CSPAD myana analysis

Basic CSPAD analysis code

An example of how to do a simple CSPAD analysis on xtc data can be found in myana_cspad.cc in the example directory of myana (/reg/g/pcds/package /ana/example). To help users setting up analyses we provide two classes, *CspadCorrector* and *CspadGeometry*, that apply user-selected corrections to the data. An example of their use can be found in myana_cspad.cc. The classes themselves are found in the same directory for users who wish to extract the algorithms for use outside the myana framework.

CSPAD data corrections

The corrector class, *CspadCorrector*, can read three files to correct or allow better use of the data: pedestals, gains, and exceptional pixel maps. The information is written by offline scripts in a simple ASCII format reflecting the readout scheme, by quadrant, two-by-one, column, and row.

Pedestals

The pedestal file can be made by the user by running 'cspadPedestalCalculator' from the myana example directory. A script is provided for the experiment operator to so generate a pedestal file from a dark frame run and push it to the online monitoring; for example, '/reg/g/pcds/dist/pds/xpp/scripts /cspad_xtc2ami.py --run <RUN#>' for the XPP environment. It is believed that the pedestals are stable at the few-hour timescale at least; in future running this will be monitored by the online task if practical. The pedestal varies by several photons from pixel to pixel so this is an important correction for low-occupancy running. Note that pedestals for high-gain and low-gain running differ.

Gains

Currently under study.

Bad pixels

For each pixel the file will indicate the OR of states like dead, hot, noisy, low-gain. Under development.

Common-mode noise

There is per-frame correction provided to take out coherent shifts in the pedestal of each two-by-one. This can be several photons. There are two algorithms available. The default bins all pixels in the two-by-one and finds the first peak on the left over a threshold then corrects that value to zero. Another looks at the truncated distribution of values in a small region and corrects that to zero if the rms of the values is small, indicating no hits, otherwise it keeps looking for a low-rms region. Both methods fail in the limit where there is high occupancy; the default is more robust against this, and the user can of course adjust the threshold to be more sensitive to the pedestal peak.

CSPAD Alignment

The *CspadGeometry* class encodes the relative alignment of the detector sections. It provides accessor functions for retrieving an individual section's translation and rotation. It also provides a method for interpolating the detector data onto a regular grid using the translations and rotations. Techniques for determining the alignment constant set are still under development, so the best-estimate constants are simply embedded in the class source code for now.