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Subject: Earl - Which sub do you use?

Posted by [Rapid](#) on Sun, 04 Dec 2005 10:21:35 GMT

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Hello Earl Geddes, I wonder which subwoofer you're using and why? Just curious since you seem to have good ideas. Could you also please explain what an acoustic lever is, how it works, if it can be implemented for a DIYer? Best regards, Mattias

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Subject: Re: Earl - Which sub do you use?

Posted by [Earl Geddes](#) on Mon, 05 Dec 2005 00:19:27 GMT

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As you might expect I build my own, and I use and recommend two different types. They both use a B&C Neo 12 - don't remember #, but could get if its important. Why two? One is for the 25-50 Hz that the Summa cabinet size does not allow. This is a bandpass tuned to about 32 Hz covering about the octave mentioned. It has a very long port on a tall cabinet and thus has its output about five feet in the air - intentional to get it away from the floor. Takes a lot of power to drive - very inefficient, but adds a notable effect at VLF. The second sub design, of which I have two, is also bandpass, same driver, but completely different design. This one is designed to cover a, 35Hz - 120Hz and is put into the LFE channel. It too is ver low efficiency - no tube amps here! These subs are located around the room. In my system, even in stereo, the LF are routed to the LFE channel, so in essence I have two speakers 50Hz and up (monopoles), two 35 - 120 Hz. and one 25-50 Hz. they were balance by measurements and tweaked by ear. This seems to work in my small room, but does not seem to be required in my very large room. In the large room the single VLF sub with ported speakers works great. The small room needs a different solution with subs placed around the room and a very well damped low end. This would be true of all small rooms. Global solutions for frequencies above about 200 Hz. are possible, but below this the solution has to be matched to the room, and try as I do, I cannot find rules of thumb that work. Although bigger is always better - of that there is no doubt. But my home theater is small because of the sound proofing. I can use it anytime. The big hoowm upstairs is a 'cooperate with the family" issue. When I am home alone I always listen in the bigger room.

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Subject: Subwoofers

Posted by [Rapid](#) on Mon, 05 Dec 2005 18:55:45 GMT

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Hi Earl! You wrote, "and thus has its output about five feet in the air - intentional to get it away from the floor." Sounds like a good idea. Is the sub placed five feet from the walls as well to get less room gain? Might be good to do if you have space or? Isn't fs of B&C speakers too high to be used as subwoofers? How come you're not using for example Peerless XLS12, Eminence LAB12 or

NHT1259?/Mattias

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Subject: Re: Subwoofers

Posted by [Earl Geddes](#) on Mon, 05 Dec 2005 19:15:42 GMT

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A few feet from the wall, but not five. Well, I have had a very good experience with the B&C products and some not so good ones with most others. You can count on their data sheets being correct. With most companies data sheets are targets, which are only sometimes hit with any accuracy. I also buy enough that I get a good deal on them and they are already a good deal. But remember that I am using bandpass designs. The bandpass design is ideal for subs because the fs of the driver (in its rear box) is at the center of the passband - not at the lower edge. Thus the fs of the driver is not a big issue, but box size can be. Hence the big box for my 25 - 50 Hz. sub. I can't figure out why so few subs are bandpass - it seems ideal to me and the ones that I have made work very well when compared to the ones that I purchased - which were not bandpass. I think that you also asked about the lever. Think of it as a passive radiator with gain. The gain is the ratio of radiating to driven areas. Two to one is typical, resulting in about 6 dB of increased output from a given driver. Wish someone actually made levels as I'd certainly use those if they were available.

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Subject: The "T" word

Posted by [Duke](#) on Wed, 07 Dec 2005 06:07:50 GMT

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"Tweaked". By ear, no less!! I'm bookmarking that post. Cheers, Duke

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Subject: Re: The "T" word

Posted by [Earl Geddes](#) on Wed, 07 Dec 2005 13:22:12 GMT

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Ah yes - got caught - almost! - on that one. The sound was tweaked but only AFTER I had taken several measurements and knew what the situation was. But really, the very low end in a room, say < 100 Hz. is so hard to measure, so completely mixed up with modal patterns that "by ear" actually does work. One should take measurements, but these are never as complete as I would like and then tweak by ear within some constraints of what the measurements say. I tweak, we all tweak in that I do use tone controls - typically -1 dB treble and + 1 or 2 dB bass. The tweaking that I was referring to above was in setting the LFE channel level since this is hard to measure.

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Subject: Hey, I couldn't resist...

Posted by [Duke](#) on Wed, 07 Dec 2005 18:25:48 GMT

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Actually the process you describe - taking measurements first so that you have an idea of what's happening as you then adjust by ear - makes a lot of sense. Perhaps that should be differentiated by calling it "educated tweaking", as opposed to "magic 8-ball tweaking". If nothing else, taking the measurements can get you into the appropriate ballpark - it's easy to be twiddling a setting back and forth between 11:00 and 1:00 when you need to be between 2:00 and 4:00 but your preconceived notions don't let you go there. I've sure done that.

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Subject: Quite correct

Posted by [Earl Geddes](#) on Wed, 07 Dec 2005 18:44:57 GMT

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And actually all I was tweaking were the levels of the various subs and the overall LFE level. It's not possible for me to excite all the subs at one time in a manner consistent with the source usage of the LFE channel. So it is tweaking, but of a very small nature. As I said, a kin to using a treble control. But I guess to a lot of folks the treble control is a no-no.

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Subject: Levers and multiple subs

Posted by [Rapid](#) on Thu, 08 Dec 2005 18:50:34 GMT

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Earl, Sounds interesting about those levers. Do you get 6dB for the whole frequency range? I downloaded your software so I've seen what a lever looks like now (pictures are easier to understand). The front lever looks like a bandpass sub but instead of a port it's got two passive radiators which are connected "in series", where the second has twice the area of the first. The other option is to build a rear lever which looks like a bassreflex but the port is changed into the lever I wrote about above. Right? Wouldn't it be possible to build the lever with 3 passive radiators (two at the second stage)? What's the problem with using a large ratio of the radiating areas? Also, I wonder about multiple subs. I think I've read somewhere that the more subs you scatter around the room, the flatter bass you'll get. Is this true?/Mattias

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Subject: Lets see

Posted by [Earl Geddes](#) on Thu, 08 Dec 2005 19:15:04 GMT

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True on the multiple subs. The response gets smoother as about  $1/n$  with  $n$  the number of subs. Big improvement with two, a little more with three, less with four and so on until it no longer makes any sense. You get a real output advantage this way too. The lever can theoretically go to any ratio, but beyond 2:1 we found that the parasites were eating up the advantages. The mechanical parameters on the radiating side are multiplied by the ratio squared. So acoustic mass load soon gets to be a problem, etc. Beyond 2:1 and we could not get the lever to survive very long. They get beat pretty hard. You don't have to use just one lever there can be more than one - if that's what you mean. We used two levers one driver. You understand the lever function well enough. It can be used wherever a passive radiator is used.

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Subject: Cheap passive radiators  
Posted by [Rapid](#) on Sat, 10 Dec 2005 09:52:54 GMT  
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So to build a lever, one could use 3 passive radiators which are connected together with a U-shaped profile? If one was to use Peerless XLS, 3 passive radiators + 1 speaker = 2.5 speakers in price so what's the point of using a lever then since 2 speakers will give 6dB more output (just like the lever but for a lower price)? I guess one has to find cheap passive radiators of good quality for the lever to get a good price/performance ratio? Mattias

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Subject: Not the way that I would do it.  
Posted by [Earl Geddes](#) on Sat, 10 Dec 2005 15:56:31 GMT  
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I don't understand your 3 passive radiators - why would you want to do that? We used a 10" driver, the same cone area in a stamped metal basket with a 2:1 area ratio. The cost of this later piece was only a fraction of the driver - why would it be more? The cost in a driver is in the motor structure, eliminate that and the cost should only be a fraction of the original speaker. Then we used two of these levers. Result; +6 dB more output at far less cost than two drivers with motors. A single lever would have reduced this cost further, but we liked the packaging options of two better. I think that your calcs have some problems.

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Subject: Seems like I've misunderstood things  
Posted by [Rapid](#) on Sat, 10 Dec 2005 17:25:05 GMT  
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When I look at the image below from Speak, I see: A speaker in a sealed box and a small passive radiator connected to a bigger passive radiator with a rod. Peerless has 10" and 12" passive radiators but there is no 8.5" ( $12"/\sqrt{2}=8.5$ ") passive radiator available from them so it's not possible to get a 2:1 area ratio. (that's why I said 3 passive radiators) Some things are unclear for me: 1. Should the big passive radiator be of the same size as the speaker? 2. Did you build the passive radiators yourself? 3. How did you build the lever? 4. Which speakers/passive radiators/components did you use to build the subwoofer? Thank you for taking the time to answer my questions. I hope somebody else also will benefit from reading this

Front lever

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Subject: Sure

Posted by [Earl Geddes](#) on Sat, 10 Dec 2005 17:59:14 GMT

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The drawing in SPEAK is for clarity. I would never build a lever like that. See link below. This construction would only cost as much as a speaker cone with surrounds and spider. Maybe \$10 for a 15" one with 2:1 ratio. Most companies charge ridiculous sums for passive radiators. >Some things are unclear for me: >1. Should the big passive radiator be of the same size as the >speaker? It should preferably be about 50% bigger.>2. Did you build the passive radiators yourself? I was with a big company and we had a supplier build them.>3. How did you build the lever? As below with a few mods - the spider did not have a hole in it as shown in the drawing. This gave a larger gluing surface. We used a frame to hold the parts, although once mounted the frame becomes unimportant.>4. Which speakers/passive radiators/components did you use to build >the subwoofer? Again, I was with Ford and we had everything custom made. This project was published in SAE and can be obtained. It shows how the theory worked as expected, the +6 dB gains were achieved and the lever with one driver outperformed two drivers in about the same enclosure volume, fewer drivers and watts required with the lever. If only I could get some company to make the actual lever, I know that this would be a popular approach. Maybe someday I will pay for the tooling and do just that. But I have other interests right now. If you, or anyone else, wants to have these levers made and sold, I would give you rights, they are patented, to do this since I own them for most configurations of advantage.

Practical lever construction