

X-ray alignment 3

Monday, Feb. 19, 2024

Lindsay, Milo, Minami, Hunter, Narukage (Wayne coming in later)

~1:45 pm starting setup.

found that GSE computer was off. (LG: I thought we left it on, so this is odd.). Also, we had difficulty with the GSE computer monitor, so we switched it out for a different (much smaller) one. The large one was later found to be working with a laptop, so what the issue was is unclear.

2:15 Powered on EXP, 28V, current is 0.33A

- Followed power-up procedure. Power supply did not seem to be grounded to EXP chassis, but I chose not to add a new connection in order to stay close to the Saturday configuration.
- 2:27 pm Turned on DE. Current 0.68A
- 2:28 pm Turned on Timepix. Current 1.23A while starting up.
- 2:36 pm Timepix hv_ramp_up_start. Milo is looking at Timepix data to assess the status after problems were found while cooling on Saturday.
- Simultaneously, Minami san is zipping data on DE and transferring to GSE computer.

3 pm Minami is done transferring data; will make images.

- time for sealed sources for Timepix!

~3:12 put Am241 in front (roughly) of Timepix for ~1 minute. Kept it in the plastic container, just held in front of the sensor. Coarse placement.

3:25 pm Milo rolled Timepix config back to previous settings (before-Saturday settings).

Around 3:27 pm I placed the source (Am241) for 1 min in front of Timepix again.

3:30 pm Narukage is finished transferring the CMOS data.

Timepix rundown: rolling back the config did not seem to fix the problem. Am241 still resulted in NO photons on the detector. Maybe a power cycle is needed after the config change? Milo is consulting with Savannah. Note: noise was seen on Timepix before we turned on HV (earlier, with the old settings), and it disappeared when the HV came on.

3:35 powered off Timepix. Waiting 2 min before powering on. Current went from ~1.2A to 0.67A.

3:39 powering on Timepix. Current back up to 1.2A.

Milo did some debugging w/o me, including turning on HV while I gave the guys a tour.

4:15 pm Turned off Timepix. Milo is retrying the pre-Saturday config, downloaded from GitHub version, just to make sure.

4:18 turn on Timepix.

4:22 Timepix is now taking data. (Timepix takes about 4-5 min to start data acquisition after being turned on.) HV is not on yet.

run1 (on Milo's computer)

- Timepix data with HV=0
- note: not tracking runs yet on GSE computer. Timepix HK will probably just end up in one big file.

4:24 pm Timepix ramp up high voltage

4:28 pm Taking ~1 min of Timepix data (via Milo computer) with HV on, no source.

(more notes in lab book)

6:56 pm powered on SAAS

6:57 pm powered on CMOS1

6:59 pm Not seeing what I expected from CMOS1, decided to shut everything down and power up in the usual sequence, following our power-on plan.

6:59 pm set DE end, current 1A

7 pm power off DE

7:01 pm power off timepix

7:01 pm power off SAAS, current 0.7A.

7:03 pm power cycled

7:03 pm starting power-on sequence: CMOS, DE+can, Timepix, SAAS. current 2.8-2.9A

Not sure if I'm seeing the right things in the GSE, but the currents look good.

8:39 pm we are almost cold, Trufocus has been checked, and Milo and Hunter are working on the alignment. In the meantime, let's try taking a bit of data just to see that everything works.

run2

8:45 pm CMOS and CdTe's are now taking data. Pedestals look noisy (b/c high LN2 flow right now) but look fine. (Note - bias voltage is 200V currently.) CMOS look normal.

I am going to try to load Kris's new GSE software that includes the double reflection (put another way, a 180 degree rotation) so that our geometry is correct. Stopping GSE data collection temporarily for this purpose.

I copied the FoGSE dir into a backup directory (backup_feb17) just to make sure I can roll back if needed.

8:54 pm did a `git pull` to load Kris's newer software. According to code timestamps, this looks successfully. Let's try it out!

run3

- New GSE visually looks ok. Of course, can't check geometry until we have a source. Milo and Hunter are aligning now.
- I want to get a little temperature info from the detectors so I'm going to briefly turn on HK data.
- As before, power readings looked fine but it's hard to know what's going on with temperatures. Disabling HK readout so that we don't freeze.
- I screenshotted the GSE while I had the power numbers displayed.
- Note: CdTe pedestals look very different from the others (see screenshot). Why?
- 9:10 pm opened EXP LN2 valve back to ~1/3. Higher than I'd like but we seem to need this to maintain temperature. Focal plane temperature is -19 C. Consider closing this a little when we start to take the real data.
- 9:19 Alignment is good (mms are 100 mV on the sums, 70 and 10 mA on the diffs)
- Ready to start X-rays

run4

- Turning on Trufocus generator, Position 4. 30 kV, 800 uA
- Started data around 9:22 or so.
- Wayne is cranking it up. 30 kV, 1 mA
- Screenshot 9:28 pm
- Screenshot 9:35
- 9:35 pm Turning off generator, stopping data collection at GSE.
- We were at -18 deg C at focal plane, so I temporarily opened the EXP valve a little.
- But then we were ready to start, so I immediately closed it a little!

run5

- 9:39 pm ramping up X-rays
- This is the +y phasing. (Rear of payload is moved in +y direction.)

- Starting GSE collection 9:40 pm
- Source went up on the display! Yay! This is the correct direction.
- 9:45 pm stopping data collection and ramping down X-rays.
- 9:48 pm Stopping CdTe readout. Note I forgot to do this for the other data runs, so there is probably multiple types of data mixed into the files.

run6

- phased in +x direction (y is centered)
- Starting GSE and X-rays 9:53 pm
- some difficulty with the GSE. It wouldn't die! Eventually I just killed that terminal window, hoping the process would die with it.
- 9:59 pm Started DE readout again, with `set_can_broadcast_read`. Before doing this, I also sent the sparse R/O command again b/c CdTe2 has a weird pedestal. After sending the sparse command, CdTe2 now looks fine.
- Ring moved into the correct direction!
- 10:02 pm turned off X-rays.
- Stopping GSE and CdTe R/O
- CdTe R/O stopped fine, but the GSE process refused to die again. Odd that this is happening when we didn't have this problem on Saturday! It is still writing logs.
 - Figured out how to kill this manually.

run7

- Position 5
- 10:13 pm Ramping up X-rays
- 10:14 pm Starting GSE, sending commands for DE data collection.
- 30 kV, 800 uA
- We see the ring where we expect (CdTe1) but there are very few photons in the GSE image. This wasn't expected. The ring looks fine, though.
- As the photons added up, it seemed like the whole plot filled in - this is probably a scaling issue in the GSE. Some of the other detectors seem to scale better (like CdTe4). Perhaps this is due to the fine pitch strips being very bright, and so you can't see the rest easily.
- Did not screen shot this because the image isn't good. But it was there!
- 10:24 pm stopped x-rays and stopped DE data collection and GSE data collection.
 - this time the GSE died easily!

run8

- Phased +y direction, position 5
- 10:27 pm turning on X-rays, starting DE data collection and GSE logging.
- Ring moved in right direction!
- Only took 1-2 minutes of data, then stopped all (x-rays, DE data, GSE logging).

run9

- Still position 5
- Phased +x direction (y centered)
- 10:32 pm turned on X-rays and data collection
 - 30 kV, 800 uA
- Ring moved the right way (to the right), nice image. A couple screenshots.
- Only took data here for ~2 minutes.
- Note: GSE seems to be killed gracefully if you *first* do ctrl-C in the terminal and then close the GUI windows.
- Note: I had to open back up the GSE to stop the DE data collection, which I'd forgotten to do.

run10

- Position 3
- This was a "medium priority" item in our plan (because we finished all the high priority ones). The goal here is to get a higher-statistics version of our high-res MSFC optic + CdTe2 pair. The previous image was a little bit low statistics.
- Taking a little extra care in the alignment to try to get it truly on-axis.
- 10:45 pm Starting GSE logging and DE data collection.
- 10:46 ramping up X-rays. 30 kV, 1 mA (full power)
- Several screenshots.
- Notes: At least on GSE view, the outer ring still looks a little deformed.
- Note: No display issues with CdTe1 now. Scaling looks fine. We see significant ghost rays on CdTe1 and CdTe 4. Not on CdTe 3 (the Nagoya optic).
- Ended X-rays and CdTe data taking at 10:59 pm.
- Stopped DE logging.

run11

- Before this run, i took a moment to check the cooler, dewar, dewpoint, etc.
 - EXP valve is at 1/8 turn.

- Cooler holding steady at -20 deg C with no problems. The actions taken previously (particularly the pressure building valve opening) must have been effective. Cooler and dewar are having no trouble now.
- Dewpoint meter reads -23 deg C, so we look good humidity wise.
- The plan for this telescope is to do 30 minutes of data (in 2 15 minute chunks), and then start the warmup. I'll then divide up the data files every 10 minutes in case things change while we warm.
- SAAS looks good so we are well aligned.
- 11:19 X-rays ramping up.
 - 30 kV, 1 mA
- 11:20 CMOS stop to start (on both CMOS cameras)
- Might as well turn on CdTe data collection too, just to get ghost rays.
- 11:23 pm Started DE data collection. Cool ghost rays! Screenshot.
- 11:36 pm Stop to start (so that we don't have gigantic data files). Did not interrupt GSE logging.
- 11:53 pm Stop to start again on both CMOS's. Did not interrupt GSE logging.
- Note: we made the decision to only take ~45 min of data here, and then move to Timepix, because Milo believes that Timepix may be working now.
- 12:10 am Stopped CMOS data acquisition and CdTe data acquisition.
- 12:13 am Finished ramping down CdTe HV to 0 and turned off X-rays.
- GSE stayed on for some time after this (but without CdTe or CMOS data taking).

Position 6

- We went to position 6 for Timepix, because Milo's assessment is that Timepix was finally working.
- Mini-X2, 30 kV, 120 uA.
- Result: Success! 2 min of data shows rings.
- Took data for 5 more minutes to get better statistics. Milo transferred data and we'll look at it tomorrow because we are out of time.

Cleanup notes

- Started warmup
- Transferred data for CMOS and DE to GSE computer.
- We'll look at all this data tomorrow.