Subject: Ultimate Line Array ($?)
Posted by Greggo on Wed, 05 Jul 2006 13:19:56 GMT
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Just having a little fun here... if we had no worries about budget and a fairly large living room or family room that was to be converted to a listening room, besides all the room acoustic stuff (which is important of course), what would you do as the ultimate expression of the line array principles discussed in this forum. Critique my example or come up with your own or both:1) Multiple DEQX or whatever they are called along with Pass amps, or possibly wire all the drivers up in series and build OTL tube amps for the mids and tweets.2) Jordan JXr 6HD, it seems to me that this would be the ultimate centerpiece of a line array system if we all got past Ted Jordans insistance that they not cross to a tweeter or super tweeter. Of course, Ted knows an order of magnitude more about this stuff than I ever will, but if we stick to Jim's latest research, then we cross them up high (but not two high, I think we have 2.5 inches center to center to work with here...), and in keeping with all the lessons learned by the full range guys spreading out to two and three ways with help up high and on the bottom, we find a driver that has a close enough center to center spacing but covers the bandwidth where we are most sensitive to crossovers, and I can't think of anything better than the new JXr 6HD. How about 25 per side so we have around 6.5 feet of line length, and we run them 300Hz to 6Khz, which should be a walk in the park for these beauties.3) I think the dipole guys are onto something, but many have reported that the Jordans don't sound that great out back, so we keep them sealed, and put another line of 25 behind the first one, and now we have a more perfect dipole because the two lines are better balanced and we use the digital filters to decide up to what frequency we have a dipole. That addresses another issue of how much of a good thing is still a good thing. As some have debated how high up you want the dipole effect in a given room, now you control it from lets say around 600Hz where most room nodes go away, all the way up to the 6Khz that we run the little Jordans. Sit in the listening seat and experiement away.4) Tweets - I don't think this is quite as important as the rest (since we are starting at 6Khz, but this is just my opinion as I don't get all excited about air and delicacy, I just want clean and effortless, as in high dynamics and low distortion), so lets just use the same stuff Jim Griffin and Rick Craig are using lately and go with 12-16 per line, whatever best matches the line length of the little Jordans. Crossed at 6Khz, we avoid all the issues around distortion raised on the Zaph Audio site (and subsequent discussions on other forums...). I would probably remove the face plates and build a custom frame that mounts from the back, allowing the ribbons to get as close as possible to the edge of the Jordans. Might even slice the edge off one side of the Jordan frames at a 45 degree angle so it serves as part of the face plate for the ribbons, then make something to match on the other side of the tweets so everything stays in balance, and this also puts the ribbons between 1/8 and 1/4 of an inch behind the front of the Jordans, might get lucky and have arrival times line up a little better between each of these drivers...5) TC Sounds 12" aluminum woofers, like the idea of similar cone material, a line of 6 run open baffle, in a seperate baffle/frame than the mids and tweets, but designed to still be placed fairly close together as their bandwidth is not quite omnidirectional so location sensitivities still apply. I would run these from 40-300Hz, dipole. Now we have two dipole towers on each side of the stereo system, and each pair is hopfully spaced just an inch or two between baffles. Not sure how I would match the profiles betwee the two however. It seems to me the Jordan towers would only need to be around a foot wide and six-eight inches deep, and they could taper at the ends to form sort of a wing like profile when viewed directly overhead. The woofer towers would need to be in a U cabinet, and how far back the sides would go I am not

sure. Probably go with baffels that are around 21 inches wide and 12-15 inches deep. Not sure about gaps between the two baffles and how much they combine to effectively extend the width of the Jordan baffle, etc... 6) Aurasound 18s (1 per side) would handle the rest, in sealed cabs, and again you could use the digital filters to adjust any overlap with the 12" dipole woofers to get the desired bass slam in a given room.Of course, the "know how" to put all this together in the most optimum fashion is beyond me, but based on everything I have read (and noting the stuff that seems to make the most sense to me personally of course), it would either be this or a 4-5 way front horn system as the ultimate home stereo. So all I need are four-six DEQX, 10 really good amps, 100 Jordans (could probably get them for less than 10K), 24-32 ribbons (around 2k?), 12 TC Sounds 12" woofers, the TC2+ I imagine unless they have something better out now, probably around 3k for those, and of course 4 of the big Aura 18s will set you back around 3k as well. I am guessing around 16k for drivers, 24k for electronics, and 10k for custom metal work and woodworking to do the cabs/frames... I wonder how this 50k, assuming you are willing to write off all your time and effort, would stack up against similar budgets in the many hi-fi salons around the country?Hope you enjoyed dreaming with me. I wonder if Dr. Griffin would be up to the task of a small consulting gig if I just go crazy some day and save up enough to buy the hardware!Regards,Greg

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Subject: Re: And now for something a bit more realistic
Posted by Greggo on Thu, 06 Jul 2006 17:19:02 GMT
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OK, I am bored so I am going to reply to my own message... Aside from getting my math wrong on the Aura 18s, it occured to me that maybe I want to come close to doing something like this someday, so what would I really do if I was using my own money and do I think it would come close to the system above. Here is my own answer to my own question in replying to my own post...this makes me the ultimate net junkie loser:1) I will listen with these speakers roughly 9-10 feet apart and 9-12 feet from the listening chair, and I am only concerned with the sound while seated, not caring about standing listeners...2) So I think I only need four Fountek NeoCD 2.0 ribbons in each speaker, again running 6kHz on up.3) Still waiting for someone to convince me that the Jordan JXr 6HD is not the ultimate starting point for a line array speaker, so until then I will stick with this idea and since the driver and frame is 3" tall, stack 9 of them in each array for a line length of 27 inches, which is a little short of ideal but will probably still deliver a much more dynamic sound than point source systems employing similar drivers. The Mark Audio site shows a recommended sealed cabinet volume that has an Fb of around 150Hz, so I would probably cross over just above that, maybe around 220Hz to help keep things clean down there.4) Keeping everything in one cabinet, how about a total of eight Seas W18E001 6.5 inch woofers, two above the mid/tweet array facing front and two below, with two sets of two mirror imaged on the back of the cabinet, for bipolar bass (and no BSC circuit required...), and if I am not mistaken their specs actually make them good candidates for MLTL cabinet design.5) I would go active between the woofer and mids, and passive between mids and tweets, and go Pass DIY for the amps, and now I think I would have a great small to medium size room line array for around 5-6k in parts.This just might be a real world project someday soon. How would you improve on it?Greg

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Subject: Re: And now for something a bit more realistic
Posted by Jim Griffin on Fri, 07 Jul 2006 01:32:23 GMT
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Greg,I'll try to answer below.1) I will listen with these speakers roughly 9-10 feet apart and 9-12 feet from the listening chair, and I am only concerned with the sound while seated, not caring about standing listeners... Eventhough you are sitting while you are listening, I strongly suggest that the design be such that it operates in the near field. Please read the Near Field Line Array White Paper to understand that we want to have long enough lines to create a near to far field transition beyond the estimated listening distance. To many benefits to the near field arrangement. Hence, I'm suggesting your woofer and tweeter line be long enough for this requirement. 2) So I think I only need four Fountek NeoCD 2.0 ribbons in each speaker, again running 6kHz on up. I'm thinking 6 to 9 of these ribbons to achieve the near field listening distance criterion.3) Still waiting for someone to convince me that the Jordan JXr 6HD is not the ultimate starting point for a line array speaker, so until then I will stick with this idea and since the driver and frame is 3" tall, stack 9 of them in each array for a line length of 27 inches, which is a little short of ideal but will probably still deliver a much more dynamic sound than point source systems employing similar drivers. The Mark Audio site shows a recommended sealed cabinet volume that has an Fb of around 150Hz, so I would probably cross over just above that, maybe around 220Hz to help keep things clean down there. I'm not in love with the small Jordans for this application. The issue is that it takes a boat load of them and they are expensive. The issue is that in a line array application you have to cross them to tweeters as the combing and sensitivity roll off will eat your lunch on the high end. Furthermore, they don't go low enough to prevent you from needing both a woofer array and likely a subwoofer. Thus you might windup with a 4 way speaker.I'm thinking a two way with mid-basses and ribbon tweeters with perhaps a sub woofer. Therefore, what I suggest is a midbass woofer array crossed to the ribbon line in the 1500 to 2000 Hz area. You may need to use a subwoofer for the lowest band (say 20 to 40 or perhaps 60 Hz). More about that the about 2000 Hz crossover point later on. The Seas Excels woofer line is perhaps the best (lowest distortion) series of woofers on the market. Dr. Linkwitz uses the 8" version in his Orion design if you read his website. For this application I like the W15 or the W18 versions of the Seas Excel drivers for the mid-bass woofers. If you use a high slope active crossover and cross low, then the mag cones can be easily tamed. The new Nextel cone drivers have more reasonable out of band less adventures to worry about so that is another way to go. 4) Keeping everything in one cabinet, how about a total of eight Seas W18E001 6.5 inch woofers, two above the mid/tweet array facing front and two below, with two sets of two mirror imaged on the back of the cabinet, for bipolar bass (and no BSC circuit required...), and if I am not mistaken their specs actually make them good candidates for MLTL cabinet design. I commented on the Excels. You would need 10-12 W15's per side or 8-9 W18's per side depending on what you choose for my suggested design. You can use parametric EQ to extend the low end of the woofer line to get into the 30 Hz low end roll off in most rooms. For really large rooms one or two subwoofers can handle the 20 to about 60 Hz area. I don't like the bipolar (or even dipolar for that matter) design for a line array application as you have too many placement constraints (for both bipolar and dipolar) or need more EQ (dipolar case) to get any bass. I really like sealed box woofers as they can handle transients without significant time delay as you get snappy response and excellent match from the midwoofers to the ribbons. The dipolar case necessitates wide baffling and/or heavy EQ and large displacement drivers to light the bass candle. A line array isn't a good use of MLTL cabinets as you have a bunch of drivers on each side and MLTL boxes are just too big vs.

either vented or sealed alignments. 5) I would go active between the woofer and mids, and passive between mids and tweets, and go Pass DIY for the amps, and now I think I would have a great small to medium size room line array for around 5-6k in parts. The parts for the design that I suggesting runs in the $4000-4500 area for the drivers. I really suggest that you think about a DEQX unit in your future eventhough it may not be in your budget. The DEQX unit calibrates the time, phase, and amplitude across the entire frequency band while allowing room corrections to adapt the speaker system to the listening room. It does three way crossovers, makes all the mesaurements you need, acts as a preamp, equalizer, DAC, and more. The mid-bass to ribbon crossover in this case can be as high as 300 dB/octave slopes (that is a brick wall) so you minimize crossover region issues. I typically use 48 or 96 dB/octave numbers. Plus the DEQX does linear phase filters for the crossovers so you get seemless transitions between driver lines with no smearing at all. Rick Craig has a design on his website that comes close to what I suggest and your needs. It is the Alexandrite model and he has specs and plots on its performance on his site at the link. I have a line array (see photo) that does a lot of what you want made from CSS WR125S midwoofers and Aurum Cantus G3i-130 ribbons. I'm using a DEQX crossover with it. Several folks heard it at the recent GPAF show.Jim
Selah Audio Alexandrite

Subject: Re: And now for something a bit more realistic
Posted by Jim Griffin on Fri, 07 Jul 2006 01:32:23 GMT
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Selah Audio Alexandrite

Subject: Re: And now for something a bit more realistic
Posted by Greggo on Fri, 07 Jul 2006 02:36:27 GMT
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Jim,Thanks for the thoughtfull reply. I need to re-read your paper as I thought the line length issues at the frequencies I was thinking would hold up better. Anyways, I certainly have nothing

but the utmost respect for the systems both you and Rick have engineered, but I can't help but wonder if there is more magic to be squeezed out of a line array that has the primary drivers working from under 300Hz up past 4kHz, with those drivers having a c-t-c spacing close enough to avoid any comb filtering. This range seems to get cited fairly often as one that, if left undisturbed by crossovers and differing transducers, can yeild a most musical and coherent presentation. This is the allure of the Jordan driver for me, granted the fact that they are not exactly the best value in terms of dollar per driver, and this is made worse by the number you need to fill a decent line length. But the idea that one could approach the silky smooth sound of a good full range driver with the dynamics and soundstage of a line array keeps nagging at me.I also wonder if you had enough of them, like 16 or 25, that they would hold up well into the low 200s or high 100s for a lower level crossover. At that point, I think it would be easy to find a stack of 4-8 woofers that would gladly work together to handle 20-200 Hz with ease. I guess the bottom line is, if you did go from a 2-way design to a three way, how would you do it and where do you get the most return? Based on all the anecdotes from the single driver guys, I would vote to start experimenting with wide bandwidth drivers like the jordans to come as close to the full range ideal as possible. I think most people just find the idea of spending all that money for such little drivers, and then crossing them to a tweeter to just be too irratating to take seriously. I would like to try someday, just to find out for sure.Thanks for pointing out that the DEQX can be thought of as much more than just a crossover, I have no idea why this did not occur to me. Thinking about just running from the digital outs of a decent CD/DVD player and then needing nothing but the DEQX untill you hit the power amps of an active speaker system helps to justify the cost when one is thinking, as I am, of upgrading their entire system. As you point out, it certainly seems to be an unbeatable tool when playing around with various speaker designs and appropriate slopes and filters to get the best out of them. Like you, I have no desire to ever think of this as a serious business, but I would like to build out the many ideas that pop into my head and have fun with it, maybe doing a custom build now and then or at least sharing plans that seem to work well with the rest of the net... all things that, if I follow through on would certainly further justify investing in a DEQX.Thanks again for your response, I wish we could get more action on this forum as line arrays are just fascinating.Regards,Greg

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Subject: Re: Ultimate Line Array ($?)
Posted by Anonymous on Mon, 10 Jul 2006 15:33:28 GMT
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>>what would you do as the ultimate expression of the line array.I'm working on something evil. Email if curious.

Subject: Re: Ultimate Line Array ($?)
Posted by Anonymous on Mon, 10 Jul 2006 15:53:09 GMT
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>>Multiple DEQX or whateveryes, or whatever >>Pass ampsyes, but there are more affordable choices that won't affectperformance.>>or possibly wire all the drivers up in series and build OTL tube>>amps for the mids and tweets. I don't consider this 'ultimate', I see it as counterproductive.>>Jordan JXr 6HDYes, but there are better line array designs that using 2" drivers.>>I think the dipole guys are onto somethingPersonal preference design. Coke or Pepsi ?>>Tweets - I don't think this is quite as important as the rest The tweeters will be the heart and soul of your sound system,this is where you need to focus on.>>TC Sounds 12" aluminum woofers [40hz to 300hz]That would be pretty good, not ultimate though. If you wantideas, email me.>>Aurasound 18syes.This is the easier part, building a monster subwoofer. Manywoofer candidates that can do this job well.>> I will listen with these speakers roughly 9-10 feet apart and>>9-12 feet from the listening chairI would make a tall array, not shorcuts in spite of a short listening distance.>>So I think I only need four Fountek NeoCD 2.0 ribbons in each>>speaker, again running 6kHz on up.Regardless of the design you choose, four tweeters is a compromise,do a full blown array with mids and tweeters.>>Still waiting for someone to convince me that the Jordan JXr 6HD>>is not the ultimate starting point Building any loudspeaker begins with quality tweeters. Great midranges mated to 'ok' tweeters never sound good. On the otherhand, quality tweeters with 'ok' midranges can be made to soundmuch better. You need to focus on the tweeters and then the midrangequest is so easy. I can tell you right now that finding exceptionaltweeters is a more difficult task as the market has very few to choose from if you want to make a line array but the market issaturated with quality midranges or midwoofers that can easily dothe task.Stay away from this type of design, you can do better DIY style.http://www.mcintoshlabs.com/mcprod/shopdisplayproducts.asp?id=20&cat=Loudspeaker+Systems&prodid=1114&product=XRT2K>>I would go active between the woofer and mids, and passive between>>mids and tweets.Go 100% active, don't waste your time with passive crossovers.>>go Pass DIY for the ampsThose DIY amps are low powered, low headroom. An array deservesmore power and headroom if you want to exploit it's potential,otherwise you will be just an average Joe with a good system,but not ultimate system.

Subject: Re: And now for something a bit more realistic
Posted by Anonymous on Mon, 10 Jul 2006 16:11:16 GMT
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>>I can't help but wonder if there is more magic to be squeezed out>>of a line array that has the primary drivers working from under>>300Hz up past 4kHz,Lets take a few steps back. The speaker builder may crossover theirmid/tweeter in the 3khz - 5khz range because they usually skimp onthe tweeters when planning a design. Very few that make DIY linearrays use the high end tweeters, instead they use cheaper tweetersand cross them over higher because they can't hang with a lowercrossover point.To squeeze out more magic: Find an exceptional tweeter that can betaken down to 1500hz - 2000hz {as Jim said} and the system not onlywill integrate well with almost any midwoofer, but the perception ofbetter sound and imagining is had.By taking the full range driver up to 4khz, then crossing to atweeter, this won't give you that magic. Sure you can make it work,but it's not as sweet as the other choice.I can take an exceptional ribbon or planar tweeter and make a fullarray with them and use $1 midwoofers and you will be blown away byhow good the sound is. I can't say the same if the situation isreversed.Suppose you did some tests and realized this is the path that indeedworks well. If your tweeters need to operate at 1500-2000hz

toperceive the 'magic', then that implies your midwoofer will operateup to 1500hz - 2000hz in which case, it's easy to find midwoofersthat can do this job easily with great SQ, and the full range driverisn't really needed.