

## **Determination of Maximum Positive Feedback in Bootstrapped Driver**

**John L Stewart**

**First of all, calculate the driver gain in grounded cathode mode from published specs-**

**For the 6SN7 family at 250 volts supply,  $\mu = 20$   
 $R_p = 7.7 \text{ K}$  while grid volts is  $-8$**

**Let  $A_1$  be the gain with these conditions,**

$$\begin{aligned}\text{Then } A_1 &= (\mu * R_l) / (r_p + R_l) \\ &= (20 * 27) / (7.7 + 27) \\ &= 15.56\end{aligned}$$

**Then find the maximum gain possible for any non-feedback triode stage-**

$$\begin{aligned}\text{Then } A_2 &= \mu \\ &= 20\end{aligned}$$

$$\begin{aligned}\text{Gain change is } A_2/A_1 \\ &= 20 / 15.56\end{aligned}$$

$$\begin{aligned}\text{In DB becomes } 20 \log A_2/A_1 \\ &= 2.18 \text{ db}\end{aligned}$$

**The feed back in the case of the bootstrapped driver is to the triodes anode, so no gain above  $\mu$  is possible. There is no gain thru the triode being plate driven.**

**NTL, some experimenters have actually built working amplifiers this way using many triodes such as the 6S4 & 12B4. Starting digging, you will find them. Commonly referred to as the 'Inverted Triode'. (Steve Bench, F E Terman, Etc)**

**The equations can be further reduced as follows-**

$$A_1 = (\mu * R_l) / (r_p + R_l) \text{ and}$$

$$A_2 = \mu$$

$$\text{Gain change is } A_2 / A_1$$

$$\text{So Gain change becomes } (\mu) / (\mu * R_l) / (r_p + R_l)$$

**That reduces to Gain Change**

$$A_2 / A_1 = (r_p + R_l) / R_l$$