Subject: Array Tweeter Selection
Posted by Username on Thu, 31 May 2007 03:55:27 GMT
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I need help choosing a tweeter for a line array project. I am concerned about the following:1. Minimum cross-over frequency2. Sound quality3. CostAfter reading (and re-reading) Dr. Jim Griffin's "Design Guidelines for Practical Near Field Line Arrays" it seemed reasonable to narrow the list by considering only tweeters that are capable of crossing over below 2,000Hz. You would think that this would be easy to objectively compare using manufacturer and vendor supplied information. I officially give up my solo attempt after a week of free time spent trying to reconcile conflicting information.The following ribbon and planar tweeters seem to be easily acquirable. The Frequency Response and Minimum Cross-Over frequencies are the best I could derive from manufacturer and vendor supplied data. The Cost listed is just a general reference based on what I jotted down in my notes. I didn't note where I found the pricing info, so I'm sure it is inaccurate. It may, however, be beneficial in comparing relative prices (i.e. early elimination of the gorgeous Raven piece).THE LONG LISTAurum Cantus G2Si _ FR: 1.4K-40K _ Min XO: 2.5K _ Cost: $90Aurum Cantus G2 _ FR: 1.4K-40K _ Min XO: 2.5K _ Cost: $170Aurum Cantus G3 _ FR: 1.3K-40K _ Min XO: 2.3K _ Cost: $320Aurum Cantus G3Si _ FR: 1.4K-40K _ Min XO: 2.3K _ Cost: $210Aurum Cantus G1 _ FR: 900-40K _ Min XO: 2K _ Cost: $400Bohlender Graebener Neo3(-PDR) _ FR: 2K-28K _ Min XO: 1.2K (line array) _ Cost: $45Bohlender Graebener Neo8-(PDR) _ FR: 700-20K _ Min XO: 350-700 (line array) _ Cost: $60Dayton PT2B-8 _ FR: 2K-26K _ Min XO: ? _ Cost: $35Eton ER-4 _ FR: ? _ Min XO: ? _ Cost: $280Fostex FT7RP _ FR: 3K-45K _ Min XO: ? _ Cost: $80Fountek NeoCd1.0 _ FR: ? _ Min XO: ? _ Cost: $60Fountek NeoCd2.0M _ FR: 1.2K-40K _ Min XO: 2K _ Cost: $120Fountek NeoCd3.0M _ FR: 1.4K-40K _ Min XO: 2.5K _ Cost: $80Fountek NeoPro5i _ FR: 850-40K _ Min XO: 1.5K _ Cost: $280HiVi RT1.3 _ FR: _ Min XO: 2.5K _ Cost: $40HiVi RT1x-A _ FR: 3K-21K _ Min XO: 3K _ Cost: $40HiVi RT1II _ FR: 3K-21K _ Min XO: ? _ Cost: $40HiVi RT1L _ FR: 3.5K-40K _ Min XO: ? _ Cost: $30HiVi RT-2 Pro _ FR: 2.3K-30K _ Min XO: ? _ Cost: $150HiVi RT2x-A _ FR: 1.7K-25K _ Min XO: 1.8K _ Cost: $80HiVi RT2II _ FR: 1.7K -21K _ Min XO: 2K _ Cost: $90HiVi RT8-II _ FR: 1.5K-20K _ Min XO: 1.7K _ Cost: $80LCY 106 / LCY 109 _ FR: 2.2K-60K _ Min XO: ? _ Cost: $200LCY 108 _ FR: 2.2K-60K _ Min XO: ? _ Cost: $190LCY 110 _ FR: 2K-60K _ Min XO: ? _ Cost: $200LCY 130 _ FR: 1.8K-60K _ Min XO: ? _ Cost: $240LCY K100 _ FR: 7K-100K _ Min XO: ? _ Cost: $200Mundorf AMT2340 _ FR: 2.2K-23K _ Min XO: ? _ Cost: $390Raven R-1.1 _ FR: 2K-50K _ Min XO: 3K _ Cost: $180Raven R3.2 MMX _ FR: 650-50K _ Min XO: 800 _ Cost: $1790Silver Flute _ FR: 3K-20K _ Min XO: ? _ Cost: $40That should leave the following short list based on the absolute maximum cross-over frequency of 2,000Hz. THE SHORT LIST:Aurum Cantus G1 _ FR: 900-40K _ Min XO: 2K _ Cost: $400Bohlender Graebener Neo3(-PDR) _ FR: 2K-28K _ Min XO: 1.2K (line array) _ Cost: $45Bohlender Graebener Neo8(-PDR) _ FR: 700-20K _ Min XO: 350-700 (line array) _ Cost: $60Fountek NeoCd2.0M _ FR: 1.2K-40K _ Min XO: 2K _ Cost: $120Fountek NeoPro5i _ FR: 850-40K _ Min XO: 1.5K _ Cost: $280HiVi RT2x-A _ FR: 1.7K-25K _ Min XO: 1.8K _ Cost: $80HiVi RT8-II _ FR: 1.5K-20K _ Min XO: 1.7K _ Cost: $80Raven R3.2 MMX _ FR: 650-50K _ Min XO: 800 _ Cost: $1790Are there any that should be added to or deleted from the above list based on cross-over frequency? Not to skip ahead to criteria 3 (cost), but I know the Raven has already been eliminated…

Subject: Re: Array Tweeter Selection
Posted by Marlboro on Thu, 31 May 2007 12:25:30 GMT
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My preference is actually the cheapest in the crowd:Bohlender Graebener Neo3(-PDR) _ FR: 2K-28K _ Min XO: 1.2K (line array) _ Cost: $45Zaph Audio gave them a rave review. At some point I will upgrade my current tweeter section in my Calipso Line Array, and the only one I would use is this tweeter.Marlboro
Calipso Full Line array

Subject: Re: Array Tweeter Selection
Posted by Anonymous on Thu, 31 May 2007 17:20:50 GMT
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HiVi RT1 and RT2 {Except RT2-Pro}, Silver Flute Yag-20 are very similar if not the same thing as Dayton PT2B. PT2B can probably be purchased for $25 each in bulk. I'd delete BG Neo8 from your short list, HiVi RT8-II, HiVi RT2 {if PT2B is lower in cost}. You should be able to use G1-G3 ribbons.I operate my PT2B @ 1700hz, 8th order. Works fine.>>I need help choosing a tweeter for a line array project.I would use PT2B in the low priced range, maybe Neo3 in the mid-higher priced range, and Fountek NeoCD2.0 for a high end design.Lets assume a 65" tweeter line. [one channel]1. Eight PT2 = ~ $2002. Eightteen BG Neo3 = ~ $7003. Eight Fountek NeoCD2.0 = ~$950I would probably bypass BG Neo3 and pay extra for the Fountek.Neo3 is a lower sensitivity and lower impedance driver than hinder maximizing line array SPL performance. You might be able to operate the $4 Dayton dome tweeter at 2khzwith a 8th order or greater crossover. Worse case, 2.5khz will work.You could add that to your list.If you want an esoteric line array, then use Fountek NeoPro5i,the higher end AC ribbon, or R3.2.

Subject: Re: Array Tweeter Selection
Posted by Username on Thu, 31 May 2007 23:07:13 GMT
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Marlboro,I read through John Krutke's "Battle of the Non-Domes" (http://www.zaphaudio.com/nondomes/). John is a huge resource for the DIY speaker community and I am thankful he took the time and effort to share his findings. Unfortunately he only had the resources to compare a narrow set of tweeters. Is your expressed preference to use the B-G Neo3 in the future is based on entirely on John's objective test results? Is it also based on some of the subjective web reviews of systems using the Neo3? I assume you haven't experimented directly with them yet.Slightly off topic:I love the Calipso Array! It's nice to see an atypical application. I know you've taken some shots over the driver spacing. The originality of the design and effort required to complete it are very commendable. Meeting all the goals of your design criteria and being able to listen to those every day must be very

satisfying.Thanks for your help,Dave

Subject: Re: Array Tweeter Selection
Posted by Username on Thu, 31 May 2007 23:12:50 GMT
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Thylantyr,Fountek NeoCD2.0This seems to be a favorite for higher end (more expensive) DIY projects. Looking at John Krutke's test results from his Zaph article (http://www.zaphaudio.com/nondomes/), the NeoCD2.0 Frequency Response looks like it could be crossed at +/- 1.5KHz. However the linear distortion measurements expressed in the Cumulative Spectrum Decay plots explain the recommended 2,000Hz cross-over. This tweeter seems to have a huge distortion problem under 2KHz. It would be great to hear from somebody that has used these in an array. If somebody has experience with this driver, did you attempt to cross them lower than 2KHz? If so, what were (are) the results?BG Neo3It is interesting that you would spend the extra $500 (2 channels) for Fountek NeoCD2.0 rather than using this unit. Neo3: 93dB, 4 ohmNeoCD2.0: 98dB, 7 ohm The Fountek CD2.0's certainly look a whole lot cooler than the BG Neo 3's. I'll have to read up on the implications of sensitivity and impedance. Dayton PT2B and its cousinsI had originally ruled out these drivers based entirely on John's distortion test results. Assuming the tweeters in your array are similar to the ones John tested, how does this distortion (1700-2500Hz) express itself in musical playback? Do you notice it? If so, is it a "liability" or a "feature?" I know this is asking for a purely subjective analysis (oxymoron alert), but I'm interested in your view on the matter. BG Neo8, and HiViIs deleting these based on their distortion measurements or something else you may have experienced or read? The Neo8 looked like a cross-over champ. All dome tweetersThere is no way I'm going to mess with boxes and boxes of dome tweeters. I'm too old to be cutting down mounting brackets.Esoteric solutionsThe R3.2's are insane. No way. The AC G2 or the Fountek NeoPro5i would both be stretching the budget thin. Would they be a real performance upgrade from the NeoCD2.0, or just cooler looking? Slightly off topic:I love the control panel and impedance switch on your arrays. I plan to steal your terminal block idea for easy impedance selection, but with somewhat sane impedance choices. You are insane…driving 0.8 Ohm loads. I've followed your theories (or mad ramblings) across various forums on the use of bridged pro amps driving multiple kilowatts into micro impedances. I will continue to look for a very bright blue flash followed by lots of white smoke from your direction. Thanks for your help,Dave

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Subject: thanks
Posted by Marlboro on Thu, 31 May 2007 23:57:39 GMT
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I've not experimented with the B&G's. Way too expensive for me.Thanks for you comments on my array. The spacing is 5 inches, which is clearly within the range of Jim's paper, especially

since I'm using active crosses at 2500 and 24db/octave.People who hit me on it haven't heard it, and haven't built one of these to MY specs.Listening is fabulous.Thanks again.Marlboro

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Subject: Re: Array Tweeter Selection
Posted by Jim Griffin on Fri, 01 Jun 2007 00:14:53 GMT
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Dave,I favor the Fountek CD2.0 or the Aurum Cantus G3 true ribbons for most line array applications. Their higher priced/larger brothers in each line can be used for severe power handling applications. The Fountek tweeters have plastic cases while the A-C tweeters all have cast metal housings. The housing difference accounts for most of the cost difference between these two brands. The ribbon tweeters have higher sensitivity ratings (upper 90's dB SPL) so they are easier to pad down a little to match the output from a line of mid-woofers. The B-G Neo 3 and 8 series have low impedance (4.0 ohms) and are low enough in sensitivity that designing to a passive crossover from a line of midwoofers get difficult as the woofer line is often more sensitive than the tweeters. The B-G Neo 8 and the longer B-G planars roll off over the 15-20 kHz area so they need a super tweeter to hold up the response. Distortion tests don't reveal the true possibilities for ribbon tweeters used in line arrays. That is because you have power distributed to 8 or 9 devices so power distortion levels are very, very low vs. single driver measurements. For example you can successfully cross the Fountek Neo2.0 and A-C G3 ribbons as low as 1500 Hz in lines of 8 or 9 devices without audible distortion for home listening conditions. By the way, an OEM version of the A-C G3 called the G3i-130 maybe available from some suppliers at a lower cost than the regular G3 without significant performance degradation. Jim

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Subject: Re: Array Tweeter Selection
Posted by Rick Craig on Fri, 01 Jun 2007 00:22:40 GMT
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If you read further on John's site you'll see that he really liked the sound of a 2-way design that he heard using the Fountek ribbon. So maybe the distortion tests are not as important to subjective sound quality as what you may think? I would think twice before you rule out a tweeter based on these tests.

Subject: Re: Array Tweeter Selection
Posted by Rick Craig on Fri, 01 Jun 2007 00:31:07 GMT
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Actually the current version of the Dayton planar is supposed to have a push-pull magnet system

that yields higher sensitivity than the YAG20. The Hi-Vi planars also have a push-pull magnet. Unless you are bi-amping with an active crossover the lower sensitivity planars restrict your choice and/or number of woofers.

Subject: Re: Array Tweeter Selection
Posted by Anonymous on Fri, 01 Jun 2007 14:37:14 GMT
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re: Zaph's tests. People make decisions based on tests, people should buy sampledrivers and do their own listening tests as it offers peace of mind.Keep in mind that Zaph tested the Silver Flute Yag-20 which issimilar to the PT2B, but as Rick said the PT2B has a better magnetas is evident by the different in sensitivity ratings. Yag-20 israted at 90dB, PT2B is 94dB. It would be premature to rule out PT2Bif you look at Yag-20 tests. Zaph also makes a note about drivers used in line arrays.For a non-line array design I would choose a dome tweeter insteadof PT2B. But for a big line array with eight - tweleve PT2B per tower, that's hard to beat for the money. You can go to home audiostores and not find that sound for $20k.You should be able to get those tweeters for $25 in bulk pricingand for the money, they do a good job. If you use 48dB/octave activecrossover {DCX2496, etal}, you can stretch the crossover frequency lower. You can also keep more distortion from manifesting when youpush the line array to higher levels. You can also change the crossover frequency for different listening situations. The activecrossover has advantages where passive crossovers are fixed. re: BG Neo3There is also BG Neo3PDR, an upgrade to BG Neo3.Sensitivity is lower; 90dB/2.83v, 4 ohmre: Esoteric solutions I didn't mention it before, but I can think of more tweeters toadd in this category, but you'd be spending $700 - $2000 on eachtweeter. lol Is it worth it? Sure it is if you want to push the SPL level higher and keep distortion lower. I'm going to guessand say you can probably generate at least 120dB[c] of treble at 12-20 feet away with these expensive tweeters. The highest endtweeter is rated for 145dB, 3kw peak power, 200mS. lol ... Based on what I've seen, it seems the logical progression wouldbe; $1 mylar, $4 dome, $25 PT2B, $120 Fountek {or equivalent thatmay cost $200}, then the $300 - $500 ribbons. Just figure out whatyour budget is and find the tweeter that fits the wallet.If you can't choose, buy one of each driver candidate and hook itup and just listen to the sound.

Subject: If you were to guess...
Posted by Jim Muro on Fri, 01 Jun 2007 17:58:40 GMT
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"That is because you have power distributed to 8 or 9 devices so power distortion levels are very, very low vs. single driver measurements. "If you were to make an educated guess, how many decibels down would the addition of each speaker unit(or group of 2 or 3 units) would the distortion levels go. Would you expect that for each unit the distortion would drop one decibel, so for 9 of them the level would drop 9 decibels?Jim Muro

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Subject: Re: Array Tweeter Selection
Posted by Username on Sat, 02 Jun 2007 06:41:03 GMT
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Rick:Thank you for taking the time to respond. I had already read John's review of the 2-way design. I came away with the feeling that John thought the success of that design was primarily due to the 2900Hz crossover point. Maybe I'm reading too much into it.I have read all the reviews I could find on Fountek ribbon based line arrays. I know you are thoroughly familiar with several of these designs. I have not found a single negative comment about distortion or sound quality from these tweeters, only glowing reviews about their sound. I was hoping for an answer approximating "distortion from an 8 tweeter array will be {insert equation and result here} less than a single tweeter operating at the same total output level."It appears that my desire to easily eliminating tweeters based on distortion and cross-over points is not viable.Thanks,Dave

Subject: Re: Array Tweeter Selection
Posted by Username on Sat, 02 Jun 2007 06:43:57 GMT
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Thylantyr:Thanks for elaborating on your original post. I will be bi-amping and using a DCX2496 for testing. I hope to upgrade to a DEQX at some point, but I will see how far I can get with the more affordable electronics.I have no doubt that I would be astonished by the sound quality of your arrays. Your suggestion on multiple crossover frequencies based on different listening situations is quite clever. I plan to try multiple crossover configurations. It is a great idea to test them at different output levels and save the different configurations that work for different settings. You didn't answer my question about audible distortion on the PT2B's. I was hoping for an answer approximating "distortion is completely inaudible on low to mid level playback, but becomes slightly audible when I twist the volume knob to 11."I was hoping to find the perfect tweeter using objective measuring. I am going to have to take your advice and buy sample drivers and do my own listening tests. I would concur with your "progression" observation in the DIY kit market, but I still can't tell why this is the case. I have the feeling that this narrow range of product selection is based on extensive subjective listening tests by a few experts in the array building field.Thanks,Dave

Subject: Re: Array Tweeter Selection
Posted by Username on Sat, 02 Jun 2007 06:48:44 GMT
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Dr. Griffin:>>"...For example you can successfully cross the Fountek Neo2.0 and A-C G3 ribbons as low as 1500 Hz in lines of 8 or 9 devices without audible distortion for home listening conditions..." THIS IS EXACTLY WHAT I WANTED TO KNOW! I can not thank you enough for your response. Dave

Subject: Re: Array Tweeter Selection
Posted by Rick Craig on Sat, 02 Jun 2007 18:42:53 GMT
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With a passive crossover design the crossover point can be defined in different ways, such as acoustical or electrical. The slopes can also be asymmetrical so in some cases a "2K" point may be electrically higher (say 2.2-2.5K) for the tweeter.The ribbons and planars do exhibit audible distortion if pushed too low or the low end response isn't properly shaped. Slopes that are too shallow can also create problems.

Subject: Re: Array Tweeter Selection
Posted by Danny Richie on Sat, 09 Jun 2007 18:26:00 GMT
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I have designed quite a few line arrays and for me the solution was to have a custom planar magnetic tweeter built just for the line source application.

Subject: Re: Array Tweeter Selection
Posted by hahax on Sat, 16 Jun 2007 23:56:49 GMT
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The Pipedreams speakers used dome tweeters and crossed over way above 2 khz and worked quite well.

Subject: Re: Array Tweeter Selection
Posted by Steven Homrighausen on Tue, 26 Jun 2007 13:00:24 GMT
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Lets assume a 65" tweeter line. [one channel]1. Eight PT2 = ~ $2002. Eightteen BG Neo3 = ~ $7003. Eight Fountek NeoCD2.0 = ~$950----------If you call Madisound and order 16 of the NeoCD2.0, you should be able to get them for about $95 each (x 8) = $760 per side.

Subject: Re: Array Tweeter Selection

“distortion from an 8 tweeter array will be {insert equation and result here} less than a single tweeter operating at the same total output level.”
----------I've been trying to figure this out as well. I think that cone/dome drivers in an array would have the distortion drop for two reasons - the sensitivity of the array increased (from multiple drivers) and the reduced drive signal going to each driver. For the sensitivity portion:- one driver = (X)dB of distortion (pick whatever harmonic you'd like).- two drivers = (X-3)dB of distortion (two drivers are 3dB more efficient, so they need to be driven with 3dB less signal to achieve the same level- four drivers = (X-6)dB of distortion - eight drivers = (X-9)dB of distortion- nine drivers = (X-9.5)dB of distortion- twelve drivers = (X-10.8)dB of distortion- sixteen drivers = (X-12)dB of distortionWith a ribbon array, you would have the reduced signal going to each individual ribbon, but the array sensitivity remains the same as one driver.If you have an array of cone/dome drivers, you have the benefit of reduced signal PLUS the sensitivity increase.I know that distortion increases as drive level increases (and not linearly). This makes me think that you have an increasing benefit as you continue to add drivers to an array.Can someone help me work through this theory?