Subject: The shunt capacitance of grid and anode chokes
Posted by Damir on Fri, 02 Dec 2005 12:37:20 GMT
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It can`t be measured successfully by ordinary capacitance meter, we must find it indirectly, finding self-resonant frequency of the inductor (scope and sig. generator, see for example "Valve amplifiers 3"-page 234). I can`t find many manufacturers data, all I can find are:1.) On the "roehrentechnik.de" web pages, there are data for their two anode chokes:-70H/1300 Ohms/Ce~300pF-200H/2800 Ohms/Ce~90 pF (2 Kammer Wicklung)Both chokes are good for 35-40mA at least.2.) Measurements of (quality) S&B grid choke by Thorsten, see the link. He found Ce~65pF.Well, 65p-90pF is not too much, but 300pF in parallel with 80pF input capacitance of 300B is 380pF. And with high impedance driver (cascode, pentode, high rp tubes common cathode...), say Rout~15kOhms, we have f-3= 1/(2*3,141*15000*380*10^-12) = 27,9 kHz , limited frequency response of the driver.Do anybody has some more informations/measurements about "typical" shunt capacitance of grid/anode chokes?
http://groups.yahoo.com/group/Thunderstone_technical/message/556

Subject: Re: The shunt capacitance of grid and anode chokes
Posted by PakProtector on Fri, 02 Dec 2005 20:29:16 GMT
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Hey-Hey!!!,You could try applying AC to them and watch for the resonance. Measure series current with a sensing resistor. Signal generator, and a true RMS meter ought to do just fine.regards,Douglas

Subject: Re: The shunt capacitance of grid and anode chokes
Posted by Damir on Sat, 03 Dec 2005 12:17:25 GMT
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Hehe, that`s why I asked, I don`t have any of these - true RMS multimeter, signal generator, osciloscope...

Subject: Re: The shunt capacitance of grid and anode chokes
Posted by Manualblock on Sat, 03 Dec 2005 12:43:34 GMT
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Anyway you could explain why you want to use chokes instead of resistors for us laymen?

Subject: Re: The shunt capacitance of grid and anode chokes
Posted by MQracing on Sat, 03 Dec 2005 14:55:17 GMT
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Hi Damir:you were saying;::::-200H/2800 Ohms/Ce~90 pF (2 Kammer Wicklung)Both chokes are good for 35-40mA at least.::::are you sure there isn't a typo in the above description?reason I ask is. at 35 mils and 2800 ohms DCR you'd have a voltage drop of98 volts.the I squared R losses would be equal to close to 3 and a half watts.and this before you even add in any ac current and add the two vectorally to arrive at the heating current.dropping 98 volts across an anode choke would be fairly "expensive" in terms of using volts efficiently... and would most likely be one hot little critter to the touch. If we were to allow a 20 volt drop then our max dcr should be approx 575 ohms. And then our I squared R losses (dc only) would be approx seven tenths of one watt compared to 3.43 watts.just curious.msl

Subject: Re: The shunt capacitance of grid and anode chokes
Posted by PakProtector on Sat, 03 Dec 2005 15:38:24 GMT
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Hey-Hey!!!,You'd have to specify the reason to use a resistor in order to say if choosing a choke might or might not be better. The choke is an energy storage device. If storing energy is useful, choosing a resistor over a choke is going to be hard.Resistors are usually esy to put into the 'single parameter' category. If you're choosing a choke to present a load, you need to consider frequency response of the inductor. This frequency response is also not going to remain constant, as other parameters of the choke begin to surface. Capacitance being the primary paramter which causes chokes to behave like things other than inductances.As Damir was pointing out, measuring these effects is not always simple. cheers,Douglas

Subject: Re: The shunt capacitance of grid and anode chokes
Posted by Damir on Sat, 03 Dec 2005 18:00:40 GMT
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Yes, the Imax is not specified, I just looked in a diagrams, where L is fairly constant to 50mA. Yes, those are limited data (like usual:-)), and I really don`t know can we use those chokes with "working quiescent DC current" of say, 40mA? Those chokes are wounded on M65 and M74 cores.And yes, 40mA and 2k8 = 4,5W and 112V "drop"...
http://www.roehrentechnik.de/html/anodendrosseln.html

Subject: Re: The shunt capacitance of grid and anode chokes

Posted by MQracing on Sat, 03 Dec 2005 18:14:06 GMT
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Hi Damir:you asked rhetorically::::I really don`t know can we use those chokes with "working quiescent DC current" of say, 40mA?:::well... like you said... it depends...1) can you afford to drop 98 to 112 volts depending on if you run at 35 or 40 mils dc. And what is the ac vector addition to the heating current... which we don't know and will be determined by the core losses and the inductive reactance of the choke and the magnitude of the ac volts across it...by any standard notion or industry practice that I've seen... this level of voltage drop and winding resistance would be considered too high for the stated current levels. 2) other thing you'd want to consider... what is the resultant temp rise of the unit... is the temp rise so high that it really puts the unit in danger (by danger I mean in excess of it's ul ratings for insulations, and magnet wire type used and etc)...but I don't want to monday morning QB another company's design or etc... I was just pointing out... the obvious... what the voltage drops and the copper power losses were under the conditions published.perhaps it would work just fine for someone, somewhere....msl

Subject: Re: The shunt capacitance of grid and anode chokes
Posted by Manualblock on Sat, 03 Dec 2005 19:33:43 GMT
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Yes thats what puzzled me; he asked about grid and anode chokes; I wondered why you would use them in place of a grid or anode resistor since they have the limitations on frequency response. Is that correct?

Subject: Re: The shunt capacitance of grid and anode chokes
Posted by Damir on Sat, 03 Dec 2005 19:34:55 GMT
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Yes, regard is needed in commenting other people designs, especially commercial, and especially when we don`t have all the data, or didn`t try the product Lundahl LL1667/15mA/270H anode choke specifies saturating Idc=25mA and max. AC signal voltage @30Hz = 390Vrms, Rw=2k4, but no Cw is given.Any Cw data known for some of your products?

Subject: Re: The shunt capacitance of grid and anode chokes
Posted by Damir on Sat, 03 Dec 2005 19:50:33 GMT
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For example, grid chokes I ordered have L=1700H and Rw=8kOhms. The AC impedance on the lowest frequency of interest is Z=2Pi*f*L = 2*3,141*20*1700 = 213,6 kOhms (as our Rg=220k we substituted), and even higher on higher frequencies (not infinitely, HF losses - Cw, etc.).Good for the driver "point of view", and very good from output tube side - only 8k DC resistance in grid circuit.But, even manufacturer (AE-Europe) doesn`t have Cw data - can be critical in combination with high rp driver.Despite technical imperfections, the main reason is "better" sound. I do not have experience here, will report when I get them

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Subject: Re: The shunt capacitance of grid and anode chokes
Posted by MQracing on Sat, 03 Dec 2005 19:56:12 GMT
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Hi Damir:The Lundahl that you mention at the recommended 15 mils dc would have a voltage drop of 36. On most of our plate chokes we try to stay at or below 20 volt drop. Worse case that I can think of is our unit with a published dc current rating of 50 mils which has a dcr of approx 550 ohms which equates to a 27.5 volt drop and a dc copper loss (in watts) of 1.375.Like Lundahl and many other manufacturers we do not publish Cw.cheers,msl

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Subject: Re: The shunt capacitance of grid and anode chokes
Posted by MQracing on Sat, 03 Dec 2005 20:13:43 GMT
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Hi MB:see if I can give you some of the "advantages" of a plate choke. first...your right... a plate choke will not have the freq response of a resistor. the resistor wins hands down on that criteria.where and when a plate choke may have some advantage is... say you were going to use a 22K ohm plate resistor.... so that it presents the anode with a 22K load impedance... this is what the anode works into load wise (keeping it simple for the moment)....now your going to have a voltage drop across that 10K to 22K ohm plate load resistor... of X amount. now sub in a plate choke... depending on specs and etc... but suppose that the plate choke has a dcr of 985 ohms and so at any given current level you will drop Y amount of dc supply volts across this resistance.So the plate choke will typically have a lot less resistance than the resistor has. Hence less supply volts are lost through the loading mechansim of the anode.But... we have yet to account for the important work of the load resistance... that it supplies a load impedance and it's this magnitude of load that does the work...the resistor basically provides the same amount of load impedance irrespective of frequency (especially in the audio band)...the plate choke... because it is a reactive component... the load impedance that it presents to the tube is dependent on the amount of inductance that it produces and the frequency...so if we have a 100 henry plate choke... then at 20 hertz it will provide or make an inductive reactance of 12,567 ohms. At 40 hertz the inductive load impedance seen by the anode of the tube will be approx 25,000 ohms and at 80 hertz 50,000 ohms and at 160 hertz 100,000 ohms and etc. So that as your double the freq and if L remains constant then the inductive reactance also doubles in magnitude. At some

frequency the L will begin to taper off and fall... but still we have in the equation L times F ... so that even though L may be falling as we go up in freq... the freq itself multiplies the effect of L (if I am saying this the right way) and produces a load impedance of Y ohms. so that a plate choke may offer some advantage in providing a larger load impedance to the anode of the tube while consuming less of the raw dc supply voltage in series with it....that might be one of the advantages of a plate choke in simplified terms.msl

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Subject: a much more succint explanation than mine :=))
Posted by MQracing on Sat, 03 Dec 2005 20:16:25 GMT
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..

Subject: perhaps this will be more intuitve...
Posted by MQracing on Sat, 03 Dec 2005 20:59:40 GMT
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Hi MB:I keep wanting to call you mercedes benz. Wonder why?Perhaps this will (or maybe it won't :=)) be more intuitive....say on a conventional series feed single ended output stage... you have an output trans with two windings... a primary and a secondary... the dc plate supply for the anode goes in the primary from one end and gets hooked to the anode of your 2A3 or 300B on the other end....guess what you have.... you have in essence a plate choke feeding the anode of your tube... only now the ac signal is also in series with this same winding... the primary of your output transformer produces a certain amount of L... it is this L (in para w\ the reflected load from the secondary) that governs or determines the magnitude of load impedance as seen by the tube. so... in a sense your standard output transformer could be thought of as a plate choke with a secondary hung on it....tell me if that helped or not...msl

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Subject: this makes an interesting assumption...
Posted by PakProtector on Sat, 03 Dec 2005 21:27:25 GMT
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that any current interested in the 8k DCR is of a DC nature. I would suggest that it is not. Yet the sonic benefits and power stage benefits to using a grid inductor, would sugget otherwise. So, for a given productin of grid charge, the inductor seems able to deal with it in a way that is less disruptive to the signal than simple Ohmic resistances. I have made some interesting measurements on an amp equipped with a well known multi-kHy grid choke that support this theory. AC grid current is treated resistively in the same way an equivalent resistive load would.

So for a given omega*L the high L chokes begin to behave like resistors. In addition to this, the grid choke has substantial capacitance in parallel. So, use just enough L to get the job done is my current practice. Fortunately it is quite easy to custom specify coil production with Heyboer. those guys are brilliant! For me, it's indespensible. Can't make reasonable tube amps without them.I will soon take delivery of some grid chokes specially wound for both balanced and minimized winding capacitance. The previous ones were simply balanced, and less attention paid to winding capacitance. They still smoked a few other devices I managed to acquire samples of. Even some allegedly well respected and well thought of designs. I have a quote on amorphous C-cores in qty which makes them *VERY* attractive in comparison to laminated sheet steel. Hardly more than low qty M6 even. Just a question of absorbing that sort of volume....:)cheers,Douglas

---

Subject: Re: The shunt capacitance of grid and anode chokes
Posted by PakProtector on Sat, 03 Dec 2005 21:43:41 GMT
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MSL:Like Lundahl and many other manufacturers we do not publish Cw. somebody will, I guarantee it.cheers,Douglas

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Subject: which is to say..
Posted by PakProtector on Sat, 03 Dec 2005 22:03:15 GMT
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as a manufacturer, you should publish specifications of interest, and the test conditions they are achieved under. Or just sit back and wait for an interested customer to publish thier won measurements. This leaves the question: do you want the quantity in question, in this case winding capacitance, to be a matter of speculation and private measurement, or of public record from your own measurements?The former will certainly occur, would you be happier with that or your own measurements?cheers,Douglas

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Subject: Re: perhaps this will be more intuitve...
Posted by Manualblock on Sun, 04 Dec 2005 01:36:03 GMT
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In fact it did; thank you very much. The basic concept of reflected load; do you have a simple explanation? Is it the 4/8 ohm output impedance?How do you find that for a power transformer?

Subject: Re: The shunt capacitance of grid and anode chokes
Posted by Manualblock on Sun, 04 Dec 2005 01:38:32 GMT
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Excellent; what about the other way, the lower freq. response?

Subject: Re: this makes an interesting assumption...
Posted by Manualblock on Sun, 04 Dec 2005 01:44:23 GMT
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Does this quote have relevance to this discussion?" As a general rule, the output transformer should have the largest core which is practicle or permissable having regard to cost or other factors. A large core of ordinary silicon steel laminations is usually better than a small core of special low-loss steel."Trying to gather rules to design by.

Subject: I think I can guess the origin of that quote....
Posted by MQracing on Sun, 04 Dec 2005 04:12:12 GMT
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IIRC... those words were spoken (or printed as the case may bee) by an academician named Dr. Partridge. The printed text can be found, I bleive, in RDH. If I'm right do I get a prize?:=))smiles,msl

Subject: Re: perhaps this will be more intuitve...
Posted by MQracing on Sun, 04 Dec 2005 04:19:28 GMT
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Hi MB:the reflected load on the primary of an output transformer is the load (say an 8 ohm nominal speaker load) put across the secondary terminals multiplied by the turns ratio squared. so if you have a turns ratio of 20:1 step down and you put an eight ohm load across the secondary you will reflect back to the primary an impedance of 3200 ohms.generally when we "spec" or use "specs" for a power trans... we don't use the impedance language but instead talk the "voltage" and "current" language.so that a 20 to 1 step down trans with say 120 volts across the primary will have 6 volts across the secondary. On power tranneys the moreso relevant and useful "numbers" are voltage and current. cheers,msl

Subject: Re: The shunt capacitance of grid and anode chokes
Posted by MQracing on Sun, 04 Dec 2005 04:25:44 GMT
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the lower you go in frequency the less inductive reactance you will get... in the example provided previously we had at 20 hertz an inductive reactance of 12566.8 ohms. At ten hertz an inductance of 100 henries will have a reactance of only 6283.4 ohms. At five hertz it will again be cut in half and an inductance of 100 henries would have an impedance of only 3141.7 ohms.so as you go down in freq reactance or impedance produced by a given amont of inductance decreases... as you increase the freq that same amount of inductance will produce greater amounts of impedance or inductive reactance.cheers,msl

Subject: Re: this makes an interesting assumption...
Posted by PakProtector on Sun, 04 Dec 2005 10:57:55 GMT
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Not really. At least not for the general performance of choke v. resistor. Clearly core mateial effects some of the important characteristics in question, but the AC nature of grid current is the basic topic. Dealing with grid charge accumulation, and its AC and DC nature was the premise of my last note.The general suggestion for avalve with a low grid circuit resistance spec has usually been, "use a choke". How big a choke, in terms of L and DCR has not been discussed or quantified to my satisfaction, for my application.I am preparing to do some measurment on my custom grid choke capacititance. It is not that difficult, and I am quite suprised it is not a generally published spec. The number is probably embarassing....considering what the general percieved 'good' numbers are!We'll just have to see! I have a few examples and I'll publish the origin of acquisition as well as manufacturer when I get my own C-core specials from Heyboer to compare to.Look at the RCA data sheet for the 2A3. Or for that matter the 1619 or the 813. All specify a low value of grid circuit resistance. My theory is that the reason for having low grid circuit impedance is almost the same. Clearly the way in which the grid circuit deals with charge acumulation is important. The AC nature of the charge build up has led me to believe that a high impedance grid choke is going to have the same effect as a big resistor.It isn't an absolute, but with a few big grid chokes to play with, I was able to collect some data which supported the theory. So, the recomendation to design for just the inductance the previous stage will stand, along with the grid circuit in question. I am moving up the scale with bigger power valves. For the 813 we'll see how the experiments go. How much inductance they will stand, and which OPTx gets the not for E-Linear modification. I am going to take better care of my lab notebook that is certain.cheers,Douglas

Subject: Re: I think I can guess the origin of that quote....
Posted by Manualblock on Sun, 04 Dec 2005 13:15:29 GMT
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Actually the origin of the quote comes from one; R.G.Keen, the author of an article on transformers I am reading.But you get the prize anyway for being a helpfull and considerate guy; along with Douglas. Do you guys think that oscillation of a circuit that shows up on an oscilloscope but is not evidently audible still causes problems with the bass response, sometimes described as weak bass or the low notes not having any weight?

Subject: Re: The shunt capacitance of grid and anode chokes
Posted by MQracing on Sun, 04 Dec 2005 13:53:48 GMT
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Hi Damir:I've been thinking about the topic being discussed and the interest in this phenomenon... well... here are several thoughts on the subject...first thought... we should separate out anode (plate) chokes from grid chokes. As they perform different functions and are used and spec'd differently. the plate choke must ordinarily be designed to accomadate unbal dc plate currents and thus generally requires an air gap. A "grid choke" typically is used with a dc blocking condensor and is designed as an "ac only" device. The magnitude of L that you want from each may also be quite different.second thought....the example you provided... quoted below...:::300pF in parallel with 80pF input capacitance of 300B is 380pF. And with high impedance driver (cascode, pentode, high rp tubes common cathode...), say Rout~15kOhms, we have f-3= 1/(2*3,141*15000*380*10^-12) = 27,9 kHz , limited frequency response of the driver.:::this is with a very high impedance tube... and generally when you want to drive a 300B grid your going to use a tube with a much, much lower internal plate resistance. Say anything btwn a low of 800 ohms to 5000 ohms or even 7000 ohms would be much more typical (I think)... with a low impedance driver and a high shunt capcitance the -3db cutoff frequency would then still be much greater than 27.9khz.as with all devices and circuits... the designer must optimize his/her circuit and use a topology that makes sense and produces good results. For example... it is much tougher to build a plate choke for a tube with an r sub p of 15K... and generally these tubes are operated at much less plate current.... so they are not even generally spec'd or used to drive the grids of triodes which do have higher internal capacitances... so with triodes most designers aim at using a tube with much lower r sub p and perhaps greater bias currents. if your going to use a tube with an r sub p of 15K I would *most* (not absolutely though) likely not recommend that you use a plate choke and instead might recommend a plate resistive load instead.third thought.... the whole issue of shunt capacitance also applies to any transformer that carries an audio signal through it...push pull output transformers will have shunt capactances across the primary... single ended output transforemrs will have these same capacities...so... why the focus on shunt capacitance (in seeming isolation) of a plate choke or a grid choke? In most real world apps... shunt capacitance is only one of dozens of parameters and quantities that must be taken into account in achieving a good design...whenever the focus of any discussion on the merits or demerits of a design boils down to ONE parameter... it's bound to lead to mischief...the trick in design is not to aim at or focus on optimizing any single parameter... whether it be minimizing shunt capacitance, maximizing inductance, minimizing DCR, or minimizing flux density level, or etc...good designs are designs that pay attention to a whole range of factors or considerations that go into a design and optimizing for the "whole" of the device and not just any single paramter...as an addendum to this post I will put up a link to a post written by voltsec which I think you may enjoy

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Subject: 300B cascode + grid choke Spice simulation
Posted by Damir on Sun, 04 Dec 2005 15:36:43 GMT
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There`s a E182CC cascode driver + 300 B SE stage simulation. I substituted 220k grid resistor with grid choke model, consists of (constant) inductance in series with its winding resistance, and with stray shunt capacitance, Cw. The Cw=200pF value I "made up", like not too good example. This is a simplified model, but "good enough" for our simplified considerations :-).Our driver has some good properties (low Miller capacitance, amplification ~35, good sound), but unfortunately, has Rout~Ra, or 12kOhms in this example. The simulated frequency response we can see in lower diagram - high frequency started to fall after 20kHz, and we have LF resonance (~8dB) on 10Hz. For later, if we want to avoid this and have a linear response down to 2Hz, we must use a much larger coupling cap Ci, about 4,7µF.And for HF - use a grid choke with smaller Cw, or another driver - with lower Rout. If we use, say, common cathode 6C45Pi, our Rout would be much smaller, about 1/10 then cascode, and now HF "falling" problem is gone, but 10Hz "hump" would be even larger - need larger Ci...Knowing Cw helps a lot in design process - especially with rel. high Rout drivers (cascode, pentode, some triodes).

Subject: Re: which is to say..
Posted by Damir on Sun, 04 Dec 2005 15:57:40 GMT
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I`d like to have a "standard" set of specifications, and measurements. Only "Plitron", IMO has good and detailed specifications, but they don`t have a grid chokes.I suspect that manufacturers don`t want to publish everything, `cos often we can read in various forums "comparisons" of some single parameters in a way, say, "Plitron PAT 4004 has power bandwith f-3= 22,7 Hz, and much cheaper OPT has 19Hz. Then former is no good, and later is much better".

Subject: Re: which is to say..
Posted by MQracing on Sun, 04 Dec 2005 16:12:31 GMT
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your point exactly...and that's also why I posted the link to voltsec's paper... cause he makes the same observation...the problem with isolating one spec (any particular singular spec) is that it invites mischief in the design process...almost any design (in a wide range of fields) is made easy if the customer only cares about one specification and will trade any and all to achieve it....but the pumping up or pumping down of any singular spec (in isolation) in an audio transformer just leads to "specsmanship" not necessarily a good overall well balanced design that will work well and sound good.if you look at your reasons as stated above and voltsec's as stated in his post (down near the bottom of his post).... that pretty much captures my take on specsmanship games.We try to optimize a range of values and parameters and etc... that produce (hopefully) a good quality, balanced, great sounding transformer. Others can design to isolated arbitrary specs... and take their chances on acheiving a good overall design.msl

Subject: Re: 300B cascode + grid choke Spice simulation
Posted by MQracing on Sun, 04 Dec 2005 16:52:57 GMT
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Hi Damir:Neat post. It invites so much discussion... that it could keep us busy for quite some time...I'll try to keep some of my comments and observations and speculations a bit more brief...first observation:presumably the data derived is a product of the WHOLE circuit... not a subset of the circuit or an individual stage or etc...which leads to (and this of necessity to an extent) that the resultant behaviours apply to the whole circuit and not to any specific part of the circuit...for example... it appears that the output transformer's primary is treated as having simply a reflected impedance of 3,000 ohms... but it to could be modeled like the grid choke... by adding the other relevant parameters of an output transformer. the power supply is not included in the analysis... it too may have an effect on the amplifiers performance in the real world. In fact... in a study that Paul Joppa did modeling resonances the worse case he came up with was a series fed se output stage which resonanted quite distinctly with the last cap (8 mfd) in the series circuit. simplifying (which all models do by their very nature)... has it's limitations and advantages... knowing all of these and ferreting them out isn't always so easy.but let's run with the spice analysis you provided...::::Our driver has some good properties (low Miller capacitance, amplification ~35, good sound), but unfortunately, has Rout~Ra, or 12kOhms in this example.::::which means that if you choose this drivers it will present a set of different challenges and design requirements than if you had chosen an alternative driver tube. fair enough. but we should all be aware of this.::::The simulated frequency response we can see in lower diagram - high frequency started to fall after 20kHz,::::I put up a small post it note to try to decipher the X and Y values and I was getting somewhere btwn -1db and -2db (with my imperfect eyes) at around 50 khz. If this is correct.... not nearly the end of the world or in-and-of-itself anywhere close to rotten in my book. I'd want to listen to the circuit and decide not decide it's merits on this spec.:::and we have LF resonance (~8dB) on 10Hz. For later, if we want to avoid this and have a linear response down to 2Hz, we must use a much larger coupling cap Ci, about 4,7µF.::::the

above was with use of a .22uf cap. On Joel Tunnah's site he has a resonance calculator as well as a Q calculator...in line with p-spices result... the resonance calculation also agrees that .22uf and 1700 henries will resonate at 8.23 hz. if we change the cap value... make it larger... here are the calculated resonant frequencies (keeping 1700 henries constant).5uf will resonate at 5.46 hz 1uf will resonate at 3.86 hz 4uf will resonate at 1.93 hzinterestingly, as voltsec sez in his post... when you change one parameter invariably you will effect or change other parameters as well...let's look at the Q.... again calculated on Joel Tunnah's website...1700 henry choke with a dcr of 8,000 ohms... then by varying cap size not only do we change the resonanct frequency but we will change the Q ....22uf cap with 1700 henries and a dcr of 8,000 ohms will have a Q of 10.988.5uf cap with 1700 henries and a dcr of 8,000 ohms will have a Q of 7.2891uf cap with 1700 henries and a dcr of 8,000 ohms will have a Q of 5.1544uf cap with 1700 henries and a dcr of 8,000 ohms will have a Q of 2.577so that not only does the resonanct freq change with the cap size but also the Q... so the magnitude of the resonant peak and behaviour of the resonance will change...all of which goes.... in my view... to the point of... this is where the designer and his\her skill comes into play... it's knowing how to opitimize the circuit... what values to use... what tubes to use... and how to optimize a whole range of values to acheive a specific performance goal.and it could very well be possible... that given certain design requirements or certain choices of other components... that perhaps LC coupling is not optimal in the particular application being looked at... but... juggling the parameters and knowing which parameters need attention or need to be optimized is part of the "skills package" that the designer brings to the table. Some designers bring more enhanced "skills packages" to the design table... others bring less developed or refined "skills packages" to the design table...be interesting to run some of the pspice simulations with the differing cap values shown above and see what ya get...on the surface.... my first hunch is that your circuit is close to being pretty darned good... maybee a bit more fine tuning will get it where you want it to bee...cheers,mslAnd for HF - use a grid choke with smaller Cw, or another driver - with lower Rout. If we use, say, common cathode 6C45Pi, our Rout would be much smaller, about 1/10 then cascode, and now HF "falling" problem is gone, but 10Hz "hump" would be even larger - need larger Ci...

Subject: Re: which is to say..
Posted by PakProtector on Sun, 04 Dec 2005 17:09:32 GMT
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Quoted::::Others can design to isolated arbitrary specs... and take their chances on acheiving a good overall design. That's a nice one-sided way of characterizing everybody else save yoursleves(or what ever group whose opinion you choose to champion).Good engineering design is not defeated by publishing specifications when asked. It has absolutely no influence on the design process if the answer is an honest measurement of the device in question.If the answer sucks, and makes one's product line look 2nd rate is another story entirely. Leaving the question un-answered does leave the impression...It is best to assume that the customer designing a circuit knows enough to look at a given product and make up his own mind. The idea that magnetics are sooooo mystical that only a designer with Xx years experience could possibly know what will sound good in a new circuit makes me laugh every time....oh well, good thing it(design) isn't really complicated.Getting a straight answer OTOH...cheers,Douglas

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Subject: Re: 300B cascode + grid choke Spice simulation
Posted by Damir on Sun, 04 Dec 2005 19:17:44 GMT
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Of course, this is the example of possible LF and HF driver "problems" when we can "blindly" put a grid-choke in existing circuit, without optimisation. OPT here is just a simbol, I use a similar circuit for OPT (with added leakage inductance).I`m aware about resonances, and Q=[(L/C)^0,5]/Rw - with "real" components it`s not easy to get Q=0,5, or critical damping, and some designing compromises are in order. Little boost on 10Hz probably isn`t tragic, no NFB, and output stage is already "down" here. "Over all" frequency response simulation shows little "hump" in subsonic area, but simple anlarging of Ci can handle it, and I like it more that way :-).Cascode driver (few versions) is a just one option, I`ll try some others, too. After "technical" optimisation, the listening test will be crucial:-).Thanks for comments and suggestions, and thanks for link - good summary :-).

Subject: good dialogue
Posted by MQracing on Mon, 05 Dec 2005 01:13:58 GMT
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Hi Damir: I enjoyed the dialogue. Keep us posted of how your circuit comes along and how it fares by ear!!!msl

Subject: Re: good dialogue
Posted by Damir on Mon, 05 Dec 2005 10:26:36 GMT
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Thanks, yes - interesting discussion. Just to add that high Rout of our driver gives better damping of our RCL resonant circuit, and we can avoid subsonic resonance with resonable values of Ci (a few µF). But, low Rout driver (gives us better HF response) doesn`t provide (external) damping - LF peak. Enlargering Ci is limited measure when we went close to 10µF territory (cost and size). One of the measures can be "tuning" R parallel with grid choke...Stay tuned...

Subject: Re: I think I can guess the origin of that quote....
Posted by Damir on Mon, 05 Dec 2005 17:50:51 GMT
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Oscillations can be "perfidious" - sometimes some notes/music material can "trigger" unstable

amp into burst of oscillations. Sometimes they are on very high frequencies, and not in "full strenght". Amp can works, but the sound suffers - screechy, glassy, weak, undinamical, strange distorted sound are some of the symptoms. It must be discovered and cured (sometimes not that easy)...

Subject: One more thing...
Posted by PakProtector on Wed, 07 Dec 2005 00:04:35 GMT
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what happens when the L is not constant, but increasing with signal like a gappless, butt-stacked core device would behave. gapping the core will tame the increasing L among other things. makes for more turns>>more Cw(same general geometry) to get the same L at some small signal.More importantly, what does gapped L sound like compared to not-gapped L?

Subject: Re: One more thing...
Posted by Damir on Wed, 07 Dec 2005 05:23:27 GMT
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Good point, the grid chokes I ordered (1700H), have max. Idc=15mA specification. I hope that I`ll get them soon, will post a impressions. Can you give us more about gapped vs not-gapped sound?

Subject: gapping zeroe DC inductors
Posted by PakProtector on Wed, 07 Dec 2005 10:05:39 GMT
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Hey-Hey!!!,For all the PP amps I have experimented with, the gapped choke sounded better. Even when the overall reduction in inductance was starting to make itself known. The measurements from the non-gapped device showed a dramatic increase in L with increasing signal. It makes sense to me that this would not be a good thing.I'm sure the 'White Paper' writers and supporters will have something silly to say about gapping inductors with no DC in their use profile...:) I got the C-core ones made so I can experiment and those measurements I'll share, including how they sound. These I got wound so as to maximize leakage L, and minimize end-to-end capacitance. I will include some comarisons to other available grid chokes for Cw. To hell with the idea of not publishing that info...:)cheers,Douglas

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Subject: oscillation
Posted by PakProtector on Wed, 07 Dec 2005 22:31:02 GMT
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Keep one thing in mind, oscillation is *NOT* a class A affair. It runs to extremes, usually to grid current...If you have the grid of any stage running to positive values, the sonics are going to suffer for some non-zero recovery period. This period will be longer than the one oscillation, and is one mechanism by which a 22 MHz oscillation can make itself known.I tried a high gm cascode and found it singing along with 20V peak-peak of 22 MHz oscillation. Resistive dampers cured it, and the circuit souded better. No easy way to be sure you've got things under control save to measure carefully.cheers,Douglas and speaking of high gm, how 'bout a 100,000 mA/V device?