Subject: Impedance correction at a compression driver's Fs - How to calculate - Wayne P?
Posted by Peter K on Tue, 21 Mar 2006 10:13:57 GMT
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Hello! I have a pair of 2” BMS 4592 ND (16 Ohm version) coax compression drivers on their way to be used from about 300 Hz and up on a large 200 Hz exponential horn for my home system. I would like to make an impedance correction curcuit to flatten-out the impedance peak around the Fs of the BMD "mid-section" (app. 360 Hz according to the graphs on the BMS website). There is a link to the driver below. Besides, I have from the manufacturer (BMS) got the following values for the 16 Ohm version: Re (mid) = 8.9Le= 0.19 (at 10 kHz)If I understand it correctly, an impedance corrections curcuit (Zobel?) can be calculated quite precise when the driver’s Qes and Qms are available. But that is usually not the case when the driver is a compression driver, as in my case. However, at the link given here: http://www.the12volt.com/caraudio/crosscalc3.asp#zobelthere is an online Zobel-calculator that based on the description seems to do what I search for. 1. The calculator asks for the “Nominal resistance”. In my case, is that the 16 Ohm (because it is said to be an 16 Ohm driver), or the Re = 8.9 Ohm provided by BMS, or…??2. Is the formula in the link the way to go, or should I rather do something else - and in that case what?I would really appreciate your help – thanks!RegardsPeter
BMS 4592 ND

Subject: Re: Impedance correction at a compression driver's Fs - How to calculate - Wayne P?
Posted by Wayne Parham on Tue, 21 Mar 2006 14:56:28 GMT
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Check out my Speaker Crossover document, because it describes techniques for dealing with the impedance peaks of a compression horn and the interaction that results with crossover components.

In a nutshell, the methods described use conjugate filters and/or additional damping. A horn acts like a series of resonances, so the conjugate is also a series of resonances. In some cases, only one impedance peak is really a problem, so it can be smoothed with a single electrical resonator. But you'll also find that increased damping will smooth the peaks, and this may be more attractive. Model the circuit in Spice and then measure your final results.

You might be interested in attending my "Crossover Electronics 101" seminar at the Great Plains Audiofest in May. We will examine several circuits, by comparing their schematics and modeled response charts as well as actually listening to speakers that use the circuits shown. So we will be able to identify how each sounds.

Subject: Re: Impedance correction at a compression driver's Fs - How to calculate - Wayne P?
Posted by Peter Krojgaard on Tue, 21 Mar 2006 19:31:24 GMT
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Hi Wayne,Thanks a lot for your reply! I will look into your document, and I am sure I will learn from it - thanks!I would really like to attend to your seminar at the Great Plains Audiofest, but since I live in Denmark, its quite a few miles a way:-(I see that the Spice program is a zip-file. Do you happen to have link to an un-zip program at hand? Thanks!RegardsPeter

Subject: Re: Impedance correction at a compression driver's Fs - How to calculate - Wayne P?
Posted by Wayne Parham on Tue, 21 Mar 2006 19:42:24 GMT
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Well, if you happen to be in the neighborhood in May, drop on by.

PkZip can be found at pkware.com.

Subject: Thanks, Wayne! (nt)
Posted by Peter Krojgaard on Tue, 21 Mar 2006 20:31:14 GMT
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RegardsPeter

Subject: "Crossover Electronics 101 seminar"
Posted by Duke on Wed, 22 Mar 2006 06:35:09 GMT
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I met Wayne at the crossover seminar he gave at the last Midwest Audio Fest a couple of years ago. Can't say I understood everything he said, but enough to suddenly make it possible for me to design a crossover for a horn. Before attending his seminar, all I knew was that my cookbook approach was totally useless. That workshop alone was worth the drive from New Orleans to Lima (Ohio, not Peru) for me.Duke

Subject: Re: Impedance correction at a compression driver's Fs - How to calculate - Wayne P?
Posted by Earl Geddes on Thu, 06 Apr 2006 15:46:50 GMT
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WayneWhile I think that your crossover paper is useful for the novice it is highly over-simplified and if naively applied would not yield the desired results.Specific points are:Driver inductances are never ideal - Leach and Vanderkooy both point this out, and your Spice model simply does not represent the actual impedance variations found in real drivers. This can be quite a pronounced effect. In my computer simulations I use the Leach model which works quite well.Spice models only give electrical performance. In the real world we have to add in the acoustical performance of the drivers which adds a great deal of complexity, but ignoring it is highly erroneous. Thats why I don't use Spice for acoustical problems. For instance, any CD device must have a falling axial response which must be corrected in the crossover. This is not reflected in your designs or discussion.The multiple impedance peaks in a compression driver are caused by reflections in the horn. A properly designed waveguide does not exhibit these higher peaks and as such allows for a much better crossover design as well as a much better directivity control. In short, if you have these peaks in your impedance curve then the horn is poorly designed and no crossover approach is going to fix that.

Subject: Re: Impedance correction at a compression driver's Fs - How to calculate - Wayne P?
Posted by Wayne Parham on Thu, 06 Apr 2006 19:01:33 GMT
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Spice models can be written to include mechanical and acoustic resonances, not just Re and Le. Some of the models described in the Crossover Document and in the Spice models available for download have these resonances included in them. Further, CD compensation is one of the key points made in these documents, so to say that it isn't taken into consideration only shows that you have not read the material.
Speaker Crossover Document
Spice executable with crossover and driver models

Subject: Re: Impedance correction at a compression driver's Fs - How to calculate - Wayne P?
Posted by Earl Geddes on Thu, 06 Apr 2006 19:21:04 GMT
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WayneI think that you are missing my point again.The drivers Le CANNOT be done correctly in SPICE - read Leach and Vanderkooy.The acoustic radiation effects - not simply the effect of the resonance on the impedance, but directivity and acoustic load (which has no electrical analog) cannot be done in SPICE. SPICE was never intended to do acoustics, and it can't.

Subject: Re: Impedance correction at a compression driver's Fs - How to calculate - Wayne P?
Posted by Wayne Parham on Thu, 06 Apr 2006 20:02:22 GMT
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Actually, one of Leach's most often cited works is a horn model done with Spice.A two-port analogous circuit and Spice model for Salmon's family of acoustic horns. by W. Marshall Leach, Jr., Professor Georgia Institute of TechnologyRegardless, I don't use Spice to model acoustics, only electronics. My Spice models are designed to give an indication of what the crossover is doing in the electrical realm only. It's a circuit modeler. Leach uses a virtual circuit to model acoustic properties but that's not what I'm doing.I use Spice to model the crossover, and that's it. My models do take account the transformation of mechanico-acoustic properties into the electrical circuit, but this is purely done to get a better model of the electrical circuit. It's not intended to model things like acoustic radiation pattern. The Spice models I made are used to give a better view of what's happening in the crossover circuit than simplified resistor-load models provide. But again, it's not an acoustic model nor was it ever intended to be one. If you took the time to look at what I've done before replying on it, you would see that.