Subject: Kilomax-18
Posted by Wayne-o on Wed, 21 Jul 2010 18:19:30 GMT
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Can the Kilomax 18 be used as a sub crossed over at 250 hz with clear sound in the 100-250 hz region ?

Subject: Re: Kilomax-18
Posted by Wayne Parham on Wed, 21 Jul 2010 20:58:34 GMT
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You betcha. Put it in a 10ft3 cabinet tuned to 25Hz. It will actually work well in even larger boxes, up to 20ft3, if you have the space for a cabinet that large. Give it plenty of vent area, at least 50in2. That will work very well down low.

Below ~100Hz, the only things that matter are box tuning and room modes. Your main concern isn't summing, because boundary reflections come into the mix. Having multiple bass sound sources increases the number of modes, and helps average everything out.

Above ~250Hz, the sound averages into a reverberent field. Modes from interaction between the source and reflections become so closely spaced they aren't noticeable anymore. This isn't the same thing as freespace, but you still want summing between direct sound sources to be constructive. So the distance between high frequency sound sources should be made closer.

Between these two frequency ranges, you transition from discrete modes at low frequencies, to more densely spaced modes as frequency goes up, to indistinguishably close modes at high frequencies. In the transition region, between about 100Hz and 200Hz or so, the upper midbass to lower midrange, you don't really want the sound sources to be too far apart, because then you can detect the distance between them and it doesn't sound natural. But neither do you want a point source because there are still some noticeable room modes. The floor bounce notch usually falls in this range.

I tend to like having sound sources in this transition range separated by a few feet. Not tens of feet but not less than a foot either. This is a good way to get smoothing of the upper midbass and lower midrange, around 100Hz to maybe as high as 200Hz. Either run a midrange and woofer separated by a foot or two, or run a flanking sub near to the mains, just a couple feet away. Overlap them in frequency range to obtain modal smoothing.

Subject: Re: Kilomax-18
Posted by Wayne-o on Thu, 22 Jul 2010 02:36:56 GMT
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Thanks, I was looking at a smaller box 4.5 to 6.5 cu ft. Is there any problem with a smaller box?

Subject: Re: Kilomax-18
Posted by Wayne Parham on Thu, 22 Jul 2010 03:45:14 GMT
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Yeah, this woofer really isn't happy with the smaller boxes. Unlike many of the JBL 22xx 18" woofers that can be used in smaller boxes, the Eminence Kilomax 18 peaks in the midbass and low bass drops off fast when used in a smaller box. If you need to go with a 6-8ft3 cabinet, I'd probably look for a different woofer. Maybe go with a 15" woofer instead.

Subject: Please forgive my jumping in...
Posted by GarlandB on Thu, 22 Jul 2010 17:11:24 GMT
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...but I have a couple of Eminence delta 15s and a couple of Omega 15s. Can either of these woofers be used in a small box for sub-woofer duty with my Pi 4s? I'd probably prefer to use the Omegas and keep the Deltas for use in my old Theater 4s.

Thanks for any advice!

Garland

Subject: Omega 15 and Delta 15
Posted by Wayne Parham on Thu, 22 Jul 2010 18:02:53 GMT
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The Delta 15 needs a huge box for subwoofer tuning, so that's probably out. I wouldn't use the Delta 15 in anything smaller than about 5ft3, and even at that, it's really a midwoofer, not a sub. To get the low notes out of a Delta 15, you really need a box that's like 20 cubic feet or so.

The Omega 15, on the other hand, makes a capable sub when put in a moderately sized 5-8ft3 box. The Omega 15 is one of those woofers that can do midwoofer duty in a 2.53 to 5.0ft3 cabinet tuned to 38-40Hz or as a subwoofer in 5.0ft3 to 8.0ft3 tuned a smidge lower, around 35Hz.

Subject: Re: Omega 15 and Delta 15
Posted by Wayne-o on Thu, 22 Jul 2010 23:51:49 GMT
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Ok, If you had your midhorn that started to cutoff at 225hz and a woofer with a high cutoff at 250hz how close would you want them for the best summing ? Thanks

Subject: Re: Omega 15 and Delta 15
Posted by Wayne Parham on Fri, 23 Jul 2010 00:01:39 GMT
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The midhorn doesn't cutoff firm at 250Hz, but rather has a fairly gentle rolloff down low. I like to overlap the midhorn and bass bin, to run the midhorn down as low as it will go and use a slow LP rolloff, usually just a ~5mH series coil. The midhorn and woofer are separated by a couple feet, and aren't in the same position in any of the three planes. This provides some modal smoothing in this range, eliminating the floor bounce notch, etc.

Subject: Re: Kilomax-18
Posted by Wayne-o on Fri, 23 Jul 2010 02:47:41 GMT
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Ok, Pure Genius! If you crossed them over at 500hz could you put them closer together like 5-6 inches?

Subject: Re: Kilomax-18
Posted by Wayne Parham on Fri, 23 Jul 2010 13:05:51 GMT
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That would remove the modal smoothing. You need the distance to provide the smoothing. You also couldn't get the midhorn that close to the woofer, it's too large.

Subject: Re: Kilomax-18
Posted by Wayne-o on Sun, 25 Jul 2010 05:34:40 GMT
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Does the same principals apply if you don't use any horns ?

Thanks again.

Subject: Modal smoothing using dense interference from multiple sound sources
Posted by Wayne Parham on Sun, 25 Jul 2010 14:37:42 GMT
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Oh, yes, absolutely. Modal smoothing is done with dense interference. It's kind of the opposite approach to what you'd take to get a good point source.

In an anechoic environment (outdoors), you'd want a point source. That would ensure constructive summing even when the listener moved. But indoors, you have self-interference from boundary reflections. That interference makes the benefits of a point source mute at low frequencies, below the Schroeder frequency, around 150Hz to 200Hz, depending on the room.

Since you can't eliminate the interference, what you want to do is to make it so dense the sound becomes an averaged field rather than forming discrete zones of destructive interference and constructive interference. Those make noticeable peaks and dips in the bass and midbass response, all the way up into the lower midrange. The trick is to do this at low frequencies, but phase it out as frequency rises. You want distributed sound sources down low and point sources up high.

Subject: Re: Modal smoothing using dense interference from multiple sound sources
Posted by Wayne-o on Thu, 05 Aug 2010 02:24:30 GMT
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If you were crossing over two drivers at 800 hz, would you need to keep them separated about 4-6 inches to make them blend together.
Thanks Again Wayne..

Subject: Position of nulls from adjacent sound sources
Posted by Wayne Parham on Thu, 05 Aug 2010 03:16:08 GMT
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I think you are talking about two 18" woofers with their edges 4" to 6" apart, so roughly 22" to 24" center-to-center. If that's so, you can calculate the angle where the nulls will be at their maximum using the formula below:

where:

d1 is the center-to-center distance between sound sources

a is the half-angle between nulls (2a is the arc between nulls)

so:

d1 = 0.61m (24") between the woofer centers

a = 20° or 2a = 40° (arc between nulls)

Subject: Re: Position of nulls from adjacent sound sources
Posted by Wayne-o on Thu, 05 Aug 2010 17:29:11 GMT
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Well I was off topic, I was talking about putting a horn crossed at 800 hz with a mid driver like a Omega-15. Would they blend close together or would you need to separate them 5-6 inches in order to smooth them ?

Subject: Re: Position of nulls from adjacent sound sources
Posted by Wayne Parham on Thu, 05 Aug 2010 18:24:13 GMT
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The crossover frequency is pretty near there, just north of that actually. Keep the driver spacing close, because this sets the position of the forward lobe and the vertical nulls. Don't reinvent the wheel, build it as designed. Lots of work went into refinement and optimization of that loudspeaker.
Crossover optimization for DI-matched two-way speakers, revisited

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