Switching detectors on 8-ID

Eric Dufresne

dufresne@anl.gov

Created August 4, 2017, revised Aug. 28, 2017

The purpose of this document is to give a step by step instruction on switching between detectors on the 8-ID-E wide-angle XPCS instrument. It resides in /home/beams/DUFRESNE/8ID/Manuals/DetectorSetup.

1   Switch from PI to Cyberstar

Table 1 shows the fast-shutter modes of operation. With a PIN diode or the Cyberstar, the Swiss Aszol shutter is not controlled by the PI CCD camera. This shutter is located after the X-ray lens, and before the diffractometer Table 2. The command shutteroff gives remote control of the shutter using command showbeam or blockbeam. The showbeam command opens the shutter, while the blockbeam command closes the shutter permanently.

shutter command	shutteron	shutteroff
showbeam	PI CCD triggers shutter opening, otherwise closed	shutter is opened
blockbeam	shutter closed	shutter closed

Table 1: Fast shutter modes.

To switch from the PI camera to the Oxford Cyberstar, follow the procedure below:

- Move $2\theta \approx 30°$, i.e. type: umv tth 30.

- unmount the PI CCD and mount in on the X48 rail with its Be window cover.

- mount the Cyberstar on detector rail (or PIN diode pind4)

- use velcro strap for cable relief

- move back to original 2θ value

- type: plcounter cyber (or pind4). This sets the plotting counter to cyber.

- close se4vgap for narrow resolution, so type: umv se4vgap 1 (1 mm opening over 1 m is 1 mrad detector angle.)

- type: shutteroff

- type: showbeam

2   To switch from Cyberstar to PI.

- Move $2\theta \approx 30°$, i.e. type: umv tth 30.

- type: shutteron

- unmount the Cyberstar from the diffrcatometer detector rail (or PIN diode pind4) and mount it on the table X48 rail

- mount the PI CCD on the detector rail without its Be window cover.

- use velcro strap for cable relief

- move back to original 2θ value

- open se4vgap, so type: umv se4vgap 19 (maximum opening)

- type: select_PI

To adjust the dark on the PI camera for the EPICS real-time display (see Fig. 1), type: blockbeam. Then take a few snapshots, i.e. as single images (use "Acquire" button) or with the TV mode (press "Start" button, acquire a few images, then stop TV mode). Click on the "Set As Dark" button. Then type: showbeam, and start the TV mode to observe detected x-rays.

3 Notes about using the "x-ray eye" TV camera for sample alignment.

For sample height alignment, you can visualize the beam with the x-ray eye and bissect the beam with the sample laying flat with an anle of incidence near zero degrees. This is done by:

- Mount x-ray eye on X-48 location on the table rail.

- Move 2θ above 50 degrees so "umv tth 50". This is needed because the connectors of slit se3 block the beam.

- Shutter must be opened, so type shutteroff and showbeam commands

- If the PI camera is mounted on the detector arm, the PI CCD should be covered by the Pb cover and the EPICS TV mode should be on (see Fig. 1).

4 Various helpful command on 8-ID-E XPCS set up.

You can collect CCD images during scans by setting up spec to control the PI camera with the "ccdscan_setup" command. Usually, we take 5 darks, throw out the first dark, we save the data, and take one exposure per scan point. The files are saved in /home/8-id-e/RunName/UserDir/specfileName/Snumber. Each scan is saved in a directory starting (S39 for scan 39). Any regular spec scan needs the prefix command ccdscan before it i.e. ccdscan lup th -.05 .5 20 1. Make sure plcounter is set to ccdc.

Other useful commands:

- splot (plots the currect spec scan on screen)

- pplot (prints the currect spec scan on coal)

- lpstuff your_spec_command (prints the output of your_spec_command to coal)

CCD Control

CCD Setup
CCD Type   PI
Attenuation Status (0–31)   0
Shutter Status (1=Open, 0=Closed)   0

TV Mode
Exposure Time (sec)   5

Acquire   Abort   Start   Stop
Set As Dark   Update RO 1

Monitor Mode
Filename   mp11_att0_014
Sequence Number   521
Start Batch Monitor
Start Scan Monitor   Stop Monitor

Image Display Setup
Colormap   CMIN   CMAX
jet   0   1000

573: Min=0, Max=3923, ADU/Photon=740, #Photons=2039, #Sat_Pix = 0, Avg = 11.52, Sum=2.007e+07
Aborting. Tvmode will not work when Images are being Saved ...

572: Min=0, Max=4508, ADU/Photon=740, #Photons=2071, #Sat_Pix = 0, Avg = 11.45, Sum=1.9952e+07
Aborting. Tvmode will not work when Images are being Saved ...

571: Min=0, Max=5887, ADU/Photon=740, #Photons=2116, #Sat_Pix = 0, Avg = 11.52, Sum=2.0069e+07
Aborting. Tvmode will not work when Images are being Saved ...

570: Min=0, Max=4249, ADU/Photon=740, #Photons=1998, #Sat_Pix = 0, Avg = 11.45, Sum=1.9947e+07
Aborting. Tvmode will not work when Images are being Saved ...

569: Min=0, Max=4470, ADU/Photon=740, #Photons=2035, #Sat_Pix = 0, Avg = 11.50, Sum=2.004e+07
Aborting. Tvmode will not work when Images are being Saved ...
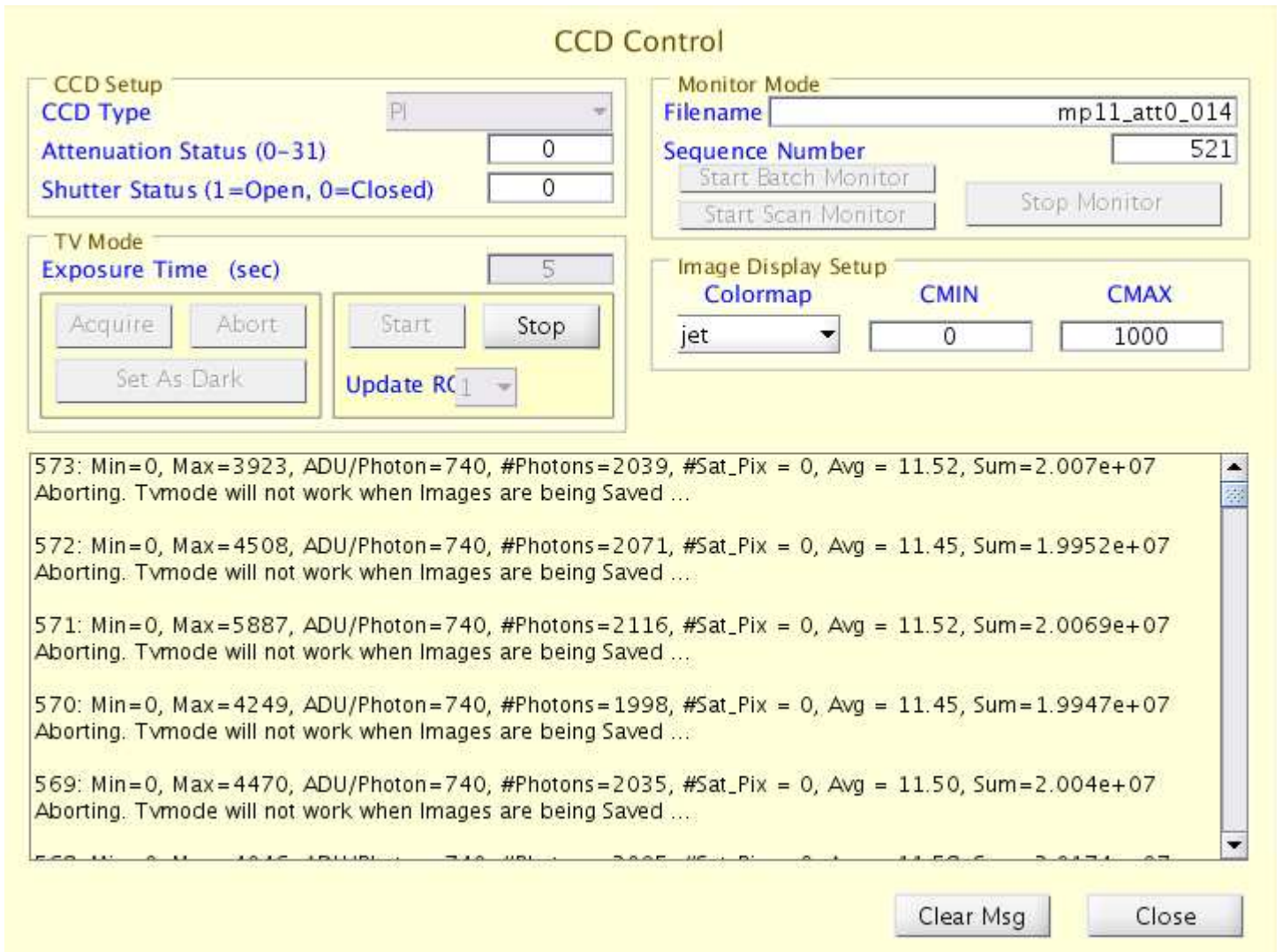
Clear Msg   Close

Figure 1: Matlab PI CCD control window. Note that the CCD is 16 bit so the Max should not go over 65536. Keep the number of saturated pixels low or the CCD response is non-linear and the signal may spread to other pixels.

4