Subject: Re: Crossovers - Again !!!!!!!
Posted by Wayne Parham on Wed, 04 Apr 2012 00:04:59 GMT
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Conductance across the voice coil provides electrical damping. The smaller the resistance, the more damping. The most damping is created by a dead short.

Consider that the amplifier shorts the voice coil too. An amplifier with high damping factor is one with low output impedance. It effectively shorts the voice coil. You won't get any more damping than that using a shunt resistance. Not for a driver connected directly to the amplifier, or through a small value coil. The damping provided by the amplifier is like having a direct short across the voice coil, so no resistor is going to improve on that.

Tube amps have less damping, of course, but still usually more than you can provide with shunt resistance. That's why you rarely see resistors across woofers, except for Zobels, which do their thing at higher frequencies. At low frequencies, the amplifier is the primary source of electrical damping.

On a related note, have you ever heard the output transformer of a tube amplifier buzz slightly on loud bass notes? What is happening is the woofer's back-EMF is causing the laminations in the output transformer to vibrate. It's kind of the same thing that can cause a power transformer to buzz. At low volumes, the output circuit can handle it, but at higher levels, the back-EMF becomes excessive. Sometimes it can even cause arcing inside the tube, because the transformer steps-up the back EMF and applies it to the anode. I've also seen woofers create enough back-EMF to generate a chirping sound in piezoelectric tweeters connected to the same circuit.

Those are extreme examples though. If the tube is arcing from back-EMF, then it really shouldn't be driving that load. A shunt resistor won't help much, because the amplifier is still providing most of the damping. It's just straining trying to do it. A resistor with low enough value to increase damping by any significant amount will short-circuit the amplifier, so that's no help.

Where I see the most benefit from shunt resistors is to provide a specific load for a crossover circuit. The crossover somewhat decouples the amplifier from the driver, and so its ability to provide damping is diminished. The amplifier is a dead short, but the crossover filter is a reactive circuit and it is loaded with a complex impedance (the driver). Sometimes the crossover/driver combination really needs a shunt resistance to set everything right.