
Subject: Need help with a center channel

Posted by [Forty2wo](#) on Fri, 15 Dec 2006 22:21:36 GMT

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It has been a very long time since I designed a speaker. I vaguely remember punching the Thiele-Small numbers, one by one into a TI calculator, but it's all very foggy. What I want to do, is build a center channel speaker for the home theater setup I am working on. For the mains I am using a pair of Bottlehead Straight 8's. I have 4, 5" drivers, the MCM 55-1870, the same used in the 8's. I plan to run 4 or maybe just 2, if it makes more sense, full range. The $F_s=54$, $V_{as}=10.04$ L, & $Q_{ts}=.401$ The max box size I can use works out to be about 1.95 cubic feet. (52.5 Lt.) , a bit smaller would be better but hey, we do what we gotta do... So, My questions to O yee speaker gurus are. Can you recommend a simple box program to use, I have not kept up. How do I model an array as a single driver? Do you think I should be modeling for a vented or sealed box, I bet if I knew the answer to 1 and 2 I could answer this myself Thanks in advance...John

Subject: Re: Need help with a center channel

Posted by [Duke](#) on Sat, 16 Dec 2006 09:34:22 GMT

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I presume you're going to set the center channel to "small" in your processor, so that it won't be receiving a full-range signal. Might as well use all four drivers, to get as much headroom as possible. If you set the center channel to "small", what's the cut-off frequency? A sealed box of .6 cubic feet will be -3 dB at about 100 Hz, with a stuffed-box Q_{tc} of about .7. A vented box of 1.2 cubic feet tuned to 60 Hz will be -3 dB at about 60 Hz. This is what I'd do, as I'd rather have the center channel's inherent rolloff well below the frequency where the processor cuts it off. In my opinion, most center channels have a flawed driver layout. Horizontally spacing two midwoofers on the same baffle narrows, rather than broadens, their coverage pattern. The center channel should have a wide enough pattern to give uniform coverage throughout the seating area, and very few do. You can make a better center channel by building a splayed array. Have two of the drivers firing about 22.5 degrees to the left of the centerline, and the other two firing 22.5 degrees to the right of the centerline. Each pair is in a vertical rather than horizontal stack. This will give fairly uniform coverage across a 90 degree horizontal arc. The vertical coverage will be narrowed by stacking the drivers, but that's seldom a problem in home theater. You can use either a convex or concave arrangement to get the splay. Both will work - and both have advantages and disadvantages. Below is a link to a prosound speaker that uses a concave splayed array for the woofers. Looks to me like the splay is closer to 15 degrees. That 22.5 degrees isn't carved in stone - it can be more or less, but I wouldn't go over 30 degrees. My \$.02. Duke
<http://www.reyaudio.com/index.html>

Subject: Re: Need help with a center channel

Posted by [Bob Brines](#) on Sun, 17 Dec 2006 11:45:34 GMT

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That's one huge center channel by normal standards. Where are you going to put it? It sounds to me that this should be behind the screen of a front projection TV. Given all of the other things that can go wrong with center channels, you need to have the acoustic center of the speaker somewhere at least near the center of the screen. That's why the horizontal layout (let along SAF) of most commercial centers. Are you sure that phantom center is not working for you?

Subject: Thank you both.

Posted by [Forty2wo](#) on Mon, 18 Dec 2006 03:03:26 GMT

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First the box size I stated would be the absolute max that would fit. A smaller box is what I had in mind. But on the other hand, the shelf is 42" wide and anything that has to sit in the middle, more or less takes the whole thing, as far as 19" sized components go. The splayed arrays look good. I will give that some testing with the speakers I had planed to use for the rears. In the mean time my receiver has craped out. I have it on the bench but I am having a hard time finding the tubes. One more question. How do I model 2 or more identical drivers? Do I plot for 1, then double the volume or do I somehow add the driver specs? Or? As you can see this is not my area...John

Subject: Re: Thank you both.

Posted by [Duke](#) on Mon, 18 Dec 2006 03:57:21 GMT

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To model two drivers with a computer program that doesn't allow me to enter two drivers, I just double the Vas. The other parameters stay the same. Or you can model one and then just double the box size. If it's a vented box, to keep the same tuning frequency double the port area but keep the same port length. Duke

Subject: Re: Need help with a center channel

Posted by [Dr Mark Carter](#) on Tue, 19 Dec 2006 03:36:13 GMT

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Dear John, I agree with one of the other correspondents, that using the MTM (D'Appolito format), in the horizontal rather than the vertical alignment makes no sense for a center channel speaker.

The design of a center channel speaker is a difficult problem. It has to carry as much of the program as the front left/rights. It must be at least as good a speaker as the those also. It needs to have a relatively narrow horizontal dispersion so as not to cause interference with the left right speakers. It needs to excel in the natural reproduction of the human voice. It has to be compact. A tall order, and not surprising that most center channel speakers fall way short of the mark. I believe that the center channel speaker is best constructed using a coaxial driver. Good coaxial drivers for the home constructor are made by SEAS. They have a good crossover. Both are available from Madisound. They also have fabricated enclosures. This is the link.http://www.madisound.com/cgi-bin/index.cgi?exact_match=yes&product=SEC&cart_id=7119086.22070 These drivers like other small coned woofers in a small cabinet exhibit a step response. This results in a slightly thin tenor range. Since I think you plan to shelf mount, this will tend to mitigate this. To correct the step response requires a second driver in which the coaxial tweeter is not connected, and the woofer driven by a first order crossover with 6db per octave roll off above 250 Hz. The speaker enclosure needs to be twice the volume. If you have two speakers in an enclosure you have to double the equivalent volume (VAS) in your calculations. If the drivers are in parallel then the sensitivity is up 3db. When choosing whether to go closed box, or ported, look at the Qts of the driver. If it is less than 0.3 ported alignment or horn is the way to go. Between 0.3 and 0.35 you can go either way. Above 0.35 closed box is usually the best way to go. Transmission lines tend to work best with drivers between Qts of 0.3 and 0.35. A good modelling program in Box Pro, it comes with x-over pro. I have just built a studio/home theater using transmission line speakers. There are nine lines in all, four of the speakers are dual line enclosures. The rear speakers, which in a seven channel system are actually the side speakers, are minimal ripple closed box design. The center channel is a transmission line, and uses two of the SEAS coaxial units. The step response correction uses an active electronic crossover. The coloration of a well designed line is very low indeed. Bass extension is good, even and natural. No bass restriction is required to these speakers. This center line is designed to go through the wall. The tweeter is connected in the lower driver only, which is right above the center of the TV screen, angled to the optimum listening area. I'm very proud of this center speaker, I know of nothing quite like it. The whole rig reproduces human dialog in a very natural conversational tone. No chestiness or sibilance. Opera watched on it is a truly pleasurable experience.http://gallery.mdcarter.com/main.php?g2_itemId=5756http://gallery.mdcarter.com/main.php?g2_itemId=5534 I hope I have covered your questions. My advice is you need to find a very good reason not to use a coaxial driver in this application. Good luck! Mark.

SEAS Coaxial driver

Subject: Re: Need help with a center channel
Posted by [Forty2wo](#) on Thu, 21 Dec 2006 01:28:27 GMT
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Hey Dr Mark, Thank you for your response, much good info there. I chose the MCM driver, well, because I have a few and they are the same driver as used in my mains. Your idea of a coax driver makes sense. From you and others who have been kind enough to respond, I am getting the idea that smaller/vertical is better. I will work with that as far as the position I have will allow, I don't think I want to mount a speaker over the TV, at least for now. I did find a box program that seem to work, it's name escapes me for now. I used to build speakers some 20 years

ago in a small way. I have forgotten most of that but with the help of the folks here, some of the little I knew is coming back. I had a look at your photo site. Very impressive. I like the way you can lurk behind the wall of amps. Sort of like the 'wizard of OZ' ...John
