Subject: Re: Multiple Subwoofers
Posted by Wayne Parham on Tue, 16 Feb 2010 22:05:43 GMT
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I agree in all aspects except the points of asymmetry and number of corner sources. I realize you know my position in this matter but I'll restate just in case other readers don't.

There are two schools of thought on this, one championed by Todd Welti at Harmon and the other by Earl Geddes. While they are basically the same, there is a subtle difference: Geddes proposes an asymmetrical arrangement while Welti suggests a handful of symmetrical arrangements. Both agree, however that once you get past about four subs, it doesn't matter where you put them unless they are all grouped in the same spot. Pretty much, with four or more subs, you can put them just about anywhere.

Why that last point is significant to me is that if you use cornerhorns, you can control the radiation pattern above the Schroeder frequency, specifically limiting it to 90°. I find this to be an elegant solution, one that combines all the best features that can be used to create constant directivity. No other configuration that I can think of gives CD through the entire audio band, but this one can. It does require, however, that the sound sources be placed in corners since the expansion from the apex is what sets the radiating angle at midbass/midrange frequencies up. For a stereo pair, that's at least two sound sources in corners, and some content is bass.

There are Welti multisub configurations that can be employed with more than one bass sound source in corners. One is to have subs in all four corners. As I said earlier, both Welti and Geddes agree that once you get to four subs or so, it doesn't matter where you put them. So from this, I draw the conclusion that the multisub configuration can be successfully deployed with bass sound sources in more than just one corner.

As to asymmetry, while I agree in general, I must always delve a little deeper than that in discussions like these. You remember Geddes talking about this in 2005 or so when he was refining his approach. At first, he suggested complete random placement, with the only caveat being that at least one sub be placed in a corner. I pressed him that "random" was probably not the right term, since random includes all sources grouped together. Perhaps I wanted to be more precise because of my computer background - that "random" includes ordered as well as unordered groupings - but with Geddes usually being somewhat precise in his terminology, I would have thought he would appreciate the distinction. I proposed that Geddes define an algorithm, and he did exactly that: One sub in a corner, one sub at a wall midpoint, and a third at a random position but not the same as either of the other two subs. His goal was not to be random, but to be decorrelated, and his arrangement is intended to provide that.

I see this as being useful and understand what he is trying to do. It's the point of the multisub configuration, to break up the self-interference patterns so they don't line up and reinforce one another. That's ultimately the goal whether you setup more Welti-like or more Geddes-like. But I would remind everyone interested in this concept that the room and its contents are rarely symmetrical, and that in a sense, it is difficult to achieve a truly symmetrical arrangement.

In many cases, you can setup in what appears to be symmetrical but have its nodes look more

asymmetrical. Likewise, in some cases, you can setup asymmetrically but still have nodes line up in the intended listening area. Of course, if you're using four or more subs, it gets to be less and less important how the self-interference patterns from each individual sub lines up, because they all interact. But the fewer the number of subs, the more their individual placements become.

One thing that often helps, is the fact that like I said above, most rooms are not symmetrical. You can often arrange the loudspeakers in such a way that they are symmetrical with respect to the listener but not symmetrical with respect to the walls. Sometimes the mains are symmetrical with the room, but the subs are not. And sometimes the mains and a pair of subs are symmetrical, but one or two extra subs are placed that are not. Each of those are valid configurations, in my opinion.

To me, it is attractive to have symmetrically placed point source speakers above the Schroeder frequency because this enhances stereo balance and gives better imaging. I don't think you can really achieve the proper stereo effect without symmetry, and I think probably most everyone agrees with that. I have found empirically that symmetry is also desirable for stereo speakers down a little below the Schroeder frequency, but this presents an interesting problem when using multiple sound sources at low frequencies for modal smoothing. The lowest notes from a cello or male singer should emit from speakers placed symmetrical with respect to the listener, for example, because you can easily localize the source(s). So what is the best solution in this case? Symmetry for stereo imaging or asymmetry for decorrelation?

One solution I have used is to place midbass/midrange sound sources acoustically distant but symmetrical with respect to each other. Being acoustically distant in the upper modal region generally means just a few feet apart. This provides some smoothing in the upper modal range while maintaining symmetry that is important for imaging and stereo balance. I have done this using midrange and woofer drivers placed a couple feet apart, overlapping between 100Hz and 300Hz or so. I have also done it with what I call "flanking subs". What I do is to place two subs a few feet from the mains and overlap them up to the upper midbass. The trick is to keep them close enough to the mains they sound like they are the same source, but far enough away to provide smoothing in the upper midbass. The low-pass frequency is important too. It's actually pretty easy to dial them in though - if the mains are off you can hear the very bottom end of the midrange but with the mains on, you can't even tell the subs are playing. That's the goal. Other subs can also be used, placed further away and low-passed lower too, of course.