

Here another look at this amplifier, of the schematic in Post # 1:

The 6FQ7 or 12AX7 plate impedance, r_p , is increased because of:

The 160 Ohm un-bypassed cathode resistor. ($R_K \times \mu$). Both tubes $\mu = 100$.

$160 \text{ Ohms} \times 100 = 16,000 \text{ Ohms}$ additional plate resistance (additional to the data sheet spec.).

The plate load of the 6SQ7 (or 12AX7), is 220k plate load resistor, and the 300k Schade plate to plate feedback resistor.

But the effective resistance of the 300k is less than 300k.

Why, you ask?

The in-circuit gain of the EL34 plate, is in opposite phase to the 6FQ7 / 12AX7 plate.

Ultra Linear mode:

EL34 UL mode has a μ of about 18. EL34 UL plate resistance is about 2500 Ohms.

With a 5k primary, the gain is $5k / (5k + 2.5k) \times 18 = 12$

(A KT77 in Ultra Linear mode will be the same)

The EL34 plate is going 12V in one direction, while the 6FQ7 or 12AX7 plate is going 1V in the opposite direction.

. . . The 300K has 13 times more signal current through it, versus a simple plate load resistor.

$300k / 13 = 23k \text{ Ohms}$ loading on the 6FQ7 or 12AX7, and remember the 220k resistor too.

Just for the other differences:

Triode Mode:

EL34 Triode mode has a μ of about 9. EL34 Triode mode plate resistance is about 1250 Ohms.

With a 5k primary, the gain is $5k / (5k + 1.25k) \times 9 = 7$

(A KT77 in Triode mode will be the same)

The 300k Schade feedback resistor is about $300k / (1 + 7) = 37.5k \text{ Ohms}$

Pentode Mode:

EL34 Pentode mode gain is $G_m \times R_L$. G_m is 11mA / Volt

With a 5k primary: Gain $11mA \times 5k = 55$

(A KT77 in Beam Power mode will be the same)

The 300k Schade feedback resistor is about $300k / (55) = 5.5k \text{ Ohms}$

Schade negative feedback often works very well. But it is so often mis-understood.

Just my opinions