Subject: 4 x 1 Ohm = 16 Ohms (sometimes)
Posted by Damir on Mon, 25 Jul 2005 20:01:05 GMT
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Reading the specs for some "Partridge" SE OPTs, I found something that can be interesting (if you like OPTs and math and have nothing better to do). The specs say: "Primary impedance Rpr=3500 Ohms, and four secondaries of 1 Ohms - for 4, 8 & 16 Ohms connection." How?We have turns ratio between the primary, Npr (number of turns of the primary winding), and four identical secondaries Ns1=Ns2=Ns3=Ns4n = Npr / Ns1-4We don`t have those numbers, but we know impedance ratio(s):z = Rpr/Rsec1-4 = 3500/1 = 3500And from imp. ratio, our turns ratio is: n = z^0.5 = 3500^0.5 = 59,16Note that z^0.5 is the square root of z.Simplified, we can "assume" that Npr=5916 turns, and Ns1-4=100 turns.a)We can connect all four 1-Ohm secondaries in series:Then we have n1=Npr/(Ns1+Ns2+Ns3+Ns4)= 5916/400 = 14,79And Rs-a = Rpr/n1^2 = 3500/14,79^2 = 16 Ohmsb)We can connect only three secondaries in series, then we haven2=Npr/(Ns1+Ns2+Ns3)=5916/300 = 19,72Rs-b = Rpr/n2^2 = 3500/19,72^2 = 9 Ohms ("close enough" to nominal 8 Ohms)c)We can connect only two secondaries in series (but probably, better to connect Ns1 & Ns2 in series, then Ns3 & Ns4 in series too, then both series "combinations" in parallel)n3=Npr/(Ns1+Ns2) = 5916/200 = 29,58Rs-c = Rpr/n3 = 3500/29,58^2 = 4 OhmsSimple enough, when we know what is impedance ratio (z), and what is turns ratio (n). Turns ratio is equal to voltage ratio, and if we measure, say, 100Vrms across the primary, and say, 5Vrms on 4-Ohms winding, we have voltage/turns ration=100/5 = 20, and our impedance ratio is z=n^2 = 20^2 = 400. Then our primary impedance is Rpr = z * Rsec = 400 * 4 = 1600 Ohms.

Subject: Re: 4 x 1 Ohm = 16 Ohms (sometimes)
Posted by Thermionic on Mon, 25 Jul 2005 20:38:56 GMT
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Interesting. Indeed, four 1 ohm secondaries in series do NOT make for 4 ohms, as the impedance ratio is the square of the winding ratio, instead of merely the sum of their individual reflected impedances added. Great post as usual, Damir!I know that some hi-end transformer makers, such as Plitron and Electra Print, use multiple secondaries tied together to attain a single, fixed value, usually around 5 or 6 ohms reflected Z. The fixed "middle of the road" value is intended to cover both 4 and 8 ohm speaker duties. They claim that better bandwidth is attained by this method.Thermionic

Subject: Re: 4 x 1 Ohm = 16 Ohms (sometimes)
Posted by Manualblock on Mon, 25 Jul 2005 22:01:26 GMT
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How come the reflected Z doesn't change with frequency? Please excuse if this is a dumb question.

Subject: Re: 4 x 1 Ohm = 16 Ohms (sometimes)
Posted by chana on Tue, 26 Jul 2005 01:34:09 GMT
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all in series =16 Ohmsall parellal = 4 Ohmstwo of them parellal then series to the other two =8 Ohms

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Subject: Re: 4 x 1 Ohm = 16 Ohms (sometimes)
Posted by Damir on Tue, 26 Jul 2005 04:43:11 GMT
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And how four identical 1-Ohm windings connected parallel become 4-Ohms secondary? The same for your 8-Ohms example. Can you post your math? Impedance (z) and turns ratio (n) are different things, z=n^2 - that`s why I posted it, some people are little confused...

Subject: Re: 4 x 1 Ohm = 16 Ohms (sometimes)
Posted by Damir on Tue, 26 Jul 2005 10:54:45 GMT
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Not dumb, we know that impedance of the speaker is not a constant resistor, but it changes with frequency. Properties of the OPT (Lp - bass frequencies, Lw & Cw high frequencies, etc.), and tube(s) connected (rp) also impact the frequency response.But, simplified - we can observe speaker like resistor, and primary load Ra like constant resistance, 3,5kOhms in this example, on some "middle" frequencies of interest.

Subject: Re: 4 x 1 Ohm = 16 Ohms (sometimes)
Posted by Damir on Tue, 26 Jul 2005 11:00:26 GMT
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Thanks, and yes, my Plitron/Amplimo toroidal OPTs are 5 Ohms nominal secondary impedance. They have 5 secondaries, connected in parallel. But how they actually wound them (interleaving,

etc.) is the "secret" inside the potted unit...:-)

Subject: Re: 4 x 1 Ohm = 16 Ohms (sometimes)
Posted by Thermionic on Tue, 26 Jul 2005 16:53:03 GMT
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Yep, I've had the pleasure of making the acquaintance of a few Plitrons myself, both PP (5 ohms nominal) and SE (4 and 8 ohms). That's how I knew about the multiple secondaries; the huge bundle of blue wires emerging from the potting epoxy that keeps the contents "top secret." I peel off the little silver "Designed by Vanderveen" stickers from the bottom and stick them on my toolbox for "victory marks," LOL!IMO, they're just about the best iron mankind has ever made. I have some Tamuras that are certainly quite detailed, coherent, and refined, but the Plitrons do eat their lunch, IMHO.Thermionic

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Subject: Re: 4 x 1 Ohm = 16 Ohms (sometimes)
Posted by Damir on Tue, 26 Jul 2005 19:31:07 GMT
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I only wish that those OPTs are little less expensive...:-)Did you see that M. Vanderveen has www page now, mostly about R&D and cnsultation, but have some pages about new book, etc.BTW, his book "Modern High-End Valve Amplifiers" is IMO a new "standard" about OPTs and tube amps, I could only wish 100 more pages about amplifiers, classes of operations, etc. I learned much from his books, and from books by M. Jones, too.Hehe, "Tube Books" is a new message here...:-)
http://www.mennovanderveen.nl/eng/

Subject: Re: 4 x 1 Ohm = 16 Ohms (sometimes)
Posted by chana on Wed, 27 Jul 2005 22:27:36 GMT
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Sorry,I made a mistake on 4 ohms tap.It should be two pairs of 1 ohm parallel then connect two of them in series. Thanks

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