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Subject: Horn mouth vs. front baffle or "speaker cone"  
Posted by [johnnycamp5](#) on Mon, 03 Sep 2018 17:53:23 GMT  
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When comparing horns to direct radiators.....

I have read over the years that the mouth of a horn is to be considered the same (in regards to fore/aft source location) as the surface of a direct radiator/woofer cone on a typical loudspeaker front baffle.

Is this generally correct?

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Subject: Re: Horn mouth vs. front baffle or "speaker cone"  
Posted by [Wayne Parham](#) on Mon, 03 Sep 2018 18:31:02 GMT  
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I think what you're talking about when you say "fore and aft" is the acoustic center. It's the position of the sound source - The point in space where sound originates.

This is most important when phasing with other sound sources for proper summing. It's also relevant when determining the SPL and falloff via inverse-square calculations.

The acoustic center is not obvious. Some people simplify it as being the location where the voice coil is. Some simplify it as being where the diaphragm is for direct radiators or the mouth for horns. But none of these is correct. The acoustic impedance has an influence on the position, because impedance has a reactive component. If the impedance were purely resistive the position would be a little more obvious, but being reactive and changing with frequency means it moves.

Do a search here for "acoustic center." There is a lot of material online that describes it in more detail.

Acoustic Center

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Subject: Re: Horn mouth vs. front baffle or "speaker cone"  
Posted by [johnnycamp5](#) on Mon, 03 Sep 2018 19:42:56 GMT  
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Thanks Wayne....I'll search/study "acoustic center." I was indeed asking about the source position.

In my case, I was concerned with how relevant the "acoustic center" would be... if I were to temporarily set the pi mid horns and tweeter horns atop a set of 4pi's with the waveguides

disabled.

Sort of a "pseudo" 3-way speaker using the 7pi crossover.

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Subject: Re: Horn mouth vs. front baffle or "speaker cone"  
Posted by [johnnycamp5](#) on Mon, 03 Sep 2018 20:44:00 GMT  
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Although...  
in the 200-300Hz range, I'm not sure how critical the time align really is.

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Subject: Re: Horn mouth vs. front baffle or "speaker cone"  
Posted by [Wayne Parham](#) on Mon, 03 Sep 2018 21:33:38 GMT  
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You're right that the lower the frequency, the more "wiggle room" you have. As long as the sound means lower frequencies can be further apart. Bass frequencies have longer wavelengths.

difference, summing is destructive and nulls form. And also realize that drivers are stacked vertically, so when the listener moves vertically, the distances between each driver and the

This is what forms the vertical nulls. You can see them in a polar chart. A well-designed speaker has nulls spaced uniformly above and below the speaker at a fairly wide angle, high above and far below the forward centerline.

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Subject: Re: Horn mouth vs. front baffle or "speaker cone"  
Posted by [johnnycamp5](#) on Tue, 04 Sep 2018 00:02:02 GMT  
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I think I understand what you mean by "vertical nulls".

I had something like that in my living room system due to room dimensions or nulls that I attributed to a low 7.5' ceiling.

While sitting on the couch listening to my system (4pi's with flanking subs), the music sounded awesome...

nice and punchy, especially with those flanking subs...

but when you stood up, almost all the punch went away, as if you had shut off the subs and half

of the woofers!!

To confirm my hunch of vertical room nulls (what else could it be?), I built a set of high flanking subs (using a pair of 2226H) with the centers about 2' below the ceiling.

I used the single bass array concept -

For my room it equals=  $\frac{1}{2}$  of the ceiling height (3.75) vertical distance between each woofer center (in my case the 4pi and flanking sub) and  $\frac{1}{2}$  of that distance (1.875') between the top woofer and the ceiling/bottom woofer and the floor.

The woofer in the 4pi was somewhat less than that, but I did not bother to raise them.

Also, the single bass array  $\frac{1}{2}$ - $\frac{1}{4}$  distances are applied horizontally as well (left wall to right wall), but I could not do this in my room (but it wasn't far off).

The bottom line is it worked! The deep extension wasn't there with the JBL's.. but the mid-bass punch was back.

Stand or sit...the bass response was the same.

Every ones experience is unique...but needless to say, this got me liking the (vertical) bass array concept lol.

P.S.- The high flanking JBL's were low passed at 150Hz. 24db/octave slope.

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Subject: Re: Horn mouth vs. front baffle or "speaker cone"

Posted by [Wayne Parham](#) on Tue, 04 Sep 2018 01:04:26 GMT

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Here's a post that contains a video that shows measurement of vertical nulls:

Crossover optimization for DI-matched two-way speakersThe thread above shows my design

Click in the link that says "Vertical Nulls" about halfway through the first post. It will show you a video of a measurement where I move the microphone above and below the speaker, through the forward lobe above to the upper null and below to the lower null. This shows you exactly what I'm talking about. I design the speaker to place these nulls outside the radiation pattern.

The measurement in the video described above shows result of interference between two sound sources, the woofer and the tweeter. The forward lobe is clean: Summing is constructive  $\pm 20^\circ$  above and below the speaker.

Something similar happens with reflections and room modes. The sound reflected from the nearest boundaries causes self-interference notches that look a lot like those vertical nulls. Arrays mitigate this, and that's what flanking subs are for: They mitigate nulls from nearest boundaries in the 80-120Hz range, which are very common. Similarly, room modes cause peaks

and dips from resonances in the room. Multisubs help in the 20-80Hz range because they are a form of an array that are very effective at smoothing low-frequency room modes.

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Subject: Re: Horn mouth vs. front baffle or "speaker cone"  
Posted by [johnnycamp5](#) on Tue, 04 Sep 2018 20:21:31 GMT  
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Yes that's a good bit of info on vertical nulls. I've seen it before.

Just to be clear..

the phenomenon I was experiencing, with the bass punch diminishing when standing and returning when sitting, was happening when using my flanking subs located just behind and outside of each main.

I then raised the subs up about two feet (to create more vertical separation from the main it was flanking) but the vertical null still existed.

It wasn't until I brought them up to about 2' below the ceiling (to center of woofer) that the null between standing and sitting disappeared.

Stranger than fiction!

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Subject: Re: Horn mouth vs. front baffle or "speaker cone"  
Posted by [johnnycamp5](#) on Tue, 04 Sep 2018 20:25:20 GMT  
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I wish I had measured at which frequency this was occurring...but I did not have my measurement mic at the time.

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Subject: Re: Horn mouth vs. front baffle or "speaker cone"  
Posted by [Wayne Parham](#) on Tue, 04 Sep 2018 21:18:35 GMT  
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I definitely understand what you've described. Geddes suggests placing one sub high in the air like that, specifically to deal with modal smoothing in the vertical dimension.

My guess is your troublesome mode is probably in the 60-80Hz range. Partly because you've described it as "bass punch" and partly because flanking subs aren't addressing it.

Self-interference and modes above 80Hz are smoothed with flanking subs, but they can't do anything with the modes below that. They're not spaced far enough from the mains. In most

rooms, the modes that flanking subs can address are axials above the second or third wave and some of the oblique and tangentials. These are the modes between about 80Hz and 160Hz, and they're sometimes pretty troublesome. Flanking subs also mitigate the self-interference from nearest boundaries, especially the wall behind the speakers, which almost always causes a deep notch between 80Hz and 120Hz. This is because the convenient place to put speakers is often against the wall or a foot or two from it, but that makes this deep notch. So flanking subs can address all those things, but they can't smooth lower frequency modes, below 80Hz or so.

So all that to say you're probably best off with a distributed multisub placed right where you suggested in addition to your flanking subs. Set a sub up high on a shelf somewhere and low-pass deep enough to prevent localization. Again, this is very much like the multisub arrangement that Geddes prefers. He likes to place one sub 2/3rds the way up the wall.

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Subject: Re: Horn mouth vs. front baffle or "speaker cone"  
Posted by [johnnycamp5](#) on Wed, 05 Sep 2018 10:38:41 GMT  
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I think your guess of 60-80Hz is right on.

Last summer I did build a pair of angled, vertical towers (you can see their location by the darker pic).

They reside just outside of each left and right 4pi main (they are about 6'4" high).

I suppose they work as both flanking sub...and high flanking sub (or high distributed sub?).

In either case, it solved/eliminated my vertical null problem from sitting to standing.

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#### File Attachments

- 1) [IMG\\_2523.JPG](#), downloaded 353 times
  - 2) [IMG\\_0031.jpg](#), downloaded 382 times
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Subject: Re: Horn mouth vs. front baffle or "speaker cone"  
Posted by [Wayne Parham](#) on Wed, 05 Sep 2018 14:11:08 GMT  
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Looks like a great speaker. And you're right - They work the same way multisubs do. They are

multisubs.