Subject: Ultimate Dipole Line Array
Posted by AudioFred on Sun, 04 Sep 2011 19:51:48 GMT
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I've finally dedided a rich guy like me shouldn't let price get in the way of building the ultimate line array speaker, so I've ordered the parts and will start building when they arrive from Parts Express. I'll be using twelve of these woofers per side. I realize they are obscenely expensive, but isn't it all about the music? http://www.parts-express.com/pe/showdetl.cfm?Partnumber=299-012

For the tweeter I'll be using a single center-mounted Vifa DX-25. Its low Fs, high sensitivity, and price make it almost a no-brainer.
http://www.parts-express.com/pe/showdetl.cfm?Partnumber=264-1020

These will be dipole arrays using a 6' by 16" mdf baffle.

Subject: Re: Ultimate Dipole Line Array
Posted by Wayne Parham on Sun, 04 Sep 2011 23:41:28 GMT
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As a price-no-object speaker, I think those Sony's will really shine.

I'll bet you'll have 'em done by next May, so I hope to see 'em in Dallas!

Subject: Re: Ultimate Dipole Line Array
Posted by AudioFred on Mon, 05 Sep 2011 11:55:31 GMT
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Wayne Parham wrote on Sun, 04 September 2011 18:41
As a price-no-object speaker, I think those Sony's will really shine.

I'll bet you'll have 'em done by next May, so I hope to see 'em in Dallas!

I know they will "shine" because the paper thin steel baskets ring like a bell at 5Khz

These are the drivers you find in a $40 Sony boombox. But as everybody knows, when you diy a line array using cheap, terrible sounding drivers, the sound becomes amazingly good - better even than Rick Craig's $10K Selah Audio line arrays. It's a well known psychacoustic effect known by psychiatrists as "the DIY syndrome".

I built a pair like this once before using cheap buyout drivers, and they sounded "compromised",

but when used with a subwoofer and a 100uF electrolytic cap to high pass the midwoofers they were the world's greatest party speakers. They would play compressed rock music at awesome levels. I gave them to my nephew, who still thinks he has the world's best speakers.

http://fredt300b.smugmug.com/Hobbies/Speakers/132721_kcDVmw#189064178_fy3mT

I doubt these will accompany me to Dallas.

Subject: Re: Ultimate Dipole Line Array
Posted by AudioFred on Sun, 02 Oct 2011 21:03:29 GMT
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Making some progress on these. Tomorrow I'll wire them and begin to design a crossover. So far I've spent more on hardware and mdf than I did on the drivers.

http://fredt300b.smugmug.com/Hobbies/Speakers/132721_kcDVmw#1508729179_FLgMG2J

Subject: Re: Ultimate Dipole Line Array
Posted by AudioFred on Tue, 04 Oct 2011 13:51:23 GMT
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Got them all together, and I'm pleased with the sound considering they cost about $100 to build. I also did some measurements, which are critical in designing a crossover. When you're talking "line array" you can forget about using a crossover design program, because woofers behave very differently when they are arranged in an array versus a point source.

Here's the in-room frequency response of one woofer measured at one meter. It's the one directly below the tweeter. No other drivers are connected. Notice the peak between 5 and 6khz. Any crossover you designed for this woofer would have to attenuate that peak.

File Attachments
1) SonyOne.bmp, downloaded 8866 times

Subject: Re: Ultimate Dipole Line Array
Posted by AudioFred on Tue, 04 Oct 2011 13:54:23 GMT
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Now here's the in-room frequency response of the twelve woofer array measured at one meter. Notice what's happened to the frequency response versus the single woofer.

File Attachments
1) SonyArray.bmp, downloaded 8591 times

Subject: Re: Ultimate Dipole Line Array
Posted by AudioFred on Tue, 04 Oct 2011 14:01:21 GMT
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But you don't listen to a line array at one meter. The listening position distance should be at least the length of the array, and ideally more than that. So here's the same in-room response of the twelve woofer array measured at the sofa, which is ten feet from the speakers. You can still see the 5-6khz peak, but the overall response is much smoother at this distance.

It is now possible to see how you could include a tweeter that would integrate fairly well with this array, but it's obvious it will need a low fs for a crossover frequency no higher than 2khz, it will have to be fairly efficient to match the woofer arrays's sensitivity, and you will need to use a higher order crossover to get it to play fairly loudly down to the crossover frequency.

File Attachments
1) SonyArray3meters.bmp, downloaded 8530 times

Subject: Re: Ultimate Dipole Line Array
Posted by AudioFred on Tue, 04 Oct 2011 14:09:25 GMT
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The tweeter also needs to be inexpensive. Forget about ribbons or horn-loaded compression drivers. Any good one would be too expensive. Enter the Vifa XT25. Low resonant frequency, high sensitivity. It also has a reputation for being very robust, and important feature for a tweeter that must match twelve woofers without breaking a sweat. Here's the array with the XT25 and a third order crossover (electrolytic caps, of course, because it must be inexpensive). I also experimented with tweeter attenuation resistors and found I like a 1.5 ohm resistor ahead of the tweeter crossover, which is included. The tweeter caps are a 15uF and a 31uF. The inductor is a 0.15mH. The woofer array is wired directly with no filter.

File Attachments
1) SonyArray3meterstweeter.bmp, downloaded 8490 times

Subject: Re: Ultimate Dipole Line Array
Posted by Wayne Parham on Tue, 04 Oct 2011 14:12:16 GMT
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Good stuff there, Fred. I agree with your reasonabing, and the end result looks "sound".

Subject: Re: Ultimate Dipole Line Array
Posted by AudioFred on Tue, 04 Oct 2011 14:34:03 GMT
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Wayne Parham wrote on Tue, 04 October 2011 09:12
Good stuff there, Fred. I agree with your reasonabing, and the end result looks "sound".

Thanks, Wayne. Here's the link to a picture of the completed arrays
http://fredt300b.smugmug.com/Hobbies/Speakers/132721_kcDVmw#1512196823_37hRx64

Subject: Re: Ultimate Dipole Line Array
Posted by gofar99 on Tue, 04 Oct 2011 15:50:56 GMT
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Cool Fred, Now if there were 12 15inchers on a 4X8 sheet of plywood It couldn't be a line array, but more like something from the distant past. Remember the "sweet 16"? It used a batch of cheap drivers and was surprisingly good (for then at least.)

Subject: Re: Ultimate Dipole Line Array
Posted by AudioFred on Tue, 04 Oct 2011 18:41:46 GMT
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gofar99 wrote on Tue, 04 October 2011 10:50Cool Fred, Now if there were 12 15inchers on a 4X8 sheet of plywood It couldn't be a line array, but more like something from the distant past. Remember the "sweet 16"? It used a batch of cheap drivers and was surprisingly good (for then at least.)

We're showing our age by remembering the "Sweet 16". I believe it was in Popular Science, which every 1960's high school science geek looked forward to receiving every month. With 16 drivers arranged in a square, the Sweet 16 beamed like a 24" woofer. A few years later the Rodgers Organ Company picked up the idea, and its church organs used several open back enclosures with 24 6X9" woofers and a single compression tweeter in the middle. Not exactly a constant directivity design. The science of speaker building has come a long way since then.
