Subject: gapped Iron
Posted by PakProtector on Sat, 22 Apr 2006 10:24:11 GMT
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Hey-Hey!!!,I finally got my custom C-core grid chokes installed in my HY69 amp. While measuring them with a minimum(no intentional or additional)gap, I got about 1k2 Hy from end to end at a few volts signal. This would provide a nice 600 Hy load to each of the PP phases. The inductance was clearly varying(increasing greatly that is) with signal. In wiht some spacers. With a clamp to tension them, and finely adjust the gap(and therefore inductance), I adjusted the gap to yeild 650 Hy end-to-end. The inductance is no longer varying so drastically with signal. The self resonant frequency is not varying with signal either(Cw stays the same, as L varies, so does self resonance).It sounds wonderful. This gapping experiment is going to continue with PP output TX's. Small gaps, and with other parameters monitored and adjusted to deal with reduced inductance. The better behaved the core is, the better the circuit will work.cheers,Douglas

Subject: Re: gapped Iron
Posted by Damir on Sat, 22 Apr 2006 11:09:45 GMT
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Your findings (importance of gapping/constant inductivity even in PP OPT) are very similar/identical to "Lundahl" and "Intactaudio" design philosophy...but, of course, opposite to one another company we can`t name...(or in other words:"The name that should not be spoken..." Did you see this graph for one R-core OPT? Those kinds of data are rare in the hi-fi industry... Can we finally get those Cw numbers per PP phase? Graphs, please?
http://www.icl.co.jp/audio/english/RX40.htm

Subject: Re: gapped Iron
Posted by Old Brown Eyes on Mon, 24 Apr 2006 18:01:52 GMT
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Hey Damir and Doug,At the risk of becoming an unmentionable name here wouldn't trying to keep the grid chokes inductance more or less a constant insure the very problem you are trying to cure? Namely that if the inductance is a constant then the load is a frequency dependant variable. Instead if the inductance is high enough to swamp the load resistor and tube's internal resistance at low hertz and then falls in a more or less linear manner so that the actual impedance the tube works into is a constant wouldn't that be best? Off the top of my head 1,000 henry at 20 hertz would be 125K but at 20kHz only 1 henry is needed to have the same reactance. Of course there are more things to consider than just the inductive reactance but I think you get the gist of my question. Now I have no idea just how the reactance falls as a function of frequency but

offhand to keep a constant load I come up with roughly needing 1/50th @ 1kHz as at 20 hertz and 1/1000 @ 20kHz as at 20 hertz.Russ

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Subject: Re: gapped Iron
Posted by Damir on Tue, 25 Apr 2006 11:24:01 GMT
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Hey, I`m kidding - just watched Harry Potter`s 4th movie (not that I`m too impressed, simplified and too dark for my liking). Opinions and critique are welcomed!As I can see it, design process is dealing with compromisses and personal opinions - someone can think that 0 mA DC / max. inductance is a right "path", another one that smaller L with gap is the better. Some people think that one of the reasons for good SE OPT/amp sound is linearer (although smaller) inductance, `cos of the gap...other people prefer parafeed.I have limited experience in this "gap field", I only can "confess" that with my high-L PP toroidal OPTs even small DC imbalance of a few mA "hurts" sonics...BTW - how do you like your grid chokes - opinions, findings?"That`s one small step for a man, one giant leap for manikin."

Subject: Re: gapped Iron
Posted by PakProtector on Tue, 25 Apr 2006 21:50:32 GMT
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Hey-Hey!!!,Russ, I have a few things for you to consider. One, what happens to the choke's impedance at self resonance? As one approaches self resonance the impedance is not equal to Omega*L anymore, and for that matter, after the self resonant point, that's also true.clip:Off the top of my head 1,000 henry at 20 hertz would be 125K but at 20kHz only 1 henry is needed to have the same reactance. That applies only to something that is only inductive. The winding capacitance appears in parallel with the inductance. This capacitance causes all sorts of things to srtay from Omega*L.Also, since inductance is varying with signal magnitude on a minimum gap core, what do you suppose is happening to the self resonant point?Dave Slagle brought up that air is a very linear core material, and that a gap in the magnetic path is going to average the two characteristics, 'Iron' and air together. I like the idea of a linear core material. I have heard it in a few experiments. I am going to get some special lams so I can experiment with PP outputs with gaps. Same coil as the minimum gap core, and perm adjusted with the gap...It's one way of isolating something approaching a single parameter. It isn't perfect, but it'll do for now, eh?cheers,Douglas

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Subject: Finally did a little testing
Posted by Russ57 on Sun, 30 Apr 2006 15:15:58 GMT

Amp in question is basically Joel Tunnah's 6V6. I had not tested it prior to adding the grid chokes so keep that in mind. Voltage out of signal generator was kept at 1/2vac as measured by a Fluke 87 RMS meter. Voltage out of the amp was measured across a Radio Shack 8 ohm 20 watt non-inductive resistor with a Fluke 189 RMS meter. Singal generator is an crappy old heathkit and required a lot of adjusting to keep voltage a constant.Basically the amp was flat from 40 hertz to 1,000 hertz with an output voltage of 2.24vac. At 30 hertz it was 2.264, 20 hertz 2.294, 10 hertz 2.336 so clearly the 0.47uF caps need to be made larger. This is audible. Now from 1khz to 2khz output rose from 2.24X to 2.25vac and stayed flat to 9khz (I heard the amp "sing at 7khz and 8khz). At 10khz it was up a little to 2.256vac. From 10khz to 20khz it fell about 0.001 volts per 1,000 hertz and by 15khz I was back to my 2.25vac. At 18khz it was 2.24vac, 20khz/2.232, 30khz/2.115, 40khz/2.02, 50khz/2.09, 60khz/1.97, 70khz/1.68, 80khz/1.592, 90khz/1.615, and 100khz/1.6.So it looks like "maybe" the grid chokes bring me a little extra gain in the 2khz to 18khz range. The amount is very slight and considering the amp has no intentional feedback other than omitting the cathode bias cap on the voltage amp I am happy with the results (cathodyne phase inverter though). Square wave looked good with just a tad of overshoot and ringing. Joel has scope pics on his site and they are comparable.So if anything it looks to me like the grid chokes give me a little extra output from 1ksomething to 18khz. The amount is small and gradual but given the signal generator 3 place accuracy is to be considered suspect. But it is the best I can do with what I have and hope it is of some use. When I get around to it I'll look a little closer at the 1khz to 2khz range and try again at higher output levels and repost if anything of interest is discovered.Russ

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Subject: Re: Finally did a little testing
Posted by Damir on Sun, 30 Apr 2006 18:44:59 GMT

When we convert it to dB, it is negligible - for example, the "rise" on 10kHz vs. 1kHz (2,256V - 2,24V) is just 0,06dB! If we included possible measuring errors and equipment accuracy...it is flat! It is good info - basically, nothing bad (frequency response wise) happened by the grid-choke. If it sounds good on your speakers like it measures...congrats. Post your other findings - larger output, etc. Thanks!
