Subject: Some Questions Regarding This PA Subwoofer
Posted by Elliot Thompson on Tue, 09 Nov 2004 22:34:01 GMT
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Hi.Does anyone have any measurement graphs purtainingthis design? Wayne posted this on the Live Board, but didn't offer a graph, stating what this box can, and, cannot do.Thanks.

Subject: Re: Some Questions Regarding This PA Subwoofer
Posted by Wayne Parham on Wed, 10 Nov 2004 03:28:40 GMT
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This project is still in its initial phase. The main feauture is the push-pull plenum and I'm confident it will significantly improve distortion performance. There are also some things that may improve power handling too, we'll see.In addition to the ProSoundWeb thread, you'll find more disussion

loudspeakersnew subwoofer

Subject: Re: Some Questions Regarding This PA Subwoofer
Posted by Elliot Thompson on Mon, 15 Nov 2004 02:20:00 GMT
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Thanks.So, how have you concluded that the second speaker facing the back the first speaker won't rip it apart under High SPL use?Or is this is meant to get 400 watts?What kind of cones, works bests such a design? Is the firstdriver reinforced to handle the amount of air pressure beingsubjected under high SPL use?Thanks!Elliot

Subject: Re: Some Questions Regarding This PA Subwoofer
Posted by Wayne Parham on Mon, 15 Nov 2004 02:37:36 GMT
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The mechanical stresses the cone will endure are the same whether the magnet is exposed to the front or the rear. The point of the design is to cancel harmonics and reduce distortion. Another improvement I'm testing is a ducting arrangement to improve cool air venting rather than to allow heat to build-up a small rear chamber.Performance improvements are sought in two key areas: reduced harmonic distortion and increased resistance to thermal stress. I expect improved long-term power handling from the cooling vent, which would increase power handling and reduce

compression. I am also expecting greatly reduced harmonic distortion from the push-pull plenum drive.

Subject: Distortionss
Posted by Mike.e on Mon, 15 Nov 2004 04:41:00 GMT
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Hi waynequoting"Commercial loudspeakers generally have a force function containing both square and cubic terms,the second harmonic being predominant at medium levels,and the third harmonic increasing with increasing amplitude.."-Loudspeaker and headphone handbook - John Borwick.I think the push pull arrangement will sound pretty good Question-when the loudspeaker is used ABOVE resonance,what are the distortion factors - is it only BL nonlinearity? definately below Fs the stiffness is providing linearity.Book Also shows flux distribution with flush/extended pole piece(above top plate) showing reduced 2nd harmoncis by ~10db with extended pole pieceThe book also goes into -Cone modes,w-what the concentric corrugations on cones are for,-nodal circle overtones(non harmonic!)-also some boring derivation of point source/flat piston at the beginning :P-HUGE! section on electrostatics-Sizable section on room acoustics,-enclosures and baffle resonance measurement,-measurements and evaluation,-hardly anything on horns though!I would buy this if it was cheap enough. Also 'high performance loudspeakers by martin colloms' is pretty good. SOme derivations,its abit more balanced, ie : normal amount of info on electrostatics :PProblem is that online descriptions of books tend to hardly even tell you chapter titles! ridiculous!Im thinking of Aes anthology on CD or something...
RegardsMike.e
 link

Subject: Re: Distortions
Posted by Wayne Parham on Mon, 15 Nov 2004 06:00:16 GMT
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The second harmonic is caused by asymmetry. Anything that causes asymmetry will cause even order harmonic distortion.The main thing that causes asymmetry in a loudspeaker is the magnet, not the suspension or pneumatic loading. Those are both much more linear than magnetic flux.What causes magnetic flux to be asymmetrical is modulation from the voice coil. When the voice coil flux is in the same polarity as the fixed magnet, then total flux is the sum of the two. But when voice coil flux is in opposite polarity, then the total flux is the difference of the two. So a loudspeaker literally pushes more in one direction than the other, even if only by a very small amount. This is the main cause of harmonic distortion in loudspeakers.See the link:Magnetic StructuresUsing a shorting ring really helps reduce harmonic distortion. It works by acting as a shorted secondary that counteracts flux modulation. When the voice coil is energized, it creates a magnetic field that interacts with the fixed magnet. This moves the voice coil and it also induces current in the shorting ring, which creates a magnetic field of its own. The magnetic field of the

shorting ring is the opposite of that from the voice coil, and it serves to reduce flux modulation. It doesn't interact enough to cancel movement, just a small amount, enough to counter flux modulation. The idea is to make movement symmetrical, and it does this very well. It reduces harmonic distortion.The push-pull arrangement cancels harmonic distortion too. It does it in a different way. Instead of reducing asymmetry in the motor, it uses two of them and drives them in opposite directions. The idea is that one will be slightly stronger than the other on each half-cycle, and the opposite is true on the other half-cycle. A balance is struck because each half-cycle has a "strong" driver and a "weak" driver.A horn reduces distortion simply by reducing excursion. That's good, but it doesn't do anything to increase symmetry. And in the case of basshorns, the system may be driven below the frequency where the horn is effective. So my thoughts are that improved symmetry is always good. Horn loaded or not, folded or not, reduced distortion motors are desireable. In the horn's passband, improved symmetry serves to reduce distortion even more than the horn's reduced excursion provides. And in the case of a basshorn driven very low, the system reverts to being that of a direct radiator, so whatever linearity is built-in to the motor system is all you've got.Some have said that horn folding and front chambers reduce harmonics by attenuation. That is true. But what always troubled me with this reasoning is that the subsystems are used for more than an octave, so harmonics are presented within the passband. Sure, some of the higher frequency harmonics are attenuated by the front chamber and folds, but a lot of harmonics aren't. It just never made any sense to me to ignore the motor's distortion products. It seems obvious to me that the system is improved by employing symmetry-enhancing technologies.Honestly, for fidelity's sake, I think I'd rather have direct radiators with shorting rings or a push-pull arrangement than a horn-loaded subwoofer using ferrite magnet woofers without shorting rings. Unless the horn can be made huge, it's going to have an excursion jump down low. That's where the flux stabilized or push-pull arrangement can help, and where the horn really can't.If I have no design limits, the horn can be made huge and the drivers high quality with symmetrical movement. But in the real world with its real world design constraints, I think I'd take symmetry control over excursion control if high-fidelity were the goal. So to me, the decision to go with flux stabilization or push-pull plenums is very attractive. Horn loading is too, but again, it's only as good as size will allow. Symmetry doesn't require size.

Subject: Very true
Posted by Mike.e on Mon, 15 Nov 2004 06:50:58 GMT
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I agree with all this.A scoop style basshorn will have this 2nd harmonics then.I knew they were nonlinear-but didnt see how it affected the output. So many say they like the sound of B*ssmaxx scoops,but I cant see how. The only PRO basshorn ive heard is the martin WSX,which i thoroughly enjoy pants flapping SPLS everyweek almost -down at the closest club with 2 of them!-too bad the muddled midrange ruins the sound!Have you seen TCsounds '46mm Xmax' driver?it has ultimately flat BL curve!The BL curve looks like some one has clicked 'linearise' on computer and theyve managed to produce a reality of this!!!
tcsounds pdf

Subject: Re: Very true
Posted by Wayne Parham on Mon, 15 Nov 2004 07:02:33 GMT
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I love basshorns; I love horns of all kinds.But the first time I heard a high-quality woofer with a shorting ring, I was even more impressed than the first time I heard a good high-quality horn.Put 'em both together and you have the ultimate sound system, in my opinion. From the midrange up, horn size isn't a problem so I can't see any reason to forego them. Bass is a different story. If you have the room, go horns. If not, don't. But either way, if you have the money to go with a technology that improves symmetry, all the better. It measures better and it sounds better.

Subject: Remember my 35hz plans?
Posted by Mike.e on Mon, 15 Nov 2004 09:54:50 GMT
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Well currently my 2226 is in 175litres 33hz tuned with +6db boost at 35hz(inbuilt plate amp which i cant be bothered removing)Although it definately is loud enough,why not have more SPL headroom for pants flapping stuff with less resonant behaviour and more fidelity!FINALLY the $$$ is coming through that i was missing - so im keen to cut MOST of the horn myself with skillsaw and a guide.I can use woodglue/silicon sealant incase i get it slightly wrong;-)Exterior will probably be just paint - I was thinking of a dark blue rather than boring black.I can always change it!This way i save alot of money that wouldve been spent on the joiner! the only part he might do,is the throat baffle,because it costs heaps to rent a router.My horn only has the ONE critical 2 mitre angles on the baffle,he could do that one + wont cost much.Ive been having a serious think about horns,and I can only have 1pi loading.35hz i think is a good compromise,i wont notice a couple of hz,and it keeps the basshorn abit smaller.I dont want to build a 50hz horn then want a lower cutoff!!Unfortunately alot of the horn volume is Vrc..But as an example 2 12"s on the same horn requires about the same.All set to go! Just wondering about speaker terminal connector now..RegardsMike.e

Subject: Re: Remember my 35hz plans?
Posted by Wayne Parham on Mon, 15 Nov 2004 10:01:04 GMT
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That looks really good, Mike. I'll bet it will sound great!

Subject: Re: Remember my 35hz plans?

Posted by mollecon on Tue, 16 Nov 2004 11:12:49 GMT
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Mike, why not use smaller drivers? The horn will do the hard work of moving the air, so you don't necessarily need a large diaphragm area. You can either save space totally or use the saved space to make the horn go a lower. I'm basically repeating Bill Fitzmaurice' points here...

Subject: Re: Remember my 35hz plans?
Posted by Mike.e on Tue, 16 Nov 2004 23:56:09 GMT
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Mike, why not use smaller drivers?Because my 15" has the required VdThis is no bill fitz horn A horn that is longer,with a smaller driver will be displacement limited in the midband which is what i DONT want..I can input 240w rms and still within xmax with my 15"+ i already own it,so why buy another speaker for no reason.The reason i wouldnt go buy a lab12,is that the BL is lower causing a larger unloading effect at the horn flare frequency.Also I dont have cash pouring out my ears RegardsMike.e