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Subject: Re: Hi-Efficiency vs Lo-Efficiency Speakers  
Posted by [Wayne Parham](#) on Mon, 10 Jan 2005 19:54:20 GMT  
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You're right that shorting rings tend to reduce voice coil inductance and to make inductance more linear. That's pretty significant, especially for HF devices. And you're right that the inductance change is nonlinear. Klippel has done a lot of work in that regard, and I understand now that you have too. Now I see where we have been sort of talking apples and oranges, because I've been focused on linear distortion mechanisms and you've been focused on the non-linear ones. When I speak of symmetry and flux stabilization, I'm talking about the fact that the voice coil adds to the fixed magnetic flux in one direction and subtracts from it going the other way. You're right that the shorting ring has to be carefully sized and positioned so that its effect balances these forces and reduces asymmetry from flux modulation. But when properly implemented, it does a very good job of making the motor movement more symmetrical. One thing I've realized about shorting rings is that, like you said, the conductor isn't perfect so there is a minimum speed they work at. This translates to a lower frequency limit where they become ineffective. If the ring were superconductive, I suppose it could be made very small and it probably could work at very low frequencies. But since it isn't, a large conductor is required and that displaces magnetic material. There comes a lower limit where increases in ring size become prohibitive. The geometry of the gap and the position and size of the voice coil are important features too. They sort of set a baseline, and if static flux is asymmetrical, there is little point in AC flux stabilization. Using a shorting ring on a motor with asymmetrical static flux in the gap is a waste. The really cheap drivers sound bad even at low volume levels because the static flux is asymmetrical. The diaphragm moves further in one direction than the other even at very low drive levels. But better drivers do a pretty good job at low levels, and only start becoming asymmetrical at high drive levels. That's where flux stabilization can help them achieve that extra level of symmetry.

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