Subject: Horn Loaded woofers vs Line array woofers Question
Posted by Marlboro on Sat, 17 Oct 2009 15:48:35 GMT
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What are the respective benefits toward using a 12 long throw woofer in a horn loaded design vs using say three 12 inch of the same long throw woofers in a ported line array design?

Assume that the woofers are electronically crossed at 165hz using a 24db octave crossover, and of course they have their own 350 w/ch amp driving them.

Marlboro

Subject: Re: Horn Loaded woofers vs Line array woofers Question
Posted by Wayne Parham on Sat, 17 Oct 2009 19:13:42 GMT
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Indoors, I'd prefer the woofer array because it is distributed. Look at the multisub approach, which smoothes the sound field by breaking up room modes. Outdoors, I'd prefer hornsubs because horn loading increases effiency by matching the electro-mechanical source impedance with the mechanico-acoustic radiation impedance. You can always do both, stacking hornsubs to form an array. That's what is done at outdoor events where a lot of acoustic power is required.

Subject: Re: Horn Loaded woofers vs Line array woofers Question
Posted by Marlboro on Sat, 17 Oct 2009 19:33:06 GMT
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OK.... Stupid question.... since I know nothing about horn design.

What would happen to the sound if one used one woofer but two horns: one that goes off toward the upper half of the woofer, and one that goes off toward the bottom of the woofer? So you end up with two mouths but only one woofer.

ie: http://www.frugal-horn.com/spawn.html

or

http://books.google.com/books?id=y0d9VA0lkogC&pg=PA512&lpg=PA512

Subject: Re: Horn Loaded woofers vs Line array woofers Question
Posted by Wayne Parham on Sun, 18 Oct 2009 04:25:42 GMT

That's been done, as you saw. Naturally, it forms a more complex system, with two horns separated by some distance and driven out of phase from a common diaphragm. Another similar derivative is the back horn or scoop, which horn-loads the rear and has the front of the driver exposed to allow direct radiation. This is common in single driver loudspeaker designs and was also common in prosound horns a couple decades back. The so-called tapped horn is another derivation of that principle.

Subject: Re: Horn Loaded woofers vs Line array woofers Question
Posted by Marlboro on Sun, 18 Oct 2009 14:31:30 GMT

I've been having some discussions with some of the people on the Bill Fitzmaurice horn loaded forum. Except for the people who complained that my system shouldn't be crossing at 165 for the sub woofers and that its too bad that I did that because I probably don't have a quality system because of that, I got some good answers.

As an aside, I get kind of perturbed with people who don't seem to understand that I don't have subs, I have regular stereo woofers from before the sub movement, and that subs for me are items that have an upper crossover at a maximum of 35. if I needed a sub, I'd keep the 2.5 cu ft woofer box size, and put in a sub that crosses at 35, and uses a high xmax FIFTEEN INCHER IN THE CORNER SOMEWHERE, WITH THE HUGE BOX MOSTLY BELOW THE FLOOR IN THE BASEMENT OR OUTSIDE.

Anyways, the final discussion was that there was only a QUALIFIED MAYBE as to where I could actually hear a change in distortion level and dynamic range by switching to a horn loaded woofer from my present system. But there was potential agreement that if I added two more Gold sound woofers per channel($600 more in cost, in a box that was 9 cu foot big) or an array in the mid bass area, as a line array, I would hear a seriously different level of undistorted bass, and that it would be obvious.

So there you go. With a Bass Array, the distortion level would fall through the floor, and the dynamic range and SPL would boost dramatically, and it would be obvious, if I had a three 12 inch woofer per channel line array(or a mid bass array and a real subwoofer system). This would not necessarily be the case(maybe) if I used just one horn loaded 12 incher per side.

I'll stick with my original plan:

Put in a mid bass array for 40 to 165hz with normal roll off below it, and a dual 12 inch REAL sub woofer up to 40 in the corner somewhere with a box that is probably one of the unusal formulations that use two woofers and an equalizer to get those notes between 16 and 40 only. Rod Elliot or Linkwitz has a plan for one of those(I can't remember which).

Marlboro

Subject: Re: Horn Loaded woofers vs Line array woofers Question
Posted by Marlboro on Sun, 18 Oct 2009 16:02:38 GMT
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But.... Bill F. says that I could get lowered distortion, and higher dynamic range from the 30-165hz range by using a dual Table Tuba system from his website.

Because..... "THD with direct radiators isn't even close to the low levels achievable with a folded horn"

and

"As for a line array, there's little if any benefit to one versus a cluster array with the nearly 7 foot wavelength of 165 Hz."

Any comments here?

Everyone has biases, and the only way to filter out the biases is to try to gain alternative opinions, and then make comparisons.
In order to do that, I've been asking the same basic questions in several forums which have mostly different people posting to them. Each person's bias tends to downplay the negative aspects of their own particular viewpoint. I respect Bill's opinion, but he's clearly of the view that horn loading is the answer everywhere. I'm trying to find some kind of middle road that I can actually do either now or in the future, and that fits my specific needs both in the current system and in the future when I have more money(if that ever happens)

Subject: Multisub explained
Posted by Wayne Parham on Sun, 18 Oct 2009 16:24:42 GMT
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I'd probably generally suggest crossing subs below 100Hz but in smaller rooms, sometimes a little higher crossover is merited for specific setups. This is part of the multisub approach, which distributes low frequency sound sources. By "low frequency sound sources", to be more specific, I am refering to frequencies below the Schroeder frequency, usually somewhere between 100Hz and 200Hz.

Contrary to the traditional view, which is to try and keep sound sources acoustically close (within

frequency. In a very large room, the Schroeder frequency will drop below 100Hz; In the largest rooms, it can even drop below the passband. In such a room, the entire audio range creates a reverberent field instead of having a modal region in the bass. That's why very large rooms can be setup sort of like you would outdoors, at least in the bass. But indoors in any room smaller

than a few thousand square feet, the modal range extends up into the audible band, so room modes form. It's better to distribute bass sound sources in this environment, and in most rooms, that applies all the way up into the lower midrange.

That's where it gets a little tricky, because you certainly don't want to allow localization of distant sound sources in the midrange. However, midrange frequencies have shorter wavelength so being "acoustically distant" in the lower midrange really means just being a couple feet away. That's how I usually blend the woofer and midrange to smooth room modes - I overlap two sound sources (either midrange and woofer or sub and midwoofer) up to just north of 100Hz somewhere. I define midrange as starting at 100Hz, by the way. Others may still consider that midbass or something, so I thought I should clarify. When I talk about blending in the lower midrange, I'm talking about frequencies around 80Hz to 160Hz or so. The very bottom end of the lower midrange, transitioning to midbass.

When making a three-way loudspeaker, I use a physically large midrange (really a midwoofer) and I run it low enough to blend with the woofer below 200Hz. Instead of putting it close to the woofer, I separate them a couple feet. This tends to smooth the upper range of the modal region, up close to the Schroeder frequency. The upper crossover and physical relationship with the

Similarly, when I'm running DI-matched two-way speakers as mains, I generally put a sub a few feet from each and run the subs fairly high, sometimes upwards of 100Hz. The idea is the same, to blend the midbass with sounds sources that are distributed. I wouldn't push a sub used outdoors this high, but indoors, I would, and I'd place them this distance apart. When I'm running subs that high, I call them "flanking subs" and I keep them within a few feet of the mains. They might go to 100Hz, 120Hz, even 150Hz sometimes and with a relatively slow rolloff, like second-order.

I sometimes also run another pair of subs further away, and cross them over lower. The idea with the more distant subs is the same, using several sound sources that are acoustically distant to average room modes. These more distant subs will smooth the sound field better at lower frequencies, but naturally, should also be only used at the deepest frequencies. You don't want to be able to detect that they're even on.

Now that I've told you what I do, I'll tell you why I do it. For people that have studied sound a little bit, it seems counter-intuitive to spread your woofers around all over the room. For one thing, you would think it would mess up the stereo imaging having woofers all over the place. For another

destructive interference and comb filtering will result. So why in the world would you want to do this?

The reason is that indoors, constructive summing is truly impossible. Below the Scroeder frequency, reflections from the walls, ceiling and the floor interact with the direct sound to create

The "Schroeder frequency" is defined by the approximate frequency where the lobes and nulls from self-interference are separated enough to be clearly defined and easy to detect. Above the

Schroeder frequency, the sound is said to form a reverberent field. At this point, interference is so dense it sort of averages out. The goal of the multisub approach is to make dense interference below the Schroeder frequency so it acts more like a reverberent field too.

To visualize this, think about what's happening. Sound reflects side to side, up and down, front

sitting in what is called a null. There is a notch at that frequency in that position. Move closer to the room boundary, and the notch disappears at that frequency, but another notch forms at a

You find at low frequency, these pockets of live and dead zones are pretty far apart. It's really obvious when you're in a null or a lobe. They show up as big peaks and valleys in measurements and you can hear the bass suckout in some places, boomy in others. Room damping helps a lot, but if you're in a room with rigid walls (concrete or brick), it's really noticeable because the damping is poor.

The idea of the multisub approach is literally to add more room modes. Where a notch would be found from a single woofer and its self-interference reflection(s), another woofer (or two or three) can fill in the hole. This requires, of course, that they be distributed throughout the room in appropriate positions. And since the Schroeder frequency extends up into the midbass and even lower midrange, this same approach can be used up to about 150Hz - 200Hz. Careful choice of (crossover) overlap and driver position are the keys.

Subject: Re: Horn Loaded woofers vs Line array woofers Question
Posted by Wayne Parham on Sun, 18 Oct 2009 16:37:45 GMT
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Marlboro wrote on Sun, 18 October 2009 11:02But.... Bill F. says that I could get lowered distortion, and higher dynamic range from the 30-165hz range by using a dual Table Tuba system from his website.

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In order to do that, I've been asking the same basic questions in several forums which have mostly different people posting to them. Each person's bias tends to downplay the negative aspects of their own particular viewpoint. I respect Bill's opinion, but he's clearly of the view that horn loading is the answer everywhere. I'm trying to find some kind of middle road that I can actually do either now or in the future, and that fits my specific needs both in the current system and in the future when I have more money(if that ever happens)

I don't want to speak directly about Bill's designs because I think that would be rude. But I would suggest that you look at the measurements made of his speakers at the Prosound Shootouts in 2005, 2006 and 2007. There are SPL and distortion measurements made there with an LMS system outdoors. Doesn't get more accurate than that. Several systems were measured so you can compare them there. Since they were all made on the same day, in the same environment and with the same test plan, the comparison is as fair and unbiased as you can get.

You know, I'm a horn guy. I use horns in everything I make. But there are some places where horns aren't appropriate, in my opinion. And then there is always also the matter that a poorly formed horn is a peaky, nasty thing. So as with all things, I think there's a time and place for everything.

Subject: Re: Horn Loaded woofers vs Line array woofers Question
Posted by Marlboro on Sun, 18 Oct 2009 16:59:30 GMT
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Thanks, Wayne.

That's what I'm looking for. I respect Bill Fitzmaurice enormously, but as I've said before I'm a "WHY GUY" and I need to see data in front of me to balance the professional opinions.

I have professional opinions and over the years I have found some of them to be simply wrong in the face of mounting data. ON THE OTHER HAND, we have to fight in education regarding the No Child Left Behind law which demands that every child be 100% proficient in math and reading as measured by devilishly difficult tests that are a moving target(they make the tests harder each year) by 2014. 80 years of educational research has shown that you cannot abolish the normal curve by any fiat. You can with enormous effort raise the performance of a Downs Syndrome child on IQ tests(not ability, just tests) to the 82nd percentile. But there is no way that you can raise it to the 100%ile no matter what you do. Except in very unusual circumstances, 100% of the population reaching 100% proficient in reading and math is SIMPLY NOT POSSIBLE.

Off stump.

Marlboro

Subject: Re: Multisub explained
Posted by Marlboro on Sun, 18 Oct 2009 20:43:03 GMT
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This schroeder frequency stuff is a little bit over my head. And adding more woofers around the room is simply not possible in this room due to other stuff that is there. While I was given the room for music, I don't have total control of it, and I have to continually be removing things that the Wife has put in front of the speakers("They're so tall why does it matter if anything is in front of the few speakers at the bottom?").

Anyways Linkwitz(http://www.linkwitzlab.com/rooms.htm) has a discussion of room acoustics and talks about the Schroeder frequency too. Using the chart for lively rooms, and the volume and floor area it looks like the schroeder should be around 150, so I moved my crossover from 165 to 150 to be closer to the frequency. If I take it too low the region around the cross will get pretty mushy for the midranges and they will become mud-ranges.

I'm still working on understanding your comment.