Subject: Small speaker flanking sub limitations.
Posted by jonone on Wed, 26 Oct 2016 20:08:54 GMT
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So my main speakers are quite small typical 6" plus 1" dome tweeter. I know the idea of running your mains full range with flanking subs is to have as many speakers overlapping as possible to help smooth the response.

But if your speakers are relatively small is there some actual benefit in crossing them over at 80hz etc like the AV boys do, does this increase "headroom" or just intermod distortion?
Is intermod distortion audible?

Is it plausible to roll in the flanking subs with the circa 100hz crossover but then add a 80hz shallow crossover to your mains, this way the modal transition area is still covered by the mains and the flanking subs.
If you also have distributed subs you still have up to four sources overlapping up to 80hz. (Three in my case)

I suppose you can measure the response at the seating positions and see how adding in or taking out the 80hz crossover on the mains effects the response?

Subject: Re: Small speaker flanking sub limitations.
Posted by Wayne Parham on Thu, 27 Oct 2016 13:42:04 GMT
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When mains are very small like that, you really need to use subs just to prevent over-excursion of the mains. If you want to use a flanking sub approach in that case, you really need two subs per side.

The whole idea is to increase the number of sound sources in the modal region. This smooths room modes and self-interference notches. At low frequencies, smoothing is accomplished by placing subs around the room, distant from one another. At higher frequencies, where localization can occur, you want the sound sources closer together, but still not coherently grouped (like you would want in an anechoic environment).

The idea behind flanking sub placement is basically the same as an array. It reduces self-interference notches from nearest boundaries. At whatever frequency one sound source suffers a notch, the other won't and vice-versa. Since you tend to see these anomalies in the 100-200 Hertz region, blending of sound sources by a truncated array makes sense.

That's why we run helper woofers (flanking subs) up into that 100-200Hz range. They smooth self-interference and high frequency room modes, up to around 200Hz where the sound field becomes statistical rather than modal.

Subject: Re: Small speaker flanking sub limitations.
Posted by jonone on Thu, 27 Oct 2016 14:10:23 GMT
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So your suggesting crossing over to subs, effectively creating a three way and then having flanking subs as well?

If the above is what you mean it definitely isn't going to happen in my room with my wife.

Is there a reason why applying a high pass filter of 80hz to the mains and still using somthing like 150hz low pass to the flanking subs won't work?

Subject: Re: Small speaker flanking sub limitations.
Posted by Wayne Parham on Thu, 27 Oct 2016 16:31:36 GMT
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jonone wrote on Thu, 27 October 2016 09:10Is there a reason why applying a high pass filter of 80hz to the mains and still using something like 150hz low pass to the flanking subs won't work?
Sure, that would probably work just fine. It would smooth the anomalies around 100-120Hz, which is where we usually find the self-interference notch from the wall behind the mains.

Subject: Re: Small speaker flanking sub limitations.
Posted by jonone on Thu, 27 Oct 2016 20:17:24 GMT
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I suppose I need to measure the response with the mains run full range vs with a 80hz high pass applied, and see how it effects the response.

The manufactures of my speakers response to the question of using a high pass filter was basically you do get intermod distortion when full range but it's not audible and for a high pass to be effective against it it would need to be over 100hz and they saw that as more of a problem.

Do you think it's worth adding a high pass to help over excursion if it doesn't effect the response Wayne?
Do you think over excursion is audible/ a real world problem or do you think it's not worth it for the smoothest response.

Subject: Re: Small speaker flanking sub limitations.
Posted by Wayne Parham on Thu, 27 Oct 2016 20:25:21 GMT
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Over-excursion doesn't generally affect response. It creates intermodulation distortion. You can measure it, but more importantly, you can hear it.

So there's your litmus test: Can you hear it?

If audible, it will sound sort of like the effect fan blades have on your voice. Sort of a gargling sound. Stand very near a fan and listen to your voice. Hear that modulation? It comes from intermittent reflections causing intermittent self-interference. Now listen to your speakers with booming bass while pure vocal range tones are played. Does the bass seem to modulate the voice like the fan? If so, you have audible intermodulation distortion.

Subject: Re: Small speaker flanking sub limitations.
Posted by jonone on Thu, 27 Oct 2016 21:07:40 GMT
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Thanks for the reply Wayne, can you think of a song that is good to test for intermod?
I tried listening earlier with my speakers set to full range vs 80hz crossover to my nearfield sub, the differences are quite subtle and most of that was probably how the response was changing in my room? (haven't measured)
They do seem slightly brighter with the high pass engaged, is this the "cleaner sound " or is it just because there is less bass coming from that point?

I don't think I've ever heard modulation of vocals, my speakers are active and the bass driver is very well controlled.

Is the headroom thing a myth? I.e can a speaker actually play louder released of bass(I assume the theory is less energy is being wasted on bass) or is it that it can play louder without distortion?

Subject: Re: Small speaker flanking sub limitations.
Posted by Wayne Parham on Thu, 27 Oct 2016 22:00:33 GMT
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When a speaker is excursion limited, you can increase headroom by high-pass filter because that limits excursion. That's another reason why small mains benefit from high-pass filters.

Subject: Re: Small speaker flanking sub limitations.
Posted by jonone on Fri, 28 Oct 2016 11:30:13 GMT
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Okay I need to think if it's worth it.
My original plan was to use my AV amp and take the pre outs and split them with simple RCA splitters, one going to my mains getting fed a full range signal and the other going to my amp for the flanking subs, the flanking sub amp has dsp so I was going to just use that to put the low pass on the flanking subs and any eq/delay needed.

Now it means I need to get a dsp module (probably mini dsp) to go between my mains and AV amp, because if I high pass the mains the flanking subs will also be high passed.

Subject: Re: Small speaker flanking sub limitations.
Posted by Wayne Parham on Fri, 28 Oct 2016 15:59:36 GMT
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Perhaps you could try an inexpensive passive analog high-pass filter in the preamp line going to the mains as proof-of-concept. If you like what it does, you can then move on to try more elaborate filters with a stand-alone DSP module. And even after that, you may ultimately find a simple filter is what works best and go back to your original proof-of-concept setup. The proof is in the pudding and half the fun is working through it all to find out what works best!

Subject: Re: Small speaker flanking sub limitations.
Posted by jonone on Sat, 29 Oct 2016 08:58:20 GMT
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Thanks Wayne!
Do you have a recommendation on crossover slope? I've been looking at some pro units but there all fixed 24db I did find one that was 18db.
AV amps seem to be 12db on the speaker side and possibly 24db on the subwoofer side?
Obviously something like the mini dsp will give me options.

Subject: Re: Small speaker flanking sub limitations.
Posted by jonone on Sat, 29 Oct 2016 13:45:31 GMT
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Just been thinking and looking at my AV amp, seems I could run the flanking subs from the surround/surround back pre outs and it lets you have fronts small with crossover and surrounds large, you can set the appropriate delays and run it in 7 channel stereo mode.

I think this would work for a music only 2 channel setup with flanking subs and distributed subwoofers.
The problem comes with movies and the surround channels are coming from the front, so you would have to either switch the flanking subs off or do some cable jiggling pre film???

Subject: Re: Small speaker flanking sub limitations.
Posted by Wayne Parham on Sat, 29 Oct 2016 15:30:32 GMT
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I've had best results with low-order slopes. Second is what usually works best for me but I've even run first. I'll run third-order if I must, but that starts to be less effective. Fourth-order and higher are definitely harder to work with.

The balancing act is blending without going too far out-of-band. We want to have gradual fading with plenty of overlap but we don't want either subsystem to be run too far out of its band, e.g. subs run too high or in some cases (like the one you're describing in this thread), mains run too low.

Subject: Re: Small speaker flanking sub limitations.
Posted by jonone on Sat, 29 Oct 2016 15:46:14 GMT
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I know you don't normally filter your mains but would you run the same type of slope on the mains and the flanking subs? I.e both 12db lr or Bessel?

Subject: Re: Small speaker flanking sub limitations.
Posted by Wayne Parham on Sun, 30 Oct 2016 16:07:55 GMT
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Not necessarily. We're not expecting summing like we would in an anechoic environment, e.g. outdoors or in a very large room.

Subject: Re: Small speaker flanking sub limitations.
Posted by jonone on Sun, 30 Oct 2016 19:05:36 GMT
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So what ever gave the flattest response then?

Subject: Re: Small speaker flanking sub limitations.
Posted by Wayne Parham on Mon, 31 Oct 2016 13:30:35 GMT
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Yes, that's right. The flattest response over the widest listening area.