Subject: Re: Identical gain & tonality in double-triode tubes (ECC82)
Posted by positron on Tue, 14 Dec 2021 23:44:14 GMT
View Forum Message <> Reply to Message

kasperbergholt wrote on Tue, 14 December 2021 11:19positron wrote on Tue, 14 December 2021 01:08kasperbergholt wrote on Mon, 13 December 2021 10:52Dear tablers,

Inspired by the excellent feedback (e.g. on the E80 CC tube having quite different specs from the ECC82) the I got in this thread:

https://audioroundtable.com/forum/index.php?t=msg&th=23320&goto=94872&

some new questions have shown up in regards to gain levels for a single tube preamplifier like mine.

Which parameters determine the level og gain?

Some measurements are extremely detailed, e.g. this one from an eBay listing:

Sollwert IA [mA] fx 10,5 og 10,5
Messwert IA [mA] fx 10,012 og 9,945
= % vom Sollwer 95 og 95%
S (mA/V] 1,92 og 19,96
bei Deltage UG1 0,6 og 0m6
D Anode [%] 6 og 6,1
Messwer IA [mA] 7,2 og 7,13
bei UA [V] 225,08 og 225,08

Ri [KOhm] 9,1 og 9

--

A different listing for a tube in the same price range is a lot more sparse:

ECC82 TELEFUNKEN (12AU7 E82CC CV400) # <> # NOS
gemessen auf RPM370
12 / 12 mA 100 % = 10,5 mA

--

Most list the mA values, few the Anode value.

In addition, is there a formula for calculating if the difference between values will be noticable e.g. in a 1 dB's difference in volume measured from 1 meter from the loudspeaker?

And, lastly, how about differences in tonality / frequency response. Are such inherent in the gains measurement (or other parameters)?

Thanks again,

Kasper

Hi Kasper,

There are a couple of ways to check for the gain of a stage.

One is: Av = -Mu x RL/rp + RL

Where Av is the gain
Mu is the mu of the tube.
RL is the plate resistor
rp is the plate resistance of the tube.

Another equation is: Av = -Gm x rp x RL/rp + RL

Gm is the transconductance figure.

Mu, Transconductance (Gm or ma/v), Plate Resistance (rp), and even the plate resistance (RL) varies some.

Altering the rp, RL, Av will affect the high frequency response. The extent will depend upon said values resistances, load resistance, and capacitances involved.

The cathode resistor (Rk) will provide negative current feedback, if not bypassed, which also affects the gain and frequency response (fr).

Hope this helps, cheers.

pos

Hi Positron! Thank you! My mathematical understanding is not good enough to grasp the calculations, but I appreciate the feedback. :)

When you buy tubes, which parameters do you look for or ask for? And what would be considered an acceptable difference?

I see a lot of eBay listings mentioning 'balanced', 'matched' or 'measures strong', and some mentioning mA values and a few mentioning a lot of measurements like the one I mentioned previously in this thread.

Thanks again,

Kasper
I check for rp, Gm, thd, and purchasing/listening in signal tubes.

Rp and RL are important for frequency response (fr). If the rp becomes too high, say above 5k ohms, then RL has to be large in order to obtain necessary gain. Combine the high resistances with the following stages input Miller capacitance, and fr is significantly degraded.

Some use a cathode follower or similar to lower the output impedance (Z). However, the additional stage degrades the music. Minimal without being too simple is optimum. If one can get by with one stage, that is preferable, unless some long high capacitance ics are necessary.

Solid state almost always has to include music robbing emitter/source followers for low impedance to the next stage/output stage.

I wanted low thd for sure as that is perceptible, especially when combined with other stages/tubes with their distortions. (Same for ss devices as well.)
All tubes produce some 2nd and 3rd HD plus some higher orders, which means problems.

One incredible tube for low distortion is the JJ E88cc, 12xx7 types. All have incredibly low THD. For instance, the E88cc has ~1/9th the distortion of any other tube numbers, including the 6sn7s and exotic number types.

However, these tubes are incredibly difficult to design around or simply use due to their transparency. Many will view them average or just good, mainly because they expose the associated poor designs and poor parts used.

For instance, with just two stages/tubes/ss devices, 2nd and 2nd combine to create 4th order, 2nd and 3rd create 6th order, and 3rd and 3rd create 9th order harmonics. 3rd and 4th order creates 12th order and 3rd and 5th creates 15th order. Although low in value, the higher the harmonic, the much easier to perceive.

Attached is a graph of a typical vacuum tube, KT88, 300b etc following the 3/2 law. Notice the 5th and 7th orders. To make this seem smaller, lower the OPT primary to 2k to increase the 2nd order to astronomical levels.

"Strong" means used tube that measure close to new or new. When ordering tubes, I virtually always order tubes matched, like 2 or 4 tubes matched for similar characteristics. At the manufacturer, tubes can vary by 25% or so. Tubes with two internal triodes, I matched the sections as well. I also order low noise as well for signal tubes.

cheers

pos

File Attachments

1) 3 to 2 Tube Distortion 600.pdf, downloaded 148 times
2) 300b curves 1.jpg, downloaded 339 times