Subject: crossover electronics
Posted by Tony Valetti on Tue, 02 Nov 2004 18:14:33 GMT
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Hi, I have gone through the archives with interest. There is one thing that I would like clarified. At http://audioroundtable.com/PiSpeakers/messages/12812.html the crossover electronics lab101 handout shows big peaks in some. What is the purpose of those? I want flat response, and those peaks look pretty bad to me. Also, the woofer connected through a simple LC crossover shows a peak. Why is that? There is nothing that I could see that would cause such a peak? I'm very interested in your response.Thanks, Tony

Subject: Re: crossover electronics
Posted by Wayne Parham on Tue, 02 Nov 2004 20:59:34 GMT
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I did a little seminar at MAF 2003 called "Crossover Electronics 101" where we looked at a few simple circuits that are often used in crossovers. We touched on first-order, second-order and third-order networks, as well as conjugate filters and other compensation networks. The "Crossover Electronics 101" seminar handout contains formulas with explanations and schematics with corresponding response curves. In this seminar, we could see a schematic, look at its response curve and listen to what the circuit actually sounded like.

Passive crossovers do a lot more than just splitting the frequency sent to each driver. Since the driver itself is reactive, it becomes part of the filter. That's one reason why the crossover often exhibits some peaking. The interaction between the driver's voice coil and circuit capacitance forms a resonant circuit. If it isn't properly damped, it can generate a peaked response curve. Higher order networks have both inductance and capacitance, so they also form resonators that should have a specific load value of resistance for proper damping to prevent peaking. Since the loudspeaker is not purely resistive, that can also be a source of peaking. In some cases, it is enough to be noticeable and can be quite pronounced.

Subject: Re: crossover electronics
Posted by GarMan on Tue, 02 Nov 2004 21:27:25 GMT
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Hi Tony,Can you elaborate on where you're seeing the big peaks in the documents? Almost all the graphs in the 101 documents are Transfer Functions and not Response Charts, and having peaks in those has nothing to do with a flat response.Actual Response = Transfer Function applied to Raw Driver ResponseThere are, however, 6 Response Charts in the 101 Lab Handout

documents, from pages 26 to 31. Of these six, only the last one on page 31 would represent the response of a PI Speaker, and we do see a flat response from the tweeter +/- 3dB. The other five Response Charts from pages 26 to 30 do not represents the response of a PI Speaker, but rather steps to the final PI crossover.regards,Gar.

Subject: Re: crossover electronics
Posted by Tony Valetti on Tue, 02 Nov 2004 22:09:04 GMT
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I understand now. The crossover needs some kind of load tweaking and you show ways to do it. I never heard about that zobel before.Thanks, Tony

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Subject: Re: crossover electronics
Posted by Tony Valetti on Tue, 02 Nov 2004 22:18:36 GMT
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The one that surprised me most was the LC crossover on pg 14 at http://www.pispeakers.com/Speaker_Crossover_Lab_Circuits.doc. I can't believe that's what the crossover send to the woofer. The next page shows how to fix it but I never of that before. Say what's the difference betwen a transfer curve and a response curve?Tony

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Subject: Re: crossover electronics
Posted by GarMan on Wed, 03 Nov 2004 13:40:24 GMT
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Tony,What you're seeing on page 14 is not an example of an actual PI network, but rather an example of what not to do. Wayne tends to like to play tourguide by taking his audience on a step-by-step journey, rather jumping directly to the final destination. It's a better way to learn.To answer your question on transfer functions, a Transfer Function describes how a network changes a signal, and that network can include the crossover component and the driver itself. The Transfer Function graphs in Wayne's document describe the resulting voltage across the woofer if 1V is applied at the input.A Response Chart is the SPL (sound pressure level) that the driver gives out when it experiences voltage across its terminals. Two types of Response to consider though. Raw driver response where voltage is applied directly to the driver, and network response where voltage is applied to the driver through a crossover network. IF (BIG IF) raw driver response is perfectly flat across the entire audio spectrum, then network response would mirror the Transfer Function. However, actual response of most real world drivers is anything but flat and in those cases, you need to send a "bumpy" signal to the driver to compensate.An example is a driver that

exhibits a peak in the middle of its bandwidth. In that case, you need a "notch filter" with a transfer function that produces a valley in the same area. The resulting signal with a valley going into a driver with a peak will give you a flat response.Gar.

Subject: Re: crossover electronics
Posted by Tony Valetti on Wed, 03 Nov 2004 18:33:36 GMT
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I think I get what your saying. The response curve of an amp is its transfer function. For a speaker, the transfer function is what happens on the inside.Thanks for your insight, Tony

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Subject: Re: crossover electronics
Posted by GarMan on Thu, 04 Nov 2004 02:35:01 GMT
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Hi Tony,Just a small correction. In Wayne's document, the transfer function is the response curve of the crossover network in connection with the driver. And yes, the transfer function is what's happening "inside" the driver.
