Summary of the tests with the LeCroy and CAEN HV supplies

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We tested two prorotype HV supplies, one manufactured by LeCroy, the other by CAEN. Both supplies had 4 output channels, delivered about 1.5 mA/channel and both were controlled by a PC running DOS. Both supplies performed well, if compared to our specifications. The problems we detected relate to characteristics that we did not specify, or when the supply was operated in a way that exceeded the specifications.

In all tests we used FEU115 phototubes illuminated by a green LED operated in a pulsed mode. For technical reasons we read out and plotted the phototube signal rather than the HV itself. While this makes disentaglement of the HV and tube (base) effects more difficult, it means a more realistic system test where the extra current above the (dominant) DC is pulsed and comes simultanously in different channels.

Stability. Medium term stability (running overnight or longer) was acceptable for both supplies. Observed drifts in the phototube signal are typically within 1.5%. Even if this drift is entirely attributed to the HV supply, it would correspond to less than 4V. (In reality the drift is mostly gain drift.)

Correlation between channels. With all channels operated at a constant voltage, we measured the pulse-by-pulse correlation of the signals of PMTs powered by different HV channels. Correlation is defined as the deviation (in percent) from $\sigma_1^2 + \sigma_2^2 - \sigma_r^2 = 0$ where σ_1, σ_2 is the width of two normalized pulseheight distributions while σ_r is the width of the normalized distribution of the pulse-by-pulse ratios of signals 1 and 2. In the case of the LeCroy supply we found no measurable correlation (we were not sensitive for less than 2% correlation). With the CAEN supply we found 3-7% correlation between the different channels which were not attributable to pulse-to-pulse variations in the LED light. We have no information on the origins of these correlations; 60 Hz is a possibility.

Ramp speed and settling time. We did not measure the ramp speed of the LeCroy supply. However, we noticed that after changing the HV by about 100 V it took some 10 s for the PMT signal to settle at the new constant value. Increasing the voltage resulted in an initial overshoot while decreasing it in an undershoot of the PMT signal. – For the CAEN supply the ramp speed is adjustable. Using about 200V/s ramp speed the transition was almost completely linear and there was no measurable settling time of the PMT signals once the target voltage was reached.

Noise. The noise level of the CAEN supply operated at 1500 V and measured with AC coupling on an oscilloscope was 20 mV. There was a 75 kHz and a 2 MHz substructure in the noise, the latter possibly picked up from the computer.

Individual channel shutdown. This possibility was not anticipated or required in our specifications. However, we tested the stability of a channel when other channels on the same board were shut down abruptly. There was no measurable cross-talk between the channels of the LeCroy HV supply. On the other hand the entire CAEN unit became erratic when one or more channels were abruptly shut down.