
Subject: Loudspeaker sensitivity and boundary loading
Posted by [Wayne Parham](#) on Fri, 17 Jul 2009 18:35:27 GMT
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I wondered about the sensitivity too, and how much padding I'd need to match the tweeter. What I found is you don't pad down the tweeter any more than you do with the Delta 12LF. It's acting like its more like 95dB-96dB when baffle mounted. I am anxious to measure the system outdoors with LMS to get an accurate SPL number.

I'm betting the 93dB figure from AE is a freespace value (which makes sense for a raw driver). But you'll never realize this level in actual use. Eminence and JBL list half-space sensitivity mounted on a baffle (which is OK too, it's clearly stated).

Speaker cabinets the size of these transition from freespace to half-space (baffle step) approximately at the same frequency as the room's Schroeder frequency. The baffle sets radiation to half-space through most of the passband. So everything above the Schroeder frequency is radiated half-space, and below that you have boundary conditions and room modes, lots of stuff going on. So basically, the speaker in the box really can't radiate freespace. It would have to be in a tiny box with no baffle front area.

I haven't had a chance to measure outdoors, anechoically. My work so far has been crossover design, setting the frequency and slope to get good response on and off-axis through the crossover region. That means I really don't have any bass measurements yet. But I did use the Smith & Larson WTPro system to measure T/S and in-box impedance, which can then be used to make a very accurate model, estimating system response at low frequency.

The WTPro measures the T/S specs of the woofer and then can measure the impedance of the woofer in the box too. I have to do that to get the ZMA file for the ICD. One of the other cool things it does is to do a BoxPlot style bass response simulation, but with the added accuracy that it is using actual measurements of the woofer in the box. This is what it shows:

I expect anechoic will show a little more rolloff below 200Hz because of collapsing directivity as the baffle starts to transition to half-space. I don't ever use BSC because in room, the power response tends to dominate. Actually, room modes dominate but you know what I mean. In room there's a lot more going on than just collapsing directivity from the baffle transition. I see BSC as more of a way to voice a speaker than anything else. Still, anechoically, I expect some extra rolloff from collapsing directivity due to baffle dimensions.

Boundary conditions almost always make the speaker act like its operating in half-space to quarter-space, even if not on the ground and directly back up against the wall. Only if stand mounted in the middle of a very large room does the speaker act like its in freespace, and even then the baffle reduces directivity to half-space over most of the audio band.

Bottom line is I'll bet the TD12S is more like 96dB in the box. It's matching the tweeter in the crossover region, and that's around 96dB/M. Notice how well the woofer and tweeter are matched

in the "Vertical Nulls" video in the first post of this thread. Since we know the padded tweeter is 96dB/M, that tells me the system is probably around 95dB-96dB. I'll know for sure when I get the LMS results.
