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Subject: 2500 hz hump

Posted by [Paul C.](#) on Tue, 13 Dec 2005 22:33:11 GMT

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Wayne, besides the woofers you use in Pi's, I have been looking at other similar high efficiency woofer. It seems that most have a hump or peak in the 2000 hz range, then fall off. Examples are Eminence Gamma 12, Some the hump is quite mild, Eminence Delta 15LF, Delta 12LF, Gamma 15. What causes this peak? Is there any way to tame this in the crossover?

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Subject: Re: 2500 hz hump

Posted by [Wayne Parham](#) on Wed, 14 Dec 2005 14:25:22 GMT

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There are a couple of things that cause midrange response to rise in a midwoofer. One is collapsing directivity and the other is cone flex resonance, modes where the cone is twisting and a resonance sets up on the membrane. Collapsing DI causes a flat line of rising response but resonance modes cause peaks. You can equalize collapsing DI in the crossover, and it is a useful feature when paired with a HF horn, because you can crossover in the frequency range where directivity is similar between the two subsystems. Breakup modes are a little trickier to work with, because they make the driver surface act a sort of like a chaotic array of sound sources that change with respect to frequency.

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Subject: Re: 2500 hz hump

Posted by [Paul C.](#) on Wed, 14 Dec 2005 14:43:23 GMT

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Wayne, I am sure you have probably discussed this before, but thanks for the review!

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Subject: Re: 2500 hz hump

Posted by [Spinjack](#) on Wed, 14 Dec 2005 17:49:44 GMT

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The modes are the reason that some high-end speakers use drivers with random, but intentional, "irregularities" in the cone, is it not? For instance, Sonus Faber has those epoxy filled slits that breakup the surface. Or am I off in left field on this one?

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Subject: Re: 2500 hz hump  
Posted by [Wayne Parham](#) on Wed, 14 Dec 2005 20:10:44 GMT  
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There are lots of things manufacturers have done to reduce the problems surrounding breakup modes, mostly by working with different materials and cone geometries.

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Subject: Re: 2500 hz hump  
Posted by [Matts](#) on Wed, 14 Dec 2005 23:04:15 GMT  
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by nature of being woofers, aren't these drivers made to cross below this point? If the mfr's are trying to optimize performance in a given waveband, there are bound to be trade-offs outside of that waveband. And, if a mfr tries to make a single-driver solution, there are trade-offs in that, too (called "BASS"). No free lunches!

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Subject: Re: BTW....  
Posted by [Matts](#) on Wed, 14 Dec 2005 23:05:25 GMT  
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the Omega 15's in the Stage series, besides sounding good, have a very pretty freq. res. graph.....

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Subject: Re: BTW....  
Posted by [Paul C.](#) on Thu, 15 Dec 2005 02:04:51 GMT  
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Yes, they should cross over before that 2000 hz-2500 hump. But even with the crossover rolling them off, they still may have a high peak that interferes with getting an accurate xover. With some, even with 12 db/oct, this peak makes them unsuitable for the 1600 hz xover freq recommended for the Eminence PSD2002. A 2-way will not work for these, you would have to go much lower, and probably go to a 3-way system.

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Subject: Re: BTW....  
Posted by [Spinjack](#) on Thu, 15 Dec 2005 13:57:47 GMT

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Can you not just set the crossover point such that the signal rolls off just before the hump which combined with the hump gives relatively flat total response until the back side of the hump where the total rolloff is now steeper than 12db/oct? You would have to design the system for a steeper rolloff total on the back side of the hump.(Forgive me is I'm way off base. I'm still rather new at this.)

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Subject: bad breakup

Posted by [ToFo](#) on Sat, 17 Dec 2005 04:41:10 GMT

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if it's just rising response from the collapsing directivity of the large driver then you are right on. you can set the crossover electrically lower than your real acoustic target. You will not get an ideal summation of the two drivers, but you can take steps to insure you don't cancel out either (or just hook the tweeter up in and out of phase and see which is louder at your crossover frequency, and hope for the best). A calculated second best is not necessarily a bad thing. Cone breakup resonances are another matter altogether. I believe all the big drivers have some past 800 Hz or thereabouts, so it's more a matter of how bad are they and which sound least offensive. There can be a lot of sound still coming off the cone after the event is over because the cone is ringing like a bell at certain frequencies. You can cross it over or EQ it all you want, but it can still quack like a duck if the driver is spikey up high. I heard a frat party system once that had a hot 18 crossed to a small 3500 hz horn. Didn't matter what the instrument was, handclap - quack!, Snare - Quack!!, saxophone - QUACCKKK!!, you get my drift. Most frequency plots are set so the "pen" moves too slow to show how bad breakup really is, so you just have to be a carefull shopper and find designers/posters you trust (guess your in the right place already). Thomas

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Subject: Re: bad breakup

Posted by [Spinjack](#) on Mon, 19 Dec 2005 13:12:02 GMT

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Interesting. Is that why manufacturers of high quality drivers have gone back to paper (or paper like composites)? I remember in the late 80's that aluminum and plastic composites became very popular and paper was blasted as being flimsy, not suitable for bass (I hung up my "audiophile" hat after high school only to recently put it back on). But it seems that more recently pulp based composites are the newest "fad".

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Subject: Re: bad breakup

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Regular paper cones do have issues, but they can sound great. I think they throw off a lot of people because they often sound better than the measurements would suggest. The exotic cones can easily beat the rigidity to weight ratio of straight paper, but paper is quite rigid as well as being self damping unlike magnesium. With a lot of exotics you must cross over low and steep, and/or with a notch filter to avoid the dreaded breakup of these drivers. Paper is more forgiving at the extremes. Something like my Theater Four Pi's would be near impossible to do without a paper woofer. A rigid carbon or metal woofer would never behave all the way to crossover frequency and the hyper self damping and extra flex of polypropylene would be far too lossy to ever give the required SPL. So in the case of a high output, low distortion, full bandwidth two way, there aren't many alternatives. If you go to a Home Theater store, you will see lots of poly and a few exotics, but when you see guys running low watt amps, or high dB's (or both) in medium to big rooms, you start to see a lot of paper. There are a few paper examples for the best of the bleeding edge of ultra high end as well. There are so many ways to accomplish all these things. A great designer could make a nice speaker with diamonds or cardboard. Paper will always have a place though. Right now we have Scan Speak slit paper mids re-defining high technology midrange, Alon used an old school paper & alnico approach from Vifa in a hip dipole midrange application, and Iconic is keeping the Altec thing alive quite nicely. I do see the other materials ratcheting up a notch too. Seas magnesium 7" that can work in a two way for a small room! Scan Speak is doing metal cone woofs now, so I think things are getting pretty cool all over. Seem weird, since Home Theater and Best Buy has all but cleared my town of anything more exotic than entry level monitor audio. Then again, that may be why the hi-fi big dogs are trying so hard to please. It's hard to figure sometimes. Thomas

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