Subject: Re: 4 PI by Andy
Posted by Wayne Parham on Sun, 20 Jan 2013 19:01:01 GMT
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Damping material is not needed in traditional subs run outdoors, distributed subs in a multisub arrangement, or pretty much any subwoofer that is acoustically small. But that's a key: The subwoofer cabinet must be acoustically small, which means the low-pass frequency must be low enough that internal standing waves do not develop in the passband.

Otherwise the rules change.

If you run a big box like the one you posted as a flanking sub, then it will receive some lower midrange frequencies, and at certain frequencies, standing waves will develop inside. So I would put insulation in a big box like that, if I were running it as a flanking sub. And I wouldn't just line the walls, I'd also span the cross-section. In fact, I'd measure the finished product and make sure it was clean in the lower midrange, to even determine whether or not it was suitable as a flanking sub.

That's the whole reason we take such care with our mains, the ones that are physically large. The reason is standing waves develop in the lower midrange, and at those frequencies, the insulation inside is unable to effectively damp the standing wave nodes. So we do careful analysis to make sure the driver and port don't fall on a pressure node and we also put insulation inside that spans the cross-section. That's a more effective location for midrange attenuation - Bass goes right through but lower midrange is damped more effectively.

A physiclaly small sub, something like a 20" square box, cannot develop standing waves below 300Hz. So it's completely safe to run as a flanking sub. You can easily run it up to the Schroeder frequency without having any internal standing waves.

But even if we just increase a single cabinet dimension to three feet, now we have standing wave modes below 200Hz. This is getting down into the lower midrange, and it can adversely affect response if the pressure node lies where the driver and/or port are.

Lots of DIYers build cabinets using T/S box modelers and forget about internal standing waves. The Helmholtz frequency may be right and response below 100Hz is perfect, but the lower midrange can develop a 3dB to 6dB peak somewhere. They won't even know it unless they measure, and even then, sometimes they mis-identify the cause, thinking it's an outside reflection or even baffle diffraction.

Of course, reflection anomalies from nearest boundaries do fall in this frequency band too. But they tend to be most noticeable as notches, not peaks. And you won't see them in an outdoor measurement, in any case.

So anyway, all that to say be careful of internal standing waves in a physically large cabinet. Large cabinets are preferable, in my opinion, because they improve bass response (Hoffman's Iron Law) and because they give ample baffle area, keeping baffle diffraction at a low enough frequency it is masked by the room (and mitigated with flanking subs). But physically large boxes

take more dilligence to optimize, because the designer must always be mindful of internal standing waves.