Overview

As part of the instrument control of ERWIN it is required that the high voltage supply of the detector system be accessible through NICOS. It is foreseen to be able to adjust individual channel parameters, save these to a file and to automate the procedure for ramping the voltage up and down.

Hardware

For both ERWIN detectors an ISEG high voltage system will be used. For the small (large) detector the system comprises

- Two (four) slot crate
- CC24 crate controller
- One (three) EHS modules
    - 7 positive (+ve) and 1 negative (-ve) channel per module

The required channels for the small (large) detector are

- 2 (9) anode wires +ve
- 1 (8) boundary anodes +ve
- 2 boundary cathode stripes +ve
- 1 window -ve

Ramping up and down of high voltage – normal use

For simplicity the channels can be split into three groups – the entrance window, all anode wires and the cathode stripes. Individual channels within these groups may have different settings, but in normal use they will be ramped up and down as one unit.

When turning on the high voltage the entrance window should first be biased and then the anode wires followed by the cathode stripes. The precise steps are:

1. Ramp the entrance window to its nominal voltage

2. Ramp the anode wires to their nominal voltages

3. Ramp the cathode stripes to their nominal voltages

When turning off the high voltages the order is reversed, with all channels being ramped to 0 V.

It is permitted that the anode wires start ramping several seconds apart from each other in time. It should be avoided however that large (>200 V) differences exist between neighbouring wires. Given the relatively slow ramping speed (~5 V/s), this is not expected to be a problem.

Current limitation

In order to protect the detector from damage in the event of a short circuit or spark a current limit is placed on all channels. If this current is exceeded for a certain length of time (the trip time) the entire HV system should shut down. The ISEG modules have this functionality inbuilt, it is only required to set the required values and behaviour for each channel.

Nicos integration

Users should be able to turn the high voltage on and off through NICOS. This should be possible through a single command (e.g. 'set DetHV on') which will then handle making sure that the individual voltages are ramped at the correct speed and in the correct order to the set values. An equivalent command for turning the high voltages off should also be implemented.

An additional command which puts the anode voltages to a slightly lower voltage in order to safely move the detector may also be required – in this case only the anode wire group would be ramped down by several hundred volts.

For the detector group, or other advanced users, a method for setting the parameters of individual channels is needed.

For all users a live display of the actual voltages and currents should be available. The currently set values of the ramp speed, current limit and trip time should be available in order to confirm that the configuration file (see below) has been correctly loaded.

Parameters

The following parameters should be stored for each channel in a configuration file [typical values in brackets]. It should be possible to make changes to these values and save them to the configuration file. It should also be possible to read back the currently set parameters.

- Voltage [50 - 2200 V]
- Voltage limit (setting the voltage above this should fail) [2225]
- Ramp up [5 V/s]
- Ramp down [10 V/s]
- Current trip limit [1 uA]
- Trip time [100 ms]

Logging

A non-essential but useful feature of the software would be periodic logging of voltage and current readings for all channels. The timescale for this logging could be of the order minutes and is intended to help monitor the detector health.

In the case of a current trip event, causing the high voltage to be shut down, the channel responsible for the trip should be logged, together with the measured current if possible.