Subject: Looking for good 20 watt amp design to drive Jordan TL's?
Posted by Norris Wilson on Tue, 11 Oct 2005 04:32:05 GMT
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Hi, I am trying to help a friend track down a good 20 watt SET design that will firmly run a pair of Jordan JX92S TL speakers.He use to own a pair of Welborne Apollo MKII's and would consider going back that direction. But we feel that at 20 watts, the VV52's were short lived, not a good investment at $500 a pair.Is there a better alternative short of using an 845 at 900 Volts plus, or a $500 a pair of VV52's to obtain the desired 20 watts?If a P-P circuit would get you to that musical 20 watts with plenty of drive, that could be an alternative to the big tube SET's.Any input or suggestions would be greatly appreciated.ThanksNorris Wilson

Subject: Re: Looking for good 20 watt amp design to drive Jordan TL's?
Posted by Wayne Parham on Tue, 11 Oct 2005 07:26:47 GMT
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The Audio Note kits will get you about halfway there in terms of power. The Kit 1 is 10 watts, the Kit 2 is 12. What did you think of my Kit 2? If you'd like, we can try it on your friend's Jordan's and see if he likes them.SET amps sound good in the midrange and higher frequencies, but the real thing to listen for is bass performance. That's the hard part for a SET amp. Most loudspeakers require electric motor braking (literally) because the main part of damping in the T/S specs is electrical, not mechanical. So the output impedance is very important to bass response. If the bass sounds boomy or tubby, try it with a PP amp and see how you like it.

Subject: Damping factor - SE vs. PP
Posted by Damir on Tue, 11 Oct 2005 11:45:59 GMT
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Just to add - PP amp doesn`t have a larger damping factor (or lower output resistance) then SE amp per se, but from the fact that most PP amps have a global negative feedback loop and SE amp mostly do not.If we have a typical 300B SE amp with say Ra=3k, we can expect DF~3 without neg. feedback, or DF=Ra/(rp+Rw). We can express DF on the secondary side, like ratio DF=Rsp/Rout, where Rout is rp+Rw (anode resistance and windings resistances "reffered" to the secondary).Then, we can have 300B PP amp, class A, say with Raa=6k. Primary reflected impedance is doubled, but we now have two output tubes, and DF=Raa/(2rp+Rw). We can see that in both examples (SE & PP) we have about the same DF.In fact, if we use typical UL PP output stage coupled with somewhat lower Raa (AB1 amp), then we can expect maybe DF~1 without feedback.Simplified, and there`s a more about PP/SE things...

Subject: Re: Looking for good 20 watt amp design to drive Jordan TL's?
Posted by Norris Wilson on Tue, 11 Oct 2005 15:02:08 GMT
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Hi Wayne,How is life going in the world of Pi?I want to thank you for the kind offer of hooking up your Audio Note 2 SET to my friends Jordan speakers.My friend Mike, who lives in Seattle and I have discussed the Audio Note 2 SET as an option. But, he feels that the 12 watts is not enough to drive the Jordan transmission line speakers. He feels since the Jordan's bottom frequency response goes down to 45 Hz and is 88db efficienct at 8 ohms, that it will not have enough authority since he likes to listen to classical music. Also, since he lives in Seattle, it would be diffacult to hook up the amplifier with out a dangerous jouney across our land at the hands of the delivery wrecking crew.I for one, am not convinced that 12 watts would not be enough power to drive his speakers well. Obviously, a 5" full range driver is not the best choice to play classical through in the first place, possibly at lower listening levels though. I think that is why he feels 20 watts should be at the lower end of the amplifiers output capability.His thinking is some what stuck in the direction of a triode based SET amplifier to obtain the last degee of musical purity.I again, am open to any suggestions that would get us there, triode, pentode, SET, or push pull, I'm open.I have been trying to get my friend to build the 7591A version of Poindexter's Musical Machine with some Sansui 1000A output transformers, but he is not ready to do so at this time.Thanks again and I hope someone can chime in with other DIY amplifier designs and suggestions.Norris

Subject: Re: Looking for good 20 watt amp design to drive Jordan TL's?
Posted by Wayne Parham on Wed, 12 Oct 2005 12:14:36 GMT
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Seattle is a bit far to drive. I thought maybe your friend lived here. Everything is going great, thanks for asking. Just busy as bees to tell the truth.

Subject: Re: Damping factor - SE vs. PP
Posted by Steve on Wed, 12 Oct 2005 18:47:06 GMT
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I have to disagree a little. (assume no global feedback). Viewed near the operating point with minimal signal swing, there isn't much difference.But as the signal swings more and more, the DF varies more and more in an SET than a PP amp as the Ra is changing more in an SET triode while the PP triode combo is more constant. Theoretically, as one triode's Ra is rising, the other is lowering, maintaining an approx constant. This Ra swing occurs in all triodes, with the Ra varying from several hundred ohms to thousands of ohms and eventually (theoretically) infinite ohms at triode cutoff.

Subject: Re: Damping factor - SE vs. PP
Posted by Damir on Wed, 12 Oct 2005 20:39:07 GMT
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Well, I simplified very complex tube(s)/transformer/speaker case. Although it is true that internal anode impedance of our output triode (say 300B) is not a constant resistor, and that our Zout is not constant, especially on the frequency extremes vs. mid frequencies, and that those changes are probably little larger in SE then PP case - we can`t say that rp (and Zout) of SE amp vary wildly like in your example. Measuring the Zout of SE amps showed relatively constant value throughout the frequency and power output magnitudes.The change in rp is not large, and for most practical purposes we can model our triode like voltage source (generator) with its (constant) internal resistance rp in series.Definition of DF like I explained it is correct, it is a ratio of primary (reflected) resistance and tube internal resistance, or ratio of speaker resistance and rp reffered at the secondary - rp divided with OPT impedance ratio. PP amp (class A) has two tubes in series. Then we can add complexity in our model (Rw, Lp, Lsp, Cw, Zsp...)...
http://usuarios.uninet.com.br/~edelima/

Subject: Re: Damping factor - SE vs. PP
Posted by Damir on Wed, 12 Oct 2005 21:11:57 GMT
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But, if you thought about graphical load line/anode characteristics/waveform "asymetry" around quiescent point, and subjective "sound" of SE amp vs. PP amp it is a little different thing. As Doug observed, not all points on the load line have the same rp...
http://audioroundtable.com/Tubes/messages/790.html

Subject: Re: Damping factor - SE vs. PP
Posted by Steve on Wed, 12 Oct 2005 21:48:02 GMT
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>>"we can`t say that rp (and Zout) of SE amp vary wildly like in your example."It might be partly symantics Damir, so I will say the output Z and subsequent Damping Factor changes "somewhat". Even with a relatively horizontal loadline, the plate current should be held as high as possible, or keep the power down so the signal doesn't swing near the tube's cutoff. Specs from 300b data sheet (since that is the tube you mention.)At 60ma idle current at 100 volts or above, tube Ra is approx 600 ohms. At the 30ma point of the loadline, the Ra is approx 1000 ohms. The DF is no longer 3, but 1.8 at the 30ma point. (This means a peak to peak current swing of 30ma to 90ma. One can figure the output power from there.) At the 20ma point, at 100 volts or above, results in an Ra of approx 1200 ohms, double the 600 ohm Ra at 60ma. This means that a DF of 3 now becomes a DF of 1.5 at 20ma. (This means the current swings between 20ma and 100ma, with 60ma as quiescent.) If the plate current is allowed to drop to 10ma during a portion of the cycle,

the Ra is approx 1450 ohms. DF now becomes 1.25. (peak to peak swing of 10ma to 110ma.) At 5ma, the Ra increases to approx 2000 ohms, or nearly 3 times that at 60ma. Df becomes approx 1. (peak to peak swing of 5ma to 115ma.)As the tube approaches cutoff, the Ra rises towards infinity till the tube isn't actually conducting.PP has virtually no drop off of DF, except because of variations in individual tube characteristics.PP therefore does not offer such a compromise in Damping factor as SE operation does.

Subject: Re: Damping factor - SE vs. PP
Posted by Steve on Wed, 12 Oct 2005 21:49:42 GMT
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See my post just above Damir. You must have posted just as I was.

Subject: Re: Damping factor - SE vs. PP
Posted by Damir on Thu, 13 Oct 2005 04:25:14 GMT
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We can observe various non-linearities on real-tubes graphs. Amplification factor μ changes the least on various "points", and anode resistance rp more. But, thought that SE amp varies its Zout and DF wildly during the work isn`t correct. If you measure DF on say, 1W, 3W and 5W and DF on say, 100Hz, 1kHz and 10 kHz you`ll get about the same result - about 3 in my example. If your theory is correct, then you`ll get very different results.

Subject: Re: Damping factor - SE vs. PP
Posted by Steve on Thu, 13 Oct 2005 21:22:59 GMT
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Hi Damir,I am not talking about frequency changes varying Ra. Ra varies, from the characteristics chart, vs current at any frequency. This varies more over the half cycle from idle current on down VS from idle current on up, where Ra tends to be much more constant. So what you might be measuring is the Average DF or output Z. But since Ra changes over a portion of the cycle, the output Z also changes over that portion of the cycle.When the higher output Z occurs, there is less control of the woofer/midrange/tweeter, not only to dampen, but also for initiation of a signal.Take care.Steve

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Subject: Re: Damping factor - SE vs. PP
Posted by Damir on Fri, 14 Oct 2005 06:11:34 GMT
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We are talking about dinamic anode resistance. It is increment change of alternating anode voltage "through" increment change of (inphase) anode current. Static anode characteristics are not ideal, and because of curvature, we have "added" second, third and other higher order "terms" to the simple ia=ua/rp. Contribution of third and other odd-order "terms" to the fundamental expression changes the simple static rp=ua/ia.My point is that with typical use of SE amp (small power, max. power only on short peaks), we have rel. small ua, rel. small contribution of odd-order distortion, and we can say that rp=ua/ia, or dinamic rp is about static rp, found graphically at the operating point.

Subject: Re: Damping factor - SE vs. PP
Posted by Steve on Fri, 14 Oct 2005 14:55:40 GMT
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Right, we are talking dynamic Ra, and keeping the power as low as possible is crucial/fundamental for keeping Ra relatively constant, although never as good as PP. (I think that is one reason I have been hearing suggestions of using Even higher efficiency speakers.)rp= u/gm, both u and gm constantly change during a cycle. Both changing independently, not in sync, in value and causes rp to rise.This can be graphed in a quadrant. The Ra curve (at different plate voltages) rises gradually at first over the first 5 volts peak or 10 volts p-p; then rises rapidly. Even then, a 10 volt peak, 20v p-p, drive signal can easily cause Ra to change by 20% or more over a cycle. The slope of the loadline is very important. A more vertical loadline dramatically increases Ra's change and effect. A more horizontal loadline helps minimize, or even eliminates Ra changing. But a horizontal loadline causes the output power to lower, rather dramatically. This applies to any triode run SET mode. Just something to think about when designing an SET amp. RL is important.

Subject: Re: Looking for good 20 watt amp design to drive Jordan TL's?
Posted by PakProtector on Fri, 14 Oct 2005 19:46:16 GMT
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20W of PP is fairly easy, even for a Class A design. KT88's and consevative operation can get there with excellent sound. There are of course other valves than the KT88, but it is an easy example.Take the Hammond 5k/100W 1650 output TX. A pair of good KT88's, a PS to deliver 350V at 250 mA DC. I suggest a choke input filter, valve rectification and film caps(oil filled AC motor run), and borrow the Merlin amp front end(http://audioroundtable.com/GroupBuild/Projects/). As soon as I get off my backside and forward Wayne a copy of the hybrid mods to the front end, you'll see another option useable for Pete's

amp as well. It is a MOSFET/triode cascode and does a brilliant job with the E-Linear circuit.I am a bit biased to suggest PP, but it does well for me. If you must have SE, there is plenty to borrow between the two topologies.cheers,Douglas
group build projects