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Subject: Boundary conditions and floor bounce

Posted by [Wayne Parham](#) on Thu, 30 Apr 2009 04:54:40 GMT

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Boundary loading increases SPL because it constrains the radiating angle. Where a sound

reduces the radiating angle. So at low to mid frequencies, the first-arrival sound is louder. However, the speaker is more directional above around 1kHz, so the boundaries have less effect, provided of course that the speaker orientation is right (not pointed at a boundary). As you might guess, the boundary conditions make a sort of EQ because of the directivity they impart.

Boundary loading actually counters acoustic EQ, making the directivity more constant. Consider the fact that the collapsing directivity of a direct radiator tends to provide acoustic EQ in the form of rising response. Boundary loading counters this because the pattern is constrained at low frequencies, so collapsing directivity cannot take place until a higher frequency. Directivity has to collapse further than the limit imposed by the boundaries. Take corner placement, for example.

The sound field is constrained to a 90° trihedral pattern. So the sound field cannot possibly be wider than this. If the loudspeaker were in free space, it would radiate omnidirectionally and would not narrow to this point until a fairly high frequency. Even at the frequency where the pattern were said to have narrowed to 90° from collapsing directivity, it still would be only 6dB down at the edges. The walls of the room confine the acoustic energy more fully than that. The end result of it all is boundary loading "boosts" the low to midrange frequencies, and gradually less as frequency goes up. It is important to understand that what is happening isn't really "boosting" the lows but confining them. It's purely a function of directional control, much like what a horn or waveguide does. But the effect produced is of apparent boost of bass and midrange

is "voiced" for that position. In practical terms, it works well in just about any position in a typical home living room. If you put it in a corner like a cornerhorn, the midbass would be a little stronger than designed, and if you put it on a stand in the middle of the room it would sound a little thin. But just about any other position is good. Floor bounce is entirely dependent on height. It causes a notch somewhere, usually in the lower midrange, when speakers are placed on stands. That makes a trade-off of competing priorities for two-way speakers. Either you put the midwoofers close to the ground to mitigate floor bounce, or you raise them off the ground on stands to put them at ear level, or perhaps nearer to the video screen. One way to get around the competing priorities problem is by adding subs. If you add subs and put them a few feet away from the mains, then blend them with a fairly wide overlap, they will smooth each other, much like the multisub approach but in the midbass region where floor bounce might otherwise be a problem. It's a really great approach, actually. The mains and flanking subs smooth each other in the upper modal region, and you can put subs further away too if needed to smooth bass at lower frequencies. I would suggest low-passing the subs closest to the mains somewhere around 100Hz and the more distant subs lower, maybe around 50Hz.