dispersion in a cylindical wave shape, but it does play into my goal of building a speaker that requires a great deal of toe in to cross just at or in front of the listening seat and to limit the level of early side wall reflections (the one beside the speaker) and maximize the later side wall reflections (the wall across the froom from the speaker) a la Earl Geddes or something like that.Any thoughts? I am thinking seriously about working with a driver manufacturere to design a single faceplate hosting two mid-bass drivers with a planar tweeter in the middle, with the tweeter in an isolation chamber to protect it form the mid-basses, and an fs or around 80hz on the midbass and a driver design that would allow it to perform nicely with steep digital slopes around 90-100Hz to hand off to a sub tower and up to 3kHz with a smooth roll off beyond to allow a nice passive crossover from mid to tweeter, along with a very narrow plannar tweeter that can be crossed as low as 3.5khz. Then we you have an array of anywheres from 4-25 of these things you get the best out of the drivers without excursion/distortion problems and have ideal crossover points that you keep you out of the most sensitive zone. Kind of like an array that plays into the crossover point of Dr. Griffins Jordan/Ribbon monitor design.Regards,Greggo

Subject: Re: Symetrical Array (and crossover issues...) Griffen? Craig?
Posted by Greggo on Fri, 19 Oct 2007 14:59:38 GMT

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In the note above, I meant 3-4 inch drivers tightly spaced together...

Subject: Re: Symetrical Array (and crossover issues...) Griffen? Craig?
Posted by Marlboro on Fri, 19 Oct 2007 23:04:47 GMT
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3-4 inch drivers:Most systems operate at a lower crossover point because of this important consideration: they ARE USING 6-7 INCH MID RANGE SPEAKERS. For off axis performance,and for the ability to adequately handle the frequencies between 1200 and 3000, having a lower crossover is very important. However if your mid range units are 3 inchers, then off axis performance is less of an issue(especially in you average living rooms anyhow) and coverage in the upper midrange is already assured.see:(using 34 3-inchers per side, and 30 domes with a c-to-c of

Subject: Re: Symetrical Array (and crossover issues...) Griffen? Craig?
Posted by Greggo on Sat, 20 Oct 2007 00:30:56 GMT
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Hey Marlboro, thanks for replying to my post... I have followed various threads regarding your project hear and have no doubts that they sound great. I know most go with the mid bass sizes you suggested, but even when 5 or 6 I still hear people focusing on high quality ribbons that can cross low (I think lower than the comb filtering limits on c-t-c would demand) as the path to the highest quality. I had mentioned this before in a post here back in July (just search on "Jordan") starting with the very expensive Jordan 2" units and didn't get much back other than alternative ideas. Dr Griffin replied to that as well, but seemed focused on the cost of the drivers (somewhat relevant I suppose) and the posssibility that with such a high lower end cut off of around 200-300 Hz they would require not just a supporting woofer line but a subwoofer line as well. I am not sure about that last point, but I definitely would not want to go 4 way. If building a 3 way line array (and I guess that is the heart of my posting here) what would be the best crossover points? I keep thinking something around 80-100 Hz for the woofer to mid-bass (so that one could use as small a mid-bass as possible but keep the lower range in the "non-directional" zone of 100 Hz)and around 3.5 kHz for the mid-bass to tweet (to keep the mid-bass as close to a wide range driver as possible, for more coherent vocals and less sensitivity to phase issues in the crossover where we hear them the best, around 2kHz according to some of the information I have read, or something very close to that...). The other part of my curiosity is going with symetrical mid-bass lines on each array speaker, per the exchange I saw between you and Rick Craig. I have been thinking about this since the Mcintosh design came out last year (or was it a couple years ago???) and wondered if there was any potential advantages.I guess the bottom line is I am determined to think in terms of a 3-way, and I am curious about potential benefits of dual mid-bass lines to form symetrical arrays on each speaker.Greggo

Subject: Re: Symetrical Array (and crossover issues...) Griffen? Craig?
Posted by Marlboro on Sat, 20 Oct 2007 03:14:01 GMT
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I'm not sure how much of your question is answerable by me. I use a 165, and a 2500 cross. But I use a Rane Ac23 electrical crossover($459 at discount from about $550). Some people seem to consider this to be a "cheap" crossover. By experimentation for my system I find that those crossovers work the best. Unfortunately, the high quality Sammi mid ranges that I use are no longer available. They were built to sell for $16 each, but Sammi couldn't find anyone to buy them at that price and ended up selling them all at a very steep discount. The have a 3.3 Xmax, and full copper voice coils. So 34 of them at the original price Sammi wanted would have been $540. Additionally my system is tri-amped. The tweeter part of the array is 60w/ch, the mid range portion is 175w/ch, and the woofer(12 inch GoldSound poly props) is 350w/ch.All of this(combined with 34 completely separate(1/2 inch open air space) midrange tubes adds up to a synergy that is not included in any plain box speaker system with a passive crossover, and a single amp.So....I really don't know what to say to answer your other questions.Marlboro

Subject: Re: Symetrical Array (and crossover issues...) Griffen? Craig?
Posted by Duke on Mon, 22 Oct 2007 02:38:29 GMT
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The ear's sensitivity to SPL and distortion both peak at 3.5 to 4 kHz. So imho you really don't want to screw up that region. Now it's not so much that you can't get away with a crossover in that region - not at all. It's that you can't get away with a mediocre crossover in that region. I don't see how something as narrow as a ribbon could give you the kind of radiation pattern control you'd need to benefit from a Geddes-esque 45 degree toe-in. I think makes sense to just resign yourself to treating that early nearsidewall reflection, which isn't the end of the world. Duke

Subject: Re: Symetrical Array (and crossover issues...) Griffen? Craig?
Posted by Greggo on Mon, 22 Oct 2007 12:38:18 GMT
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Hey Duke, thanks for posting. I am a big fan by the way, of your products and your gracious posts on various forums that bring some much needed class to a sometimes ill-toned space.Should I take it from your reply that it is better to crossover in the 2-3k space than somewhere in the 3-4k space? I am always interested in why good designers pick certain points to target a crossover... does a philosophy in general come into play or is it simply a matter of driver choice and crossing where a particular driver seems happiest?Regarding my design idea, I was actually thinking of a planar tweeter, something like a Neo3 (or something custom, as I am considering) and perhaps with a driver mod to limit horizontal dispersion even a bit more, and then using the midbass on each side to squeeze the tweeter dispersion more into the vertical axis than horizontal axis for

even tighter pattern (D'Appolito done sideways...). How much this really works and how close it could every get to something even close to a 90 degree coverage horn or waveguide is the core issue at question for me, and well beyond my knowledge base.Then taking it a bit further, if I tried to find a tweeter or have one custom made that I could slip in between two 3 or 4 inch midbass units, it would have to be quite small so perhaps I would have trouble finding something that would be happy crossed much lower than 2.5 kHz due to the size of the diaphram, motor, flange, etc... so I thought, why not combine the issues and let the mid basses run all the way up to 3.5kHz so long as their c-t-c mounting would be possible to allow such a range and then have the tweeter just take over from there.The bottom line for me is trying to explore the issues here to see if the symetrical mounting dual midbass lines, one on each side of the tweeter line, along with a very small but carefully chosen tweeter, and very tight frame to frame mounting of drivers across the board, would combine to form a somewhat "controlled directivity" line array. I know this is almost antithetical to the concepts of a line array to begin with, but I am curious and wondering if any of the better minds out there on the web have thought about it, experiemented at all, or simply have an informed opinion to share. I do love line arrays, and I am somewhat torn between chasing this style of speaker design/build or doing something more in line with what you, Olsen, and Shaw seem to be focusing on, which I also find very appealing (really wish I could have made it out to RMAF this year to hear your latest Dream Makers, I visited your room last year and really liked what I heard....)Regards,Greggo

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Subject: Re: Symetrical Array (and crossover issues...) Griffen? Craig?
Posted by Duke on Mon, 22 Oct 2007 22:34:50 GMT
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Rather than me telling you where I think a crossover ought or ought not to be, I'll show you my source. Click in the link below.An extremely good indicator of where the ear is most sensitive is the Fletcher-Munsen curve, and at the link below is a modern revision of their work presented as a family of curves. Where the curves dips lowest is where the ear is most sensitive to sound pressure level, and sensitivity to distortion tracks that pretty closely above 500 Hz or so. Notice the dip centered around 3.5 kHz to 4 kHz, indicating where the ear is most sensitive.As you can see, there's a small bump in the curves around 1200 Hz that in my opinion would make sense for a crossover frequency from a psychoacoustics standpoint, all else being equal. That being said, in my opinion put the crossover where the drivers match up well, even if it's where the Fletcher-Munsen curve dips lowest. If necessary you can "cheat" and design in a dip in the crossover region. Unfortunately, a midbass driver on either side of the tweeter will not squeeze the tweeter's radiation pattern at all. Devices that squeeze radiation patterns are called horns or waveguides, and in order to be effective they need to be at least 1/4 wavelength long and 1/4 wavelength wide. For example, the front baffle of a typical loudspeaker is a 180 degree horn, and below the frequency where this 180 degree horn is 1/4 wavelength long we have the phenomenon known as the "baffle step". The baffle step begins at the frequency where the baffle is 1/2 wavelength wide, or in other words the frequency where the path length from the center of the driver to the baffle edge (which would be the "mouth" of our 180 degree "horn") is 1/4 wavelength long.Look at the size horns in Wayne's speakers, and the crossover frequencies. That's the width you need to control radiation pattern down to the crossover frequency he uses. A line array with good radiation pattern control down into the midrange region would require some serious

ingenuity. You see, the width you need to get radiation pattern control imposes so much horizontal center-to-center driver spacing that you'd get severe lobing.I don't know how a GOOD designer selects crossover frequency and slope, but I can tell you how I do it: I eyeball a lot of different driver combinations with my end goal in mind, then I model the ones that look most promising, then I buy the parts that modelled the best and start working on a crossover that blends them the way I want. I usually have an idea of what ballpark crossover frequency I want and what slope might work well, but I can't design the actual crossover until I've taken measurements. And even then I never get the crossover the way I want it in the first draft.Back to the line array. I'm not a line array designer, but if I were to try one I'd probably just shoot for smooth first-arrival sound and smooth power response, and concede that the radiation pattern that gives me this will probably be pretty darn wide. Which isn't necessarily a bad thing.Duke
 Equal loudness curves

Subject: Thanks Duke!, awesome post. (NT)
Posted by Greggo on Mon, 22 Oct 2007 23:58:18 GMT
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no text

Subject: Symetrical Array Benefits overblown?
Posted by Marlboro on Tue, 23 Oct 2007 03:17:32 GMT
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I'm not sure that you will actually be able hear a different between a well designed single line of mids and a double line. I hear the discussion about symetrical, and I've read Jim's description of it. Jim says: "...dual mid-range driver lines around a line of tweeters does create several potential advantages..." The operant word here is "potential". Notice how he DOESN'T SAY "does create clearly audible advantages".Maybe you would be better off spending the money on electronics or higher quality speakers. However, in my design, only the mid ranges can be of higher quality, though its questionable where you are going to find 3 incher's that cost more than $16 a piece retail.One has to be careful that one doesn't hear differences because it "just has to be better" since you paid $4000 for all the speakers. Of course if you have plenty of money to get rid of, then by all means go for even the potential. I'd rather spend the extra funds on improving my CD collection than on trying to squeeze out one more percentage point toward the mythical 100% super category. Marlboro

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Subject: Re: Symetrical Array (and crossover issues...) Griffen? Craig?
Posted by Crystal on Sun, 04 Nov 2007 00:57:45 GMT

Since there are no more Sammi mid rangers, what would you use now?