June Status report
Maple Leaf Particle Detector

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1 Activities

June was another busy month for the team. The count-rate spike in our (David Florida Laboratories) DFL testing was investigated by performing two thermal tests on each of our first two boards. (The results of these tests are described below). It was discovered that two of the resistors on the second and third channels of the first board's high voltage line were different than the resistors on the first channel, and every resistor on all other board's channels. These resistors were in fact the ones with the count spike in thermal testing.

In addition to the pressure sensors being completed for the balloon flights, all five boards are now populated and able to connect to the Geigers. These boards will undergo testing in the upcoming month.

1.1 Website

The preliminary website has been set up and is now live. The website will feature a degraded version of the specifications of our payload (Design/Electronics/Software/etc). It will also feature media releases of the team such as test flights and milestones completed on the project. The full webpage is expected to be fully operational by the end of the first week of July.

URL: `http://www.isset.ualberta.ca/students/uahasp`

1.2 Simulation

A software called 'STK' is being investigated to simulate expected count rates from historical data. This will also aid in the proper calibration of our detector's Geiger tubes.

1.3 Thermal Testing

Throughout the month, the team prepared for, and performed thermal testing on the first two boards. Initially, a procedure using a standing heater with an insulated enclosure for our electronics was devised. This had poor temperature control, and quickly overheated the electronics, whereupon the two faulty high-voltage channels malfunctioned (a voltage drop to the Geigers occurred), and the other channel remained constant. The count rate from all the tubes malfunctioned, suggesting it may be an issue with the "count" line, rather than the high voltage line (at least where the resistors are correct). On that note, one of the team members noticed that two of the high-voltage resistors going to the Geigers were different than those on every other board, and the final resistor on that board. Given the faulty testing procedure, however, the team set out to properly test both the first and second boards in a better environment.

A team member contacted the Particle Physics group at our department to receive support and inquire for equipment needed for the thermal test: an oven used by the DEAP experiment was available for use. It can raise the payload to a certain temperature in a given time, making it capable of recreating the heating portion of our thermal testing at DFL (David Florida Laboratories). Furthermore, a band of thermal-couples was available for use to measure the temperature of specific components of the board. This allowed us to see exactly when things started going haywire.

The results are discussed below, all the Figures are in the Appendix.

1.3.1 First PCB Test

As seen on the Figure 1 and Figure 2, the count rate in the second channel has a massive spike (as seen in DFL testing results). Contrary to DFL testing however, the third board experienced no spike this time. This is possibly due to not heating the oven enough.The voltages on each channel were perfectly fine. Upon further investigation, the team found that not only one resistor on each of channels 2 and 3 were changed, but also one resistor on all three channels is different from every other board. Measuring their resistance with a multimeter showed them to be equivalent at room temperature, however their operation at high/low temperatures could have changed the voltage in some way. On another note, three resistors on each of the first two boards differ from those on the final three boards, due to a shortage in Digikey's stock. The differences should be negligible, however it will be investigated in more thorough thermal tests in the upcoming month.

1.3.2 Second PCB Test

As seen on Figure 2, the second PCB has no count spikes associated with temperature, suggesting that the problem lies in the electronics of the first PCB. This Figure 1 is on a small scale to demonstrate the background radiation and radiation from a source. This Figure 4 is on a large scale to demonstrate possible spikes in count rates. As seen in the Figure 6, the voltage on the second PCB drops by about 40V on the second and third HV channels at high temperatures. This will be investigated next month, and answered in the near future.

2 Design/Development Issues

The team had ordered 12 Geiger tubes: 3 to be flown at HASP and 9 spares for thermal and hardness testing at the university and weather balloon testing purposes. The team had only received 3 on March, which were secured to be flown at HASP, since the back order of the 9 extra Geiger tubes were not luckily to arrive to the university due to the crisis in Japan. The team decided to purchase 9 extra Geigers from Germany, in case the back order never arrived. After 3 months of waiting, the 9 reminder Geiger tubes were received and now the team know has enough Geigers available for testing. If the order from Germany arrives, the team will have 21 Geiger tubes in the inventory, to perform further testing of tube performance.

A weather balloon launch, which will carry one of the testing boards and Geiger tubes, is scheduled for Sunday June 26^{th}. Three more balloon launches are scheduled for the following month. The team expects to obtain realistic count rates at high latitudes to compare with our mission in HASP, as well as to test the performance of the detector on a comparable environment than HASP

3 Milestones

Name	Date of completion
Started FLOP	Early June
Custom Tested Payload using DEAP oven	First two weeks of June
All Boards Populated	June 21
All team member obtained their radio call sign	June 23
Team radio training	June 6
Team website	End of June
Data analysis program in IDL	End of June
Data read (from payload) program to replace the use of Labview	End of June
Arrival of all components necessary for weather balloon launches	June 2

Table 1: Completed (June) Milestones

Name	EDC
Firmware completion for weather balloon launches	end of June
First weather balloon launch	June 26
AGU abstract submission	July 25
Further test Geigers and new Boards	July
Complete FLOP	By end of July
Manufacturing metal enclosure	July

Table 2: Upcoming (July) Milestones

4 Personnel

Nothing to report.

Appendix

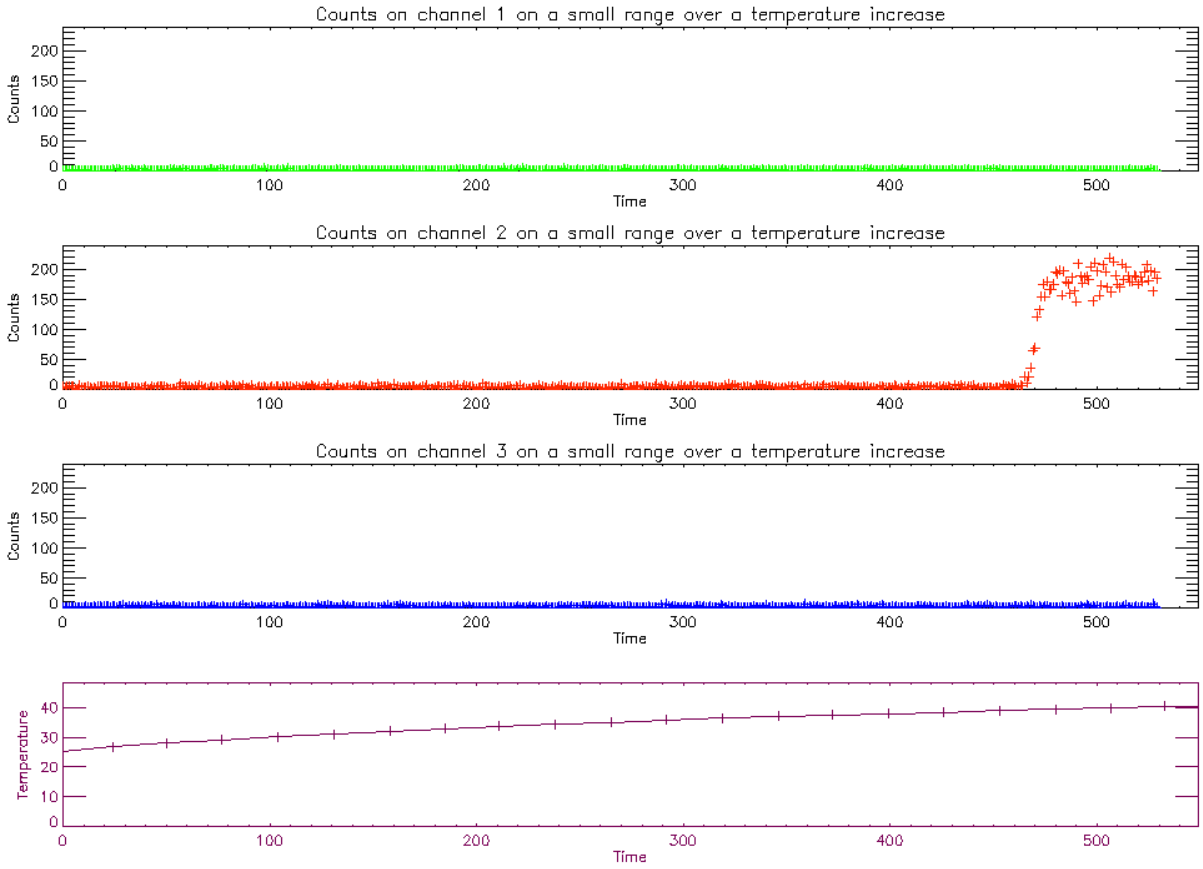

Figure 1: Counts Large Scale PCB 1

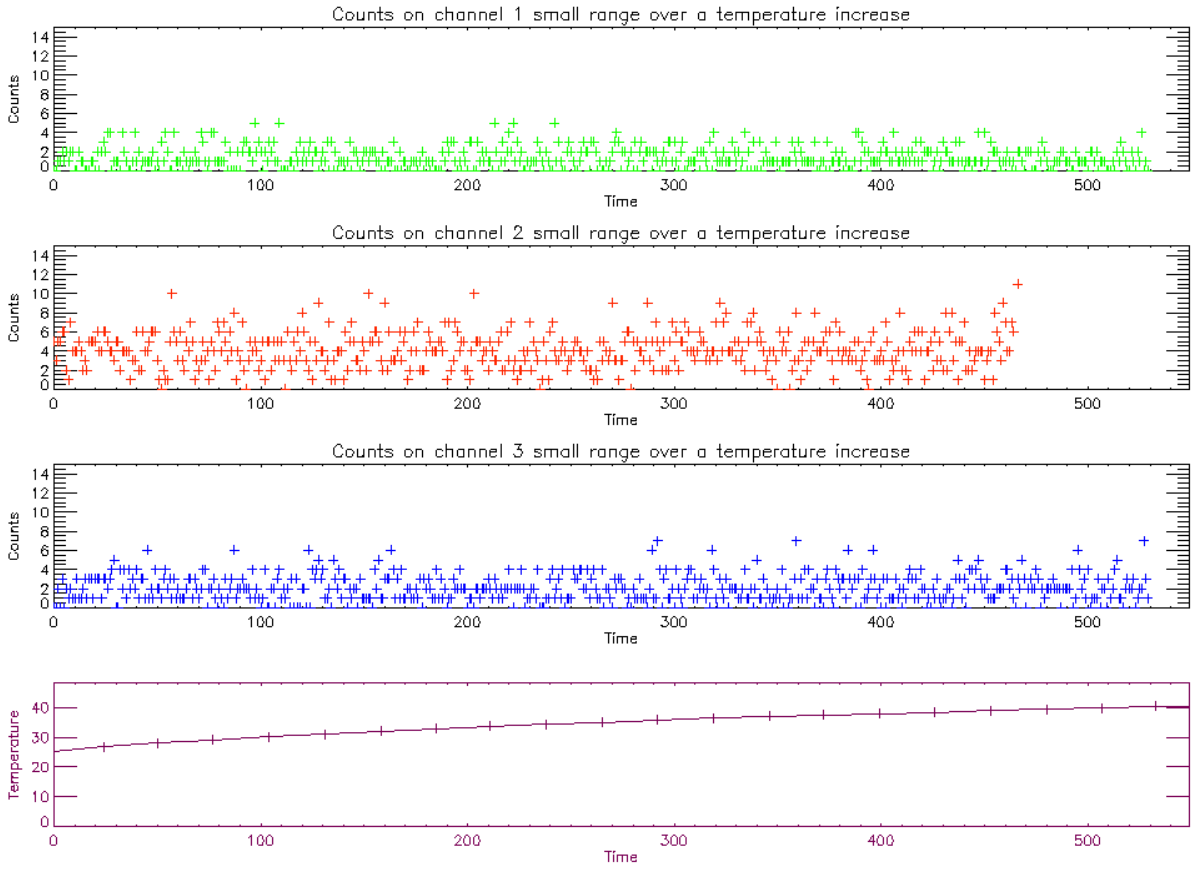

Figure 2: Counts Small Scale PCB 1

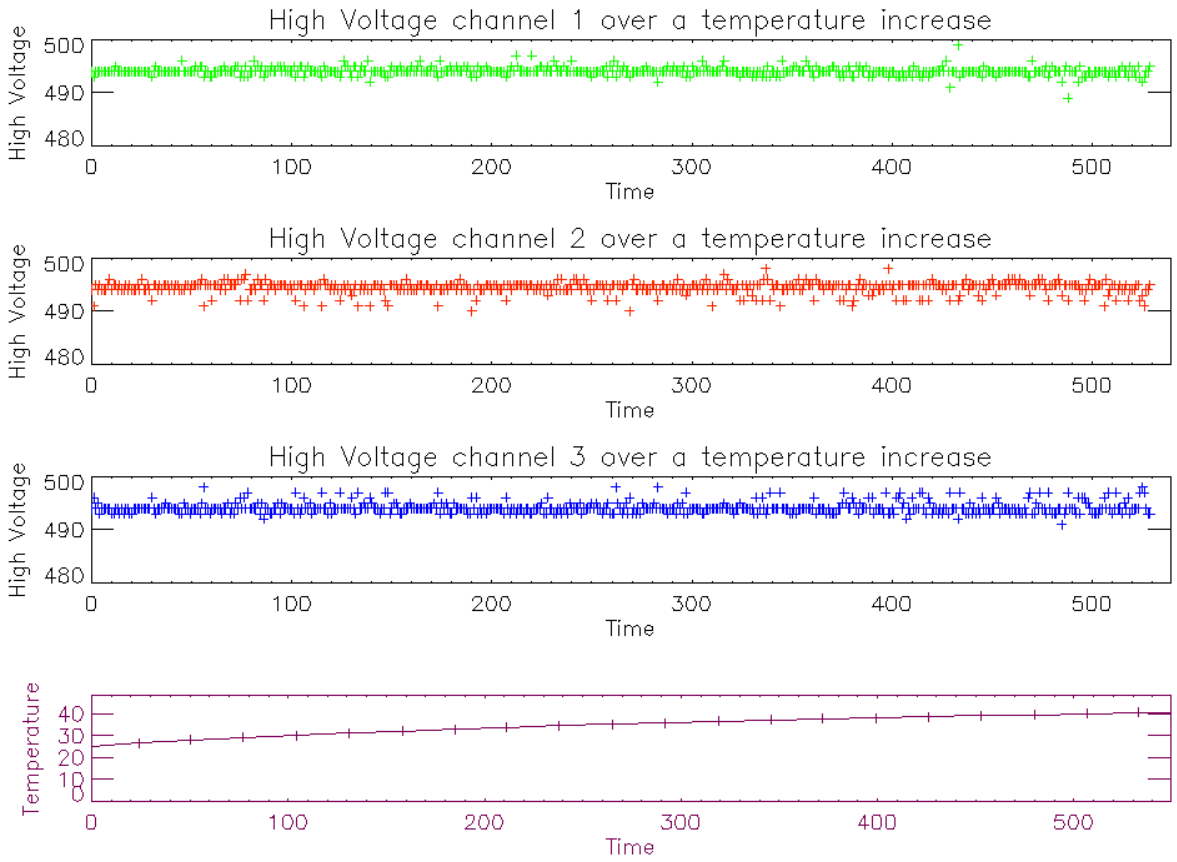

Figure 3: High voltage

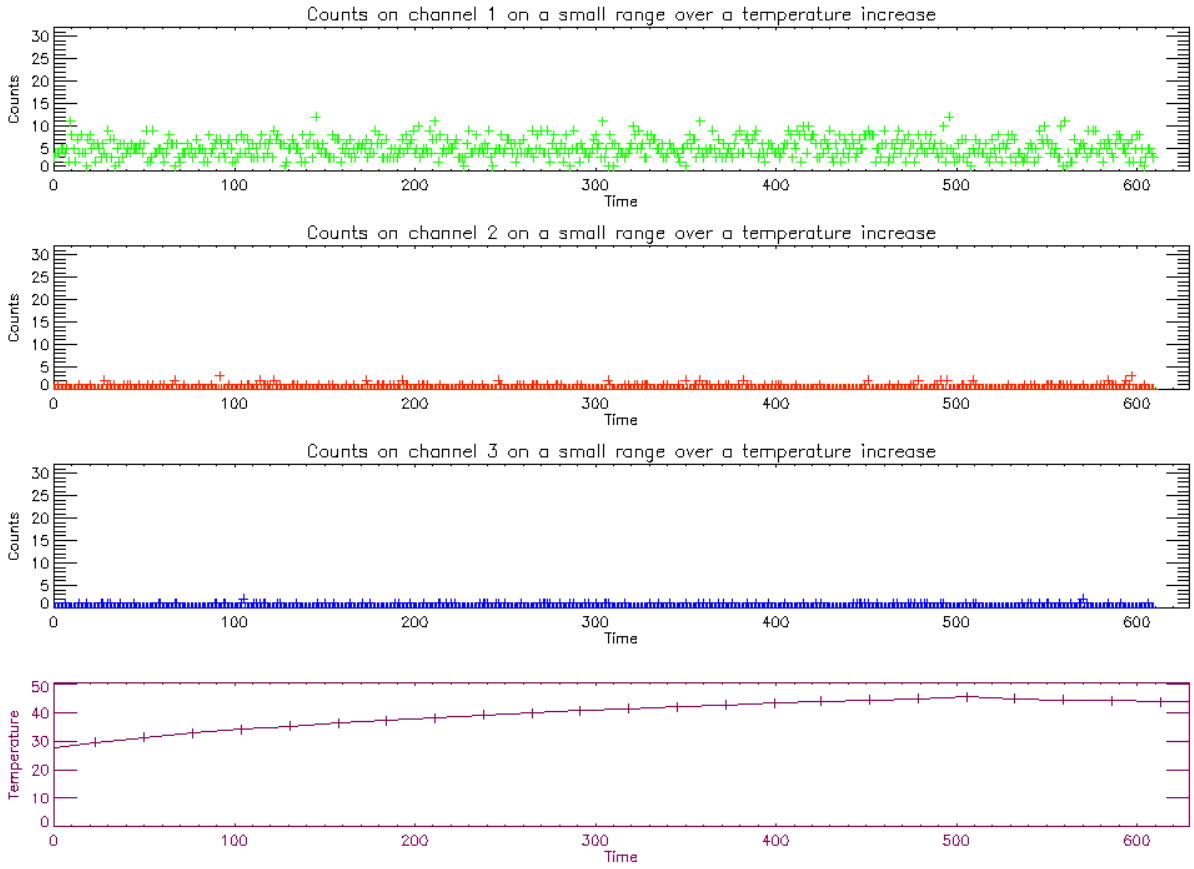

Figure 4: Counts Large Scale

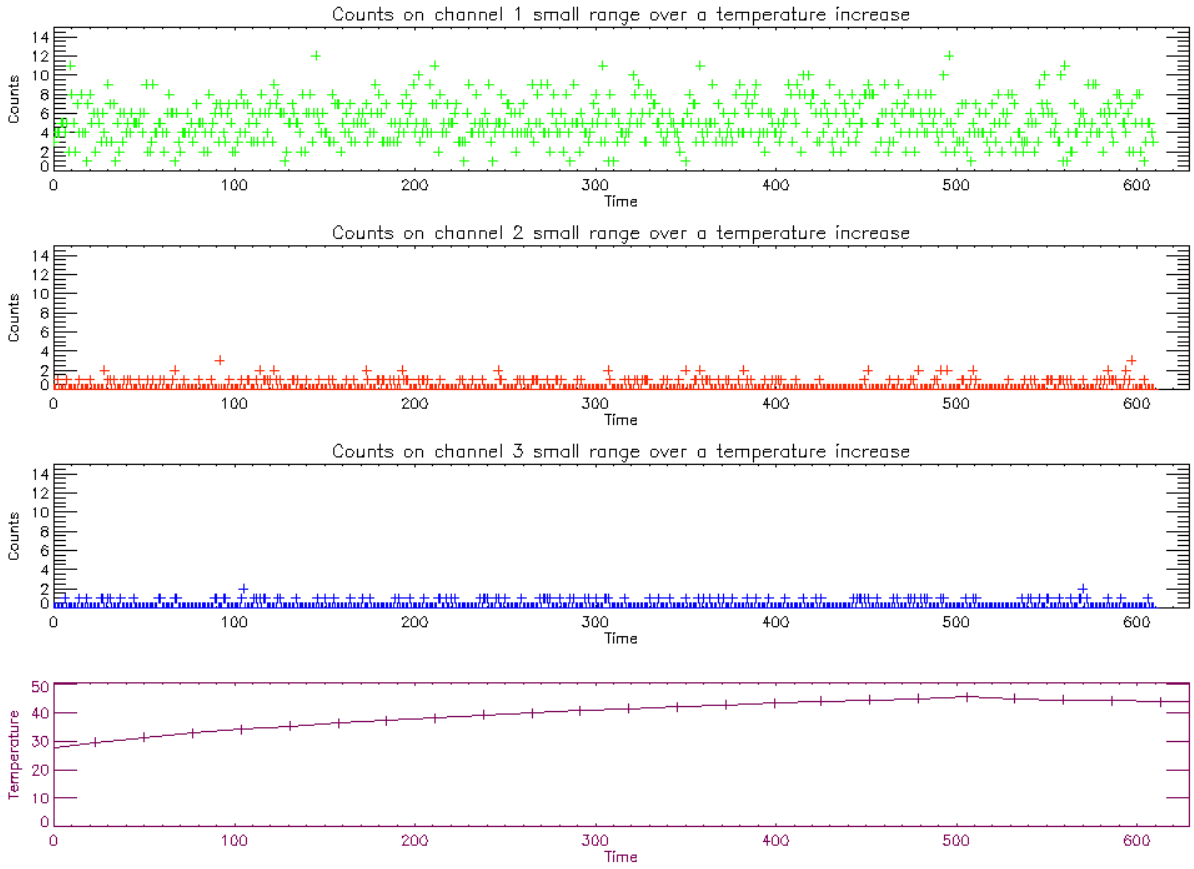

Figure 5: Counts Small Scale

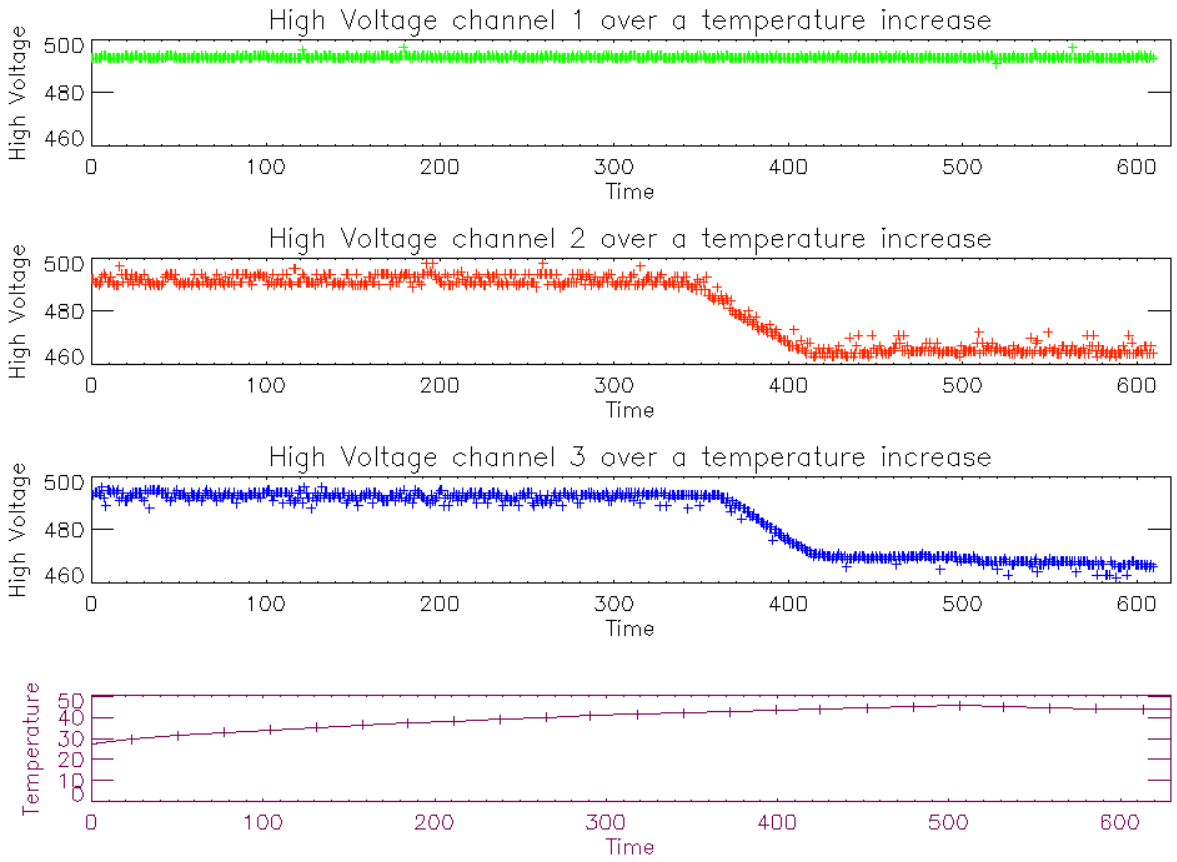

Figure 6: High voltage