Pink Faun Voltage controlled current source (VCCS)

Good power supplies are very important for good sound. Tube amplifiers need heater power supplies. Especially when directly heated triodes (DHT's, like 2A3, 300B, 50, VT25, 205D, PX4, PX25, P2, etc) are used, the quality of this power supply is very important. The heater of the tubes is directly in the signal, any harmonics from the power supply will degrade the sound quality. Non-DHT's (normal tubes like ECC83 and E88CC, etc) are less influenced by this problem, but good quality power supplies still will improve the sound.

When DC voltage is used, power supplies mostly are regulated. Voltage regulators like the LM317, LM337, LT1086, and the 78-series have very limited bandwidth. Most already loose their good properties above 1kHz, in fact there is almost no regulation anymore at 100 kHz, just where the problems start. They can be used to get rid of hum alone. Hf is almost passed completely, both when they are used as voltage or as current sources. These passing Hf harmonics influence the sound of an amplifier a lot. They make sound harsh, uneasy, reduce the image and make the background less dark.

A good solution for reducing Hf is the use of discrete passive FET current sources. A current source has a very high dynamic impedance, so the Hf harmonics will drop over the power supply. A voltage source has very low dynamic impedance, resulting in all Hf components to drop over the tube heater wires. All active regulators also have per definition limited bandwidth, they are not fast enough to control Hf frequencies. The bandwidth of a discrete passive FET current source is very high.

Voltage dropped over the tube heater wires must be constant and preferable exactly the value of the tube data sheet. When a current source is used, changing the tube or when the tubes gets older might change the heater resistance and thus the voltage over the heater wires. This reduces tube life. It is important to get the right current resulting in the right dc voltage.

Applying voltage directly over cold tube heaters will result in high inrush currents. When the heaters are cold, the resistance is much lower than when they are hot. Sometimes tubes even flash noticable, but most of the time you do not see it, but it is there anyway. It is very important to limit the inrush current, this will prolong tube life.

Pink Faun developed the VCCS stabilisation to take care of all the above. For DC (very low frequencies) it adjusts the current so that exactly the right voltage is applied to the tube heater wires all the time. For AC (including all Hf) frequencies, the VCCS is a pure passive discrete current source, with a large bandwidth (into MHz), and high reduction (about -50dB typical) of AC harmonics. VCCS will improve the sound a lot compared to normal regulators.

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