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Subject: Re: Helper Woofer Location

Posted by [Wayne Parham](#) on Tue, 25 Oct 2011 02:21:42 GMT

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Modeling won't show what we're trying to accomplish unless you do a room simulation. Most software I know of simulates a speaker in anechoic space or some simple radiating angle (e.g. halfspace). Room simulation software tends to see the source as a simplified radiator. I don't know of any software that does both at the same time.

The flanking sub approach is a room mode thing, and takes into account the difference between the modal range and the statistical range. It is something you can easily measure, but it isn't something that your typical crossover modeling software is going to show.

second woofer might be used in a 2.5-way configuration to help give some extra power where the response started to sag because of the baffle directivity transition. In a sense, the second woofer in a close-spaced 2.5-way is a baffle step compensation device.

Indoors, everything changes. You no longer want to increase point source energy in the modal region. All this does is make the modes stronger. Where there are nulls, no amount of power thrown at them will make the SPL greater. No equalization helps, because the nulls are a cancellation effect. More power in just makes more power to cancel out. All it does is to make the peaks between the nulls louder. So baffle step compensation is exactly the wrong thing to do, at least in speakers this size.

Likewise, you don't want to increase bass output in a point source by adding closely spaced woofers. That's why I propose what might be called a remotely-spaced 2.5-way speaker, which uses a helper woofer like a flanking sub. It smoothes higher frequency room modes, much like the multisub approach smoothes the lower bass. The helper woofer smoothes midbass and lower midrange, because it is set between the midwoofer and the closest boundaries, filling in the self-interference holes.

Again, the more oft-seen closely-spaced 2.5-way speaker would be appropriate in an anechoic environment, it's what you want for a speaker that will be used outdoors or in a very large room. But indoors, you really need to spread the sound sources around. The only way to smooth the peaks and valleys from room modes and self-interference is to increase the number of modes. You have to increase the numbers of sound sources, to fill in the holes with dense interference.

If you're planning to use this speaker for home hifi or home theater, don't waste that second woofer by putting it on the same front baffle. Put it a little further away. You can put the midwoofer and tweeter up high in front and put the helper woofer low in back. Or you can make a separate box to put the second woofer in, so you can place it a couple feet away in all three dimensions.

Try it both ways and measure the difference. Make one speaker a traditional close-spaced 2.5-way and make the other using two separate boxes, a main speaker on a stand and a flanking sub. You'll be amazed at how much smoother you can make the 80-200Hz range using flanking

subs. You'll see about a 10dB improvement in the response fluctuation in that range. It will go from having a 15dB-20dB hole somewhere between 100Hz and 200Hz to having about 6dB ripple. Night and day better, and right in the fundamental range of piano, vocals, cello and many other instruments.

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