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Subject: Impedance at resonance and tube amps  
Posted by [Duke](#) on Sun, 12 Oct 2003 15:43:51 GMT

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Wayne -If I understand correctly, the Theater 4 Pi works great with SET's and such; the Theater 3 Pi does not work well with tube amps (especially not SET's); and the Stage 4 Pi works pretty well with tube amps down to about 10 watts. Not having read every post you've made on the subject, from what I have read I gather that the issue at hand is the woofer's impedance at resonance. The Delta 15 in the Theater 4 Pi has a  $Z_{max}$  of 52 ohms; Delta 12LF in the Theater 3 Pi has a  $Z_{max}$  of 93 ohms; and the Omega Pro 15 in the Stage 4 Pi has a  $Z_{max}$  of 122 ohms. I would have thought that a fairly low  $Z_{max}$  would be desirable for a tube amp, but evidently the high  $Z_{max}$  Omega 15 works better than the medium  $Z_{max}$  Delta 12 LF. I'm probably taking bits and pieces out of context - could you show me the big picture, or point me to a source? Thanks! Duke

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Subject: Re: Impedance at resonance and tube amps  
Posted by [Wayne Parham](#) on Mon, 13 Oct 2003 03:10:37 GMT

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I've found some SET amps that don't seem particularly sensitive to load and others that are very sensitive. The issue is that as source impedance is increased, the resulting circuit acts more like one having constant current. This makes the woofer excursion vary purely because of the electronics, which sets the amount of motor drive and damping. What you have essentially is a voltage divider, where both impedances are fairly significant, and one of them varies considerably at different frequencies. If the amplifier has very low source impedance, then it acts like a constant voltage source. It acts like there is no voltage divider, because the source is essentially "shorted." When full power is applied, the voltage across the motor goes to the rails. And when no voltage is applied, it acts like the motor is shorted. So the load impedance doesn't interact with the source impedance very much as a voltage divider. These effects are quite noticeable when you take a motor with high  $Z_{max}$  and compare its behaviour in a circuit having strong drive/damping ability to another having high source impedance. You can drive a speaker having low  $Z_{max}$  with either of two amps having different damping factors and you might not hear much difference if the amps are comparable in other respects. But put a speaker with high  $Z_{max}$  on the amps, and you'll definitely notice it. Try this experiment: Take a high-power solid-state amp and drive a speaker with low  $Z_{max}$ . Now take the same amp and put a series resistor inline, of say 10 ohms. The low  $Z_{max}$  speaker won't peak too much, and you won't notice the difference in frequency response. You might hear the reduction in output, but the response curve will be fairly similar so the speaker will sound similar. But do the same thing with a high  $Z_{max}$  speaker. You'll hear the difference now. There are some SET amps that have high enough source impedance that they act this way. So they probably are best paired with speakers having low  $Z_{max}$ .

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Subject: Re: Impedance at resonance and tube amps  
Posted by [Duke](#) on Tue, 14 Oct 2003 11:54:14 GMT  
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Thank you, Wayne! I am constantly amazed at the wealth of knowledge you so freely share. Best regards,Duke

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