Subject: Downfiring flanking subs ??
Posted by dheflin44 on Sun, 10 Feb 2013 17:24:07 GMT
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I've always preferred the look of downfiring subs since they look less like a speaker than one that's front firing, even if it has a grill (at least that's what my wife tells me). My question is whether or not a downfiring sub is suitable as flanking sub since they have significant frequency content up to 300Hz as opposed to a typical sub's 80Hz high-order cutoff.

Thanks,
Darrell

Subject: Re: Downfiring flanking subs ??
Posted by Wayne Parham on Sun, 10 Feb 2013 18:06:52 GMT
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Flanking sub orientation doesn't matter since the sound radiated from them is omnidirectional. In fact, the problem flanking subs mitigate is caused by the omnidirectional nature of this band of frequencies coming from the mains. Self-interference from nearest boundaries causes deep notches. Since radiation is omnidirectional orientation doesn't matter.

There are three things to consider though:

First is position: With the sub cabinets placed back against the wall, the depth of the enclosure puts the acoustic center in front of the wall a couple feet. This is approximately half-way between the acoustic center of the mains and the wall. That's an important position - We want the flanking subs between the mains and the wall.

So if your subwoofer is downfiring, the acoustic center may be closer to the wall and you'll want to move it away from the wall a bit to compensate. It doesn't have to be exactly at the halfway point, and in fact is better closer to the wall but do keep this in mind. Same holds true for the floor, we want the sub between the floor and the mains.

And that brings me to the second thing to consider, which is the acoustic load provided by a nearby boundary. I'm sure you've noticed that when you place the woofer very close to the floor, its sound changes. This is because the acoustic load changes, and it becomes similar to a compression chamber. I would suggest that the woofer be spaced high enough that the boundary wasn't making a significant difference in the acoustic load. You can measure this as a change in impedance, but you can also hear it. Note though that this extra compression isn't bad - and is actually good in many cases - but we want a little distance to the boundary anyway because of its use as a flanking sub. We're not talking about a huge distance here - just a few inches, perhaps four to six.

The third thing is related to suspension and mass. Be careful that the woofer has enough suspension stiffness to support the cone without sag. Subwoofers generally have pretty loose suspensions and heavy cones, and that will tend to allow cone offset. Cone offset will make the

travel asymmetrical at the extremes, which increases distortion. So you kind of have to expect a down-firing woofer will enter distortion at lower power levels than the same woofer facing forward. To know how much difference there is, you would have to measure. Some would undoubtedly be very minor, others would be a pretty big difference. It all depends on the stiffness/mass and xmax. It's about how much sag there is and how much linear travel is available.

Also over time, it can also make the suspension permanently offset, but that's usually not a problem for decades. Just sayin'.

Subject: Re: Downfiring flanking subs ??
Posted by dheflin44 on Sun, 10 Feb 2013 19:34:44 GMT
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Great...thanks for all the info Wayne.

I'm planning to use the new Dayton 12" Ultimax subs which are said to be fine for downfiring applications.

I was planning on placing the flanking subs fairly tight in the front corners. I was hoping this would improve room coupling and also lessen the distance the mains needed to be from the front wall while maintaining the same relative spatial offset to the flanking subs. But you're saying it's better to have the flanking subs some distance into the room?

Thanks again,
Darrell

Subject: Re: Downfiring flanking subs ??
Posted by andy_c on Sun, 10 Feb 2013 21:09:48 GMT
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Hi Darrell,
There's a helpful sag calculator in the "sonosub.exe" program that can be downloaded from this page.

Subject: Re: Downfiring flanking subs ??
Posted by Wayne Parham on Sun, 10 Feb 2013 22:28:02 GMT
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dheflin44 wrote on Sun, 10 February 2013 13:34I was planning on placing the flanking subs fairly tight in the front corners. I was hoping this would improve room coupling and also lessen the distance the mains needed to be from the front wall while maintaining the same relative spatial

offset to the flanking subs. But you're saying it's better to have the flanking subs some distance into the room?
Corner placement usually works pretty well, and you could then also put distributed subs in the opposing corners for modal smoothing at lower frequencies. But I think you'll probably want the subs acoustic center out about a foot or two from the corner. It depends on how far they are from the mains.

Think about what we're trying to do with flanking subs. The notch that's created by the reflection

near the boundary "fills in" the hole, because neither the subs direct sound nor its reflection is

As you reason through this, you'll understand that you can put the flanking subs right on the boundary and they'll mitigate the notch. In fact, that's probably the best approach in some cases, and corners are likely one of them. But remember that it is complex summing, and we're looking

frequency range where it's most effective.

One more thought, if you have corners available, have you considered constant directivity cornerhorns? I am assuming you don't have symmetrical corners or that one or both has an entryway or something. But if that's not the case and you have two good corners, I would suggest using constant directivity cornerhorns.

Subject: Re: Downfiring flanking subs ??
Posted by dheflin44 on Mon, 11 Feb 2013 03:34:58 GMT
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andy_c wrote on Sun, 10 February 2013 15:09Hi Darrell,
There's a helpful sag calculator in the "sonosub.exe" program that can be downloaded from this page.
Andy,

Thanks, I didn't download the program you linked, but I did use the following percent sag formula from the Parts-Express website:

Percentage of Sag = 24,849 / (Xmax * Fs^2)

The resulting sag for the 12" Ultimax is 2.1% which should be ok (the 19mm xmax helps quite a bit).

Wayne,

When I get to that point, I'll try placing the flanking subs asymmetrically away from the corners as you suggested.

Wayne Parham wrote on Sun, 10 February 2013 16:28
One more thought, if you have corners available, have you considered constant directivity cornerhorns? I am assuming you don't have symmetrical corners or that one or both has an entryway or something. But if that's not the case and you have two good corners, I would suggest using constant directivity cornerhorns.

My room by itself would probably work very well for the cornerhorns. It's 14'x16'x10' with fairly symmetric front corners along the 14' wall. The problem is there's too much furniture in the room which results in a bookcase on one side wall about 18" from the left front corner, and a sofa on the opposite side wall about 24" from the right front corner. I'd be willing to move some stuff out, but it's funny how when only two people vote on things, the same one always loses.

Thanks,
Darrell

Subject: Re: Downfiring flanking subs ??
Posted by ooheadsoo on Fri, 26 Feb 2021 21:41:40 GMT
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Hi Wayne,

Apologies for digging up an old thread, but this seems to be most relevant to my question.

I have left and right speakers that are approximately 18" wide. I have them toed in at 45 degrees with the inside rear corner touching the front wall. Even though I have these speakers as close to the wall as I can already, presumably due to the width of the speaker, I am still getting some SBIR in the upper bass. Besides SBIR, another reason I need the speakers as close to the wall as possible is active/curious toddlers. Since I am in need of speaker stands, I intend to buy/build subwoofers as use as stands. My intent is to have them front slot port loaded and facing the front wall, as close as is reasonable. Due to the port and possibly cables running between the subwoofer and the baseboard, I assume the gap between the wall and the subwoofer will be about 3" at minimum.

I was curious to read that you were not necessarily in favor of a placement this close, and was wondering if you could elaborate some more for a layman. In my thinking, I would move the main speakers as far forward as I could to the front edge of the subwoofer (perhaps rear inside corner 6-8" away from the front wall) to lower its interference range as much as I can, and the closer I could get the subwoofer to the wall without too much interference with the port's airflow, the higher the sub's front wall interference range would be, and the mismatching interference ranges would smooth each other out.

Apologies for the crude diagram.

-----front wall-----
|xxxxxxxxxxxxxxxxxx| <-- sub and port facing wall, 3-4" gap
|xxxxxxxxxx/OOO\xx|
|xxxxxxxx/OOOOOOO\x|
|xxxxx/OOOOOOOOOO/x|
|xx/OOOOOOOOOO/xxxx| <-- speaker placed as far forward as possible
|OOOOOOOOOO/xxxxxxx|
|\OOOOOO/xxxxxxxxxx|
|xxO/xxxxxxxxxxxxx| <-- about 28" from front wall

Subject: Re: Downfiring flanking subs ??
Posted by Wayne Parham on Fri, 26 Feb 2021 22:28:09 GMT
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What you're describing may work well. It's definitely better to have the flanking subs near the boundary than it is to have them near the mains they're flanking. This is counter-intuitive, I know, and it would not be true outdoors where we would want the subs in-phase with the mains. But indoors - with all the multiple phase relationships from room modes and SBIR - we benefit from having some distance between the mains and the subs.

But like I said above, what we want is to "fill in the hole" from SBIR with that wall behind the

destructive interference. So by having another sound source in between the midwoofer and the wall, we are able to mitigate the problem. That second sound source will not have destructive interference at the same frequency. So it will "fill in the hole."

Subject: Re: Downfiring flanking subs ??
Posted by ooheadsoo on Mon, 01 Mar 2021 20:01:00 GMT
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Thanks, Wayne. In a previous post, you recommended against placing the flanking woofer TOO close to the front wall. I understand the acoustic loading may impact the woofer's performance, but I wanted to check if something else may be an issue. Thanks, again.

Subject: Re: Downfiring flanking subs ??
Posted by Wayne Parham on Tue, 02 Mar 2021 00:19:04 GMT
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The two issues are (1) acoustic loading and (2) path-length distance. If down-firing, we also have the potential of suspension settling, but that doesn't apply to you 'cause you aren't talking about down-firing. So since you already have considered the acoustic load, that leaves just the matter of path-length distance.

What I was trying to say about the placement right on the boundary is that puts it exactly (or near exactly) one-half the difference of the direct path length and the reflected path length.

The reason I mentioned it is I kind of like to avoid multiples like 1/4 and 1/2 when placing sound sources due to wavelength-related issues. But I would much prefer the flanking subs to be mounted near the wall than to be too near the mains they're flanking. So it gets a thumbs-up from me.

The main thing we're trying to do here is to ensure that the direct path length from the flanking sub and its reflected path length are sufficiently different than the direct sound of the midwoofer its reflected path length. We don't want the distances to be so great that we have localization problems, because we're running the flanking subs up into the lower midrange. But we don't want them so close that we fail to fill in the hole from SBIR.

Subject: Re: Downfiring flanking subs ??
Posted by ooheadsoo on Tue, 02 Mar 2021 05:04:37 GMT
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I see what you mean, with the wall being the 1/2 wavelength marker for the main speaker. Well, it's worth a shot, and certainly better in terms of SBIR than a conventional front mounted 3 way woofer. Thanks for the guidance, Wayne.
