Subject: Wayne, all this crossover stuff lately...(sorry, long)
Posted by ToFo on Thu, 17 Apr 2003 17:35:14 GMT
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prompts me to get into one other point that I wish to put out there. I have limited knowledge, and hope to either have this confirmed or corrected. either way I want to understand this more.I have found a number of devices with similar traits, but decided on JBL because you know it, and because I knew a lesser driver might get the response of "use a better tweeter" from some folks. This driver is quite popular even with audiophiles and is used on many a "high end" horn, often with "purist" crossovers. JBL's 2426 has impedance of about 6 ohms with peaks of 10 ohms at 1200 and 25 ohms at 450 Hz. A 13.25 cap is great for first order at 2000 Hz (6 ohms), but if you check you will note that it well within spec to use 13.25 uF at the other 2 frequencies and their associated impedances. This seems like a weird thing to me, but I checked it twice. So wouldn't all three of the listed frequencies get 1/2 power? When you take into account the drivers 2 dB peak at 1000 Hz and the caps 3 dB down at 1200, you are still within spec to call it flat down to just below 1000 Hz. This seems highly undesirable. This cannot be what people are intending to do with purist filters. It seems that many drivers have just what they need to compensate for the capacitors intended effect and confound the "cut and try" tweaker. I know I am preaching to the choir here, but there is more. The idea that the acoustic equivalent of high order filtering being rendered with a cap and natural horn unloading seems to favor unpredictable and poor crossover function, and the presence or harmonic distortion, intermodulation and resonances over the "ringing" and bigger phase angle rotations inherent in high order filters. Wouldn't running a horn through its resonance and cutoff sound awful? It does at my house.What exactly is this ringing, and why don't I hear anything bad with my Pi 1K6 X-overs.I know why the phase is no big deal, and how to deal with it, thanks to you.As for protecting the device with a series cap, 1/2 power at 450 Hz is over 4 times the excursion of 1/2 power at 2000, Yes? I realize that suspension stiffness and the amplifier seeing a 25 ohm loads negates some of this, but I can't see how it would be good for distortion figures or structural integrity to let a driver meant for 1200 and up get good juice at 450 wheather you can hear it at 450 or not (intermodulation?). Are the relationships demonstrated above as cut and dry as they look? Is my understanding correct.Now for the biggie. With the above example in mind, I wonder what is really happening at these impedance peaks with higher order filters. say an 8 ohm driver with a peak at 800 of 16 ohms was used with your 1K6 x-over. At the 800 Hz 16 ohm peak the capacitor values are perfect for crossing at 800 but the inductor is now 1/4 of what 800 Hz at 16 ohms calls for. So at 800 hz what does the attenuation curve look like? What happens to filter Q? I am sure that the crossover is effected by a doubling of impedance only an octave away. I assume that it is less of an effect with high order, but I feel like the effect would be less effective attenuation and a drastic change in Q. Am I crazy, or just lost?Thomas

Subject: Great points - You're right on point
Posted by Wayne Parham on Thu, 17 Apr 2003 18:36:24 GMT
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for it. It was also one of the main topics of discussion in the "Crossover Electronics 101" seminar at the Midwest Audiofest. Not only did we show it as a response curve - both modeled and measured - but we also listened to the sound of these effects. It is clearly audible.

There are lots of solutions that a person can choose, but a single capacitor is not one of the better ones. It either creates an audible peak or it allows excessive out-of-band energy. Caps that are small enough to actually act as a crossover make a big response peak. And those that are large enough to shift the peak down out of the passband allow too much energy to be developed down low.

So you are right on the money here. Best to analyze the system in Spice to find out what's really going on.

Subject: Thanks, and how about Spice for dummies?!
Posted by ToFo on Thu, 17 Apr 2003 19:24:46 GMT
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As I wrote that I kept thinking about Spice. I have failed miserably at using it so far.I don't suppose there is a spice for dummies book series. Seriously though, is there a good book to help introduce me to Spice.Thomas

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Subject: why are you sweating the Z peaks
Posted by Sam P. on Thu, 17 Apr 2003 20:37:04 GMT
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when the HF driver is typically isolated from the xover by the resistive padding network? Even with those wild mood/Z swings, the xover itself will still be seeing a fairly nominal load. And the HF being padded say 12dB to match the LF, when you are listening to bass in the 100dB range, the HF will be rocking along at 1/16 watt... Why not try putting a zobel directly across the HF driver to deal with the 450Hz. peak, and see if that helps. Samringing with high order filters...is it due to oversaturation, and isn't filter Q another factor...or something:(Wayne, how about a few words regarding ringing in a reactive circuit...

Subject: Hi Sam

Posted by ToFo on Thu, 17 Apr 2003 21:43:46 GMT
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I am actually with you. Plus since my stereo sounds so good I don't get to tweak anymore. I have literally taken to gardening, and sometimes I think about stupid stuff like Z peaks :) Geez! I think I start some 7Pi's before I lose it.My comments were mainly inspired by reading the below linked thread where the merits/pitfalls or using a single cap as the crossover for a compression horn midrange in a three way system is discussed. As an aside I noticed that the peaks on a 2426 were in all the right places to play havoc in such a setup. And then I wondered how or if this would mess with high order filters. Since I know just enough to be dangerous I wasn't considering the isolation provided by the HF pad. Totally makes sense though. Thanks for your comments.Thomas

Subject: Peaking and damping - Q
Posted by Wayne Parham on Fri, 18 Apr 2003 01:52:57 GMT
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The resistances in the tweeter's compensation network set the Q of the circuit. It serves triple duty - (1) It is an attenuator, (2) it augments the top octave and (3) it sets the Q of the circuit, acting as a damper.This kind of thing can be done in many ways, and with different configurations and slopes of crossovers. But the thing is that even the most simple crossover forms a rather complex filter because the load is reactive.A very thourough analysis can be done in Spice.

Subject: Re: Thanks, and how about Spice for dummies?!
Posted by Wayne Parham on Fri, 18 Apr 2003 01:55:18 GMT
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There's good documentation in the help files, but it may still be a bit cryptic. Maybe I'll focus some on using Spice in next year's Midwest Audiofest seminar.