FOXSI-4, Poker Flat, Running Notes

This document is for general running notes for the whole Poker Flat trip during the FOXSI-4 launch. If you think “I wonder if there is anywhere I can write notes about FOXSI-4 on a Google Drive somewhere to help keep track of what’s going on?” then this is the place for you!

Anyone is welcome to type in here. Simply type out the date and change it from `Normal Text` (in the bar above, to the left of the font selection) to `Heading 1` and then type away for any notes during that day. Note: don’t worry if the date doesn’t show up in the table of contents, the table needs to be refreshed to show any changes.

A table of the days with notes are below:

Tuesday, 19 March 2024

Mainly unpacking happened today
Spare GSE computer was set-up and the FOXSI systems started to be checked they all worked
A link to the data and a README for today is found here.
Discussed mounting method for the cooler

- Cooler box that controls the valves such that the valves were close, and ran parallel, to the blast shield on the cooler plate
- The hose normally attached to the dewar will be connected to another system that is operated by NSROC
- The cooler box with the red display is mounted for easy access when the rail is horizontal in order to turn it off (if required).

Questions still to be answered about the cooler are

- Where will the laptop for the cooler system go/be operated
    - The rail base (there is a small room) and/or reach the mini-blockhouse?
- The 100 ft VGA cable would need to be secured on the cooler end.
- How will the computer be monitored
    - A webcam may need to be organised by NSROC and, to use Microsoft Teams, the laptop would need to be set-up to use a physical plug-in internet connection.

Wednesday, 20 March 2024

Wow! It's the 20th already 😮
Started off getting things ready to cool the detectors.
Found the sealed source holder, the N2 gas regulator and tubing, the purge bag, dew point and charger
Started cooling at about 12:15 pm
Ideally, we would have started much earlier but for LN dewar ventilation safety, we needed to move closer to the PAB lift door

- This area needed to be cleared by NSROC first

The dewar can in at 230 PSI so had to be vented down to ~22 PSI and fitted with a feed-back regulator to maintain this pressure
Once going through the safety paperwork we started:

- Dew point of -25C @ 12:35 pm with a temperature of ~20C
- Dew point of -35C @ 13:20 pm with a temperature of ~-8C
- Dew point of -43C @ 13:40 pm with a temperature of ~-20C
- Dew point of -50C @ 15:25 pm with a temperature of ~-20C
- To maintain -20C, the liquid valve on the dewar seems to be about 20 degrees open

Next steps are to get the sealed source ready so we can start taking data as soon as the detectors have acclimated

- Going to start with Fe source for 5 minutes on one CdTe detector
    - This data will then be checked to see if the integration time is sufficient
    - While the data is being checked, we will take an exposure of the Fe source until the appropriateness of the 5 minutes integration is checked
    - This can help us decide if we need to integrate for longer
- Once the integration time is determined, perform the same integration for the other CdTe detectors
- Try a 10 minute integration of Fe on both CMOS detectors
- Timepix just needs the source waved in front of it

Starting with radiation source

- Survey meter battery test - Done
- Survey meter functionality check - Done
- Background reading: 0.03 mR/hr (reading 0.3 mR/hr on X0.1)
- Dosimeter in pocket of whoever is handling the source
- Checking the Fe source,
    - The label-side is the back of the source (the least activity)
    - The non-label/shiny side is the front (most activity)
- Checking the Am source
    - Same as Fe source
    - The label-side is the back of the source (the least activity)
    - The non-label/shiny side is the front (most activity)

Timepix Data taken

- 1 minute observation
- Fe source
- Temp = -20C
- High voltage was turned on directly from Timepix Pi

- Source moved away after one minute, then moved back in front (repeated several times)
- Power cycle of Timepix system from GSE computer (~3 min between power off and power on)
    - Power cycle requested due to update of two files in the Timepix system
        - FOXSI_TIMEPIX_formatter_jan121_flightpi
        - foxsi4_UDP_reader

Run 1
- CMOS2 on
- All cdte on (no data being taken)

3:51 - CMOS2 start taking data with source
3:55 - CMOS 1 powered up
DOing this to compare CMOS1 vs CMOS2 with the source
3:56 - CMOS1 start taking data
4:00 - Stopped GSE
4:06 - New file started, source is in front of CMOS1
4:10 - CMOS1 and CMOS2 remove (delete) data

Run 2
4:11 - CMOS1 and CMOS2 stop to start (restarted taking data)
Fe source in front of CMOS1
4:17 - Stop taking data (CMOS stays running)

Run 3 - FULL READOUT MODE PEDESTAL (CDTE)
- No source (pedestal measurement)
- CdTe Bias 100V, wait 1 minute, Bias 200V

4:20 - CMOS stopped
4:22 - Full readout mode pedestal start
Pedestal shows low livetime values, perhaps due to nitrogen noise
4:25 - Turned off nitrogen
Livetime went up to 100%, suggesting noise is due to nitrogen
4:26 - Turned nitrogen back on
Livetime went back to previous values, 5-50%
4:35 - Stopped run 3

Run 4 - FULL SPARSE READOUT MODE PEDESTAL (CDTE)
- No source (pedestal measurement)

4:37 - Entered sparse readout mode, started recording
4:45 - Following:
- Slowly started reducing nitrogen flow
- CdTe PC files are 8MB full

4:55 - Stopped reducing nitrogen flow
Nitrogen valve is almost completely shut (~10 degree from closed)
4:58 - Stopped run 4

Run 5

4:58 - Started run 5 (same config as end of run 4)
Nitrogen valve position same as above, sparse mode, 200V bias, no source
5:01 - Stopped run 5

Run 6
- Fe source on Pos2

5:03 - Start run 6 (sparse mode, CdTe)
5:10 - Stopped run 6

Run 7
- Fe source on Pos3

5:13 - Started run 7
5:19 - Stopped run 7

Run 8
- Fe source on Pos4

5:20 - Started run 8
5:28 - Stopped run 8

Run 9
- Fe source on Pos5

5:29 - Started run 9
5:35 - Stopped run 9

Run 10
- Am source on Pos6 (Timepix)
- CdTe still taking data from last config

5:43 - Started run 10
5:44 - Stopped run 10

Timepix power cycle
5:46 - Timepix powered off
5:50 - timepix powered on

Run 11
- Am source on Pos2

5:57 - Started run 11
6:00 - Stopped run 11

Run 12
- Am source on Pos3

6:01 - Started run 12
6:05 - Stopped run 12

Run 13
- Am source on Pos4

6:05 - Started run 13
6:08 - Stopped run 13

Run 14

- Am source on Pos5

6:09 - Started run 14
6:12 - Stopped run 14

Run 15

- Fe source on Pos2
- Long exposure Fe measurement while system warms up

6:17 - Started run 16
6:18 - Started cooler ramp up
6:20 - Cooler at -18C, closed nitrogen valve

- 6:21:50 1ºC away from setpoint
- 6:22:40 at -15.9 ºC, should be at -17.6 ºC

6:23:05 turning nitrogen back on.
6:32 at -13ºC
6:32 stopping data collection

Run 16 and 17
Some minimal housekeeping board data was taken across these two runs, but no significant detector data. Saving these for the housekeeping data.

6:35 stopping CdTe data collection
6:36 shut down CMOS
6:37 problem: didn't lower CdTe bias before CMOS shutdown. Can't communicate. Try restarting Formatter software.
6:53 figured it out, lowered bias and powered off all subsystems.

- Tried directly power cycling Formatter stack (including SPMU) via GSE connection to Housekeeping board. That did not fix it (Formatter hung on startup when trying to connect to SPMU-001 still).
- Once CMOS has shut down, able to restart Formatter software and command DE again. So CMOS blocks the SpaceWire bus while it has shut down but not powered off. The block is not cleared until CMOS power off, regardless of Formatter SPMU power cycle.

Thursday, Mar 21 2024

Thanasi documenting

Items for the day:

- SAAS [DONE] and Timepix fixes
- LN2 system plate mounting [DONE]
- Hi-C is doing sequence, may need to work around
- Canister HK packet change
- Discuss miniblockhouse or pedestal RS-232 link to SOC. Enables LN2 laptop to be in SOC.
- Beth can stay MAXIMUM 12 hours on Saturday. Need to wrap test by then.
- Check in with Sean about staging plans next Friday.
    - FOXSI/Hi-C will stage Thursday/Friday. Each day is like this:
        i. GPS rollout
        ii. Go straight from rollout onto rail
        iii. 3x power on checks of full system on rail
    - So we need support to verify interfaces on the rail. Will try to take care of this early next week with GSE and range support—get a Pi with 192.168.1.8, plug in on the rail, see if we can find it from SOC GSE.
- Ask NSROC (and anyone else) about FOXSI-4 shirts/hoodies?

Timepix work, as seen from Formatter

- Developments yesterday:
    - During the cooling test, Timepix was often on in the background. Formatter continuously requests Timepix data.
    - At some point, Milo changed the Timepix baud rate from 19200 (correct, agreed upon interface) to 9600, and communication started working. This means the Formatter's serial port is incorrectly configured for 9600 baud.
    - Thanasi is confused, the configuration file doesn't reflect this, and no UART system (Timepix or uplink) uses that baud rate. So it seems like the serial port is not being set up correctly in the software. The code that configures the port hasn't changed since Jan 16.
- Work today:
- Enabled printout of serial port config when Formatter starts up.
    - Prints out the expected baud rate (19200). Getting no data from Timepix though. Milo still has 9600 baud in Timepix. Change it back, reboot Timepix, and check.
    - It works after rebooting Timepix. Only Formatter change was added print statement before starting loop, to display UART config, and a full clean rebuild of the software with all file `touch` times current.
        - Suspected mechanism: when I build, the file modification time is checked. The modification times are all over the place, because I do the change on the GSE computer then push the files onto the Pi. And the Pi's clock reset every power cycle. I think `cmake` is trying to be too clever, and omitting some files based on their modification time, so the

`apps/main.cpp` or `src/TransportLayer.cpp` file were old, and retained hardcoded baud rate.

- In the above, Formatter software was started manually. Doesn't work when rebooting Formatter. `systemctl` must have a stale `formatter` binary cached.
- Reloaded `systemctl` Formatter service, power cycled Formatter (hard, as in flight), then powered on Timepix with uplink. Still doesn't work. Suspect `formatter.service` may have stale configuration path?
- After lunch: on Formatter boot, running with `systemctl`, Timepix UART is incorrectly configured. Timepix receives bad commands. Stopped `systemctl`, then started, then it works!?
- Then did:
  ```
  sudo systemctl daemon-reload
  sudo systemctl disable formatter.service
  sudo systemctl enable formatter.service
  ```
- And reboot. Now it works.
- Next: power everything off, start up as usual for launch sequence, see if there are issues.

run1

- 2:27 pm power cycle Exp. Only Formatter on first.
- Going to see if Formatter can talk to Timepix correctly after boot.
- 2:28 pm powered on Timepix with uplink command.
- 2:32 pm Timepix gets wrong commands from Formatter.
- 2:33 pm stopped formatter.service.
- 2:35 pm started formatter.service.
  - Now get data no problem.
- 2:41 pm set formatter.service Type=forking and reloaded daemon, enabled formatter.service, power cycled.
  - After, can command DE power on, so Formatter is running.
- 2:42 pm powered on Timepix. Now it looks like Formatter is stopping and getting restarted by systemctl periodically. Takes some data from Timepix once started.

run2

- Erratic Timepix data while trying out systemctl.

run3

- Added `ExecStartPre=sleep 10` (seconds) to formatter.service, restarted. No luck. (Was supposed to delay start of formatter.service by 10 s, giving time for other stuff to get configured).
- After Formatter `sudo reboot` (Timepix remains on), get data no problem.
- After hard power cycle Formatter (Timepix remains on), get data no problem.

run4

- 3:30 or so power cycled Exp, only Formatter starts on.
- 3:39 pm powered Timepix on.
- 3:46 pm getting no data from Timepix. Confirm with printout from Formatter.
- 3:46 pm reboot Formatter. Now get data without issue.

Thinking with Milo

- Need a functional plan going forward before more troubleshooting.
- We can reboot (OS only) Formatter on the rail via umbi. Modify subsystem power on sequence like this:
    1. Exp power on
    2. Timepix power on (uplink)
    3. Formatter reboot (via umbi ssh)
    4. CMOS 1 power on (uplink)
    5. …
- This adds ~45 seconds to the total startup time and should work immediately.
- … Checking if Formatter can reboot and work halfway through the 4 minute Timepix startup delay, or if we need to reboot Formatter until *after* 4 minutes after Timepix power application.
    - YES. Works fine rebooting Formatter

run5

- 5:06 pm power on Exp. Shortly after, power on Timepix. Wait a minute, then
- 5:07 pm reboot Formatter from inside, (ssh terminal command).
- 5:11 pm or so, Formatter gets good data from Timepix.
    - **So operationally, we are ok to power on Timepix and preemptively reboot Formatter.**
- 5:12 pm confirmed bias commands and erase data get through.
    - **GSE note: HVPS field stays off after bias applied, but see change in Timepix filesize and rates.**
- 5:13 pm stopped run, power all off.

run6

- Testing sequence Exp on -> Timepix on -> Formatter reboot -> all other subsystems on
- 5:41 pm power on Exp.
- 5:42 pm power on Timepix and reboot Formatter
- 5:44 pm power on CMOS 1
    - Get data down
- 5:44 pm power on CMOS 2
    - Get data down
- 5:45 pm power on CdTe DE
- 5:46 pm power on canisters
- 5:47 pm uplink delete raw data, ppslog, runlog from DE
- 5:49 pm start taking CMOS and CdTe data

- 5:51 pm stop GSE recording

run7

- 5:52 pm power on SAAS (forgot to earlier).
- 5:53 pm reboot Formatter from ssh.
- 5:46 pm stop taking data
- 5:59 pm power off

run8

- Changing Formatter-Timepix baud rate to 9600. So it will use this regardless of reboot/configuration. Check packet misses.
- 6:25 ish power cycled Exp.
- 6:27 pm powered DE on (for crude check of dropped Timepix packets)
- **GSE note: does unixtime change?**
- 6:29 pm power on Timepix
- 6:33 pm get Timepix data, delete data and HV ramp up commands go through as well. Doesn't look like an absurd amount of packet loss. Fly it.
    - **Thanasi** revise Timepix baud rate in foxsi4-commands repository.
    - Already edited in Formatter onboard.

CdTe canister HK packet change

- Minami san requested the canister HK data extend to address 0x01eb032c. This adds 20 B to the canister HK packet, a breaking change to the downlink interface. It sounds like this is necessary.
- After implementing, the current canister HK parser will only be valid for prior canister HK data. A modified HK parser will only be valid for new canister data.

SAAS work

- Look at Tamar's notes for this as well
- Fixed issue with the SAAS turning off at 10 minutes by turning off the display power management system. Check the notes for full flight configuration on this.
- Coordinate system:
    - +y is solar north, +z is from optics to detectors, +x up when the levelling plate is rotated to be on the port side of the payload
- Moving light on SAAS in the +y-direction, source moves right on the screen
- Moving light on SAAS in the +x-direction, source on screen goes down
- 2:25 pm SAAS has been running in flight mode for 40 minutes continuously, no issues. Temp is 40 ºC. Powering off.

Friday, 22 March 2024

Plans

- CdTe DE software update and validation
- CdTe frame data unixtime/TI issues
- Theodolite alignment checks
- Setup for x-ray alignment checks

CdTe DE bias change validation

- 10:21 am Minami san implemented change to CdTe DE to continue observation mode through bias voltage changes.

run1

- 10:22 am powering on Exp
- 10:23 am power on CMOS 1 and CMOS 2
    - Data lands on GSE
- 10:25 am power on CdTe DE and canisters
    - Uplinked set_ping_update to DE, canisters ping back (not needed, just less waiting for canister ping confirmation)
- 10:26 am power on Timepix and SAAS
- 10:27 am start CMOS data
    - Looks good in GSE
- 10:28:15 am CdTe DE init
    - Confirmed in GSE
- 10:28:45 am CdTe DE standby
    - Confirmed in GSE, bias 60 V
- 10:29:10 am CdTe DE obs
    - Confirmed in GSE
- 10:29:30 am CdTe DE broadcast canister start
    - Pedestals come in
- 10:30 am also getting Timepix data now
- 10:31 am CdTe DE set HV 0V
    - Looks good, see HV change on GSE, still getting event data down.
- 10:32 am CdTe DE set HV 60V
    - Looks good also, see HV change on GSE, still getting event data.
- 10:34 am CdTe DE set maximum vth and dth, then start observation
    - Obs automatically stops on threshold setting
    - After starting, get data back. Count rate higher than before.
- 10:35 am stop CMOS and CdTe data taking
- 10:36 am CMOSes shutdown and powered off

After that

- Thanasi added one “clear” line to Formatter, at the end of `TransportLayerMachine::remote_buffer_transaction()`. This clears the frame from the last `FramePacketizer` used, with the remote hope that it would help with Unixtime. The frame should already be clear. There are no expected side effects of this line.
- If successful, this should be versioned as v1.1.1.
- Power cycled Formatter after build.

run2

- Testing CMOS 1 with Fe-55
- 11:45 am powered on Exp
- 11:46 am powered on CMOS 1 and 2
  11:48 am powered on CdTe subsystem
- 11:49 am powered on SAAS and Timepix
- All systems nominal so far
- 11:50 am deleted data from both CMOSes
- 11:54:15 am start CdTe data collection
- 11:55 am start CMOSes data collection
- 11:56 am brought Fe-55 source to CMOS1
- 12:01 pm stopped source, sent CMOS stop to both. (CdTe still running)

run3

- 12:06 pm stop to started both CMOSes
- 12:07 pm brought Fe-55 source to CMOS2
- 12:12 pm stopped source
- Background reading from Geiger is ~0.02 mR/hr after test
- 12:14 pm stopped both CMOS, CdTe still running.
- 12:52 pm CdTes still running. Starting to see CdTe time problems emerge.
  - This is about an hour after starting CdTe data collection.
- Around 1:02 pm stopped the GSE log.

- Later, 1:19 pm, tried pulling from main. Includes Kris’s recent filter for unixtime/TI jumps *and* Thanasi’s uplink command box changes. Plots no longer update. Reverted back.
- After reverting and relaunching GUI, fascinatingly, CdTe 4 no longer has jumpy livetime. Screenshot after revert and relaunch GUI. Before, saw red and green lines

for CdTe 4 jump back to zero and forward again.

- Stopped taking CdTe data and powered off CdTes. And powered off Timepix and SAAS.

run4

- Validating GSE update with changes: uplink window has more info, uplink commands are logged, and Kris's edit to reject unixtime and TI jumps.
- It works. Version it.

30run5

- Changed CdTe canister HK frame size to 0x330, to include all canister fields documented in DE repository.
- ***THIS IS A BREAKING CHANGE FOR GSE CDTEHK PARSER. DIFFERENT PARSERS WILL BE NEEDED FOR DATA TAKEN BEFORE VS AFTER THIS CHANGE.***
- 3:45 pm powered on Exp (with frame size change implemented)
- 3:46 pm powered on DE, eventually started taking data
- 4:00 pm ish changed CdTe canister HK parser for new frame size
- 4:10 ish updated GSE display with new HK data from canister
- 4:14 pm stopping log

run6

- 4:20 pm trying out GSE display of data in new canister HK frames.

- GSE now should display correct # rest evt frame value after canister HK data size change.
- Everything looks good! #rest evt frame is **zero.**
- 4:22 pm powered everything off and shut it down.

run7

- Validate CMOS background subtraction functionality in GSE. (Uses an array of zeros for the background image).
- 4:25 pm or so powered on Exp
- 4:28 pm powered on DE. HK data looking good!
- 4:30 pm powered on CMOSes
- 4:32 pm started taking CMOS and CdTe data (and powered on Timepix)
    - Full mode CdTe
    - Still looks good after frame size change
    - Get Timepix data
- 4:40 pm stopped everything, powered off.
- This is Formatter v1.1.1.

run8

- Validating changes to Timepix parser
- 5:13 pm starting up GSE with Timepix parser changes
- 5:13 pm power on Timepix
- 5:18 pm see data in the GSE. Kris sees what he expected. Good.

Theodolite Test

- Dan, Milo, Hox and Tamar did the theodolite test.
- **We found the following: 0.1arcmin change in horizontal direction and 0.5arcmin change in vertical direction from the last test at WSMR – this is due to shipment.**
- Complete notes and calculations can be found in notes here

Saturday, 23 March 2024

Planning x-ray alignment

- See Lindsay's document for roles and plans.

X-ray alignment at PFBB

- The length from laser plate to optics centre: 62 ft 3 inch = 18.97 m
- 8:37 The cooling is started. (T. Minami)
- 9:02 am setting up quad cell. Required brief unbagging of connector but we're still at 20 ºC.
- Radiation meter
  No. 58: optics side near the SAAS or laptop for cooling in a small room.
  No. 59: x-ray generator side (with Wayne?)
- The height of beam laser: 51.5 ft
- 9:38 laser beam alignment start
- 9:44 adjust the height of the payload
- 10:20 coalignment is confirmed

More detailed SAAS notes available here.

Communication setup

run1

- Validating GSE <=> Exp communication, all subsystems data collection after moving Exp to test config.
- Connected Ethernet to both CMOS, DE, and Timepix for this test. SAAS output is just over BNC to monitor in broom closet.
- 8:28 am confirmed power input connector to Exp and powered on, nominal power consumption.
- 8:30 am power on CMOS 1 and CMOS 2
- 8:32 am power on all CdTe.
  - Ping good
- 8:33 am can ssh to CMOSes and CdTe DE from GSE uplink computer.
- 8:35 am powered on Timepix and SAAS
- 8:36 am confirm SAAS video feed
- 8:36 am start taking CdTe sparse pedestals and CMOS data
- 8:45 am stop taking CdTe and CMOS data
- Started using remote desktop instead of direct GSE uplink control
- 8:46 am powering off Timepix (via remote desk)
- 8:47 am stopping log (via remote desk)

X-ray generator and radiation check

Written by Riko.

- Lindsay, Wayne, Dan, and Riko were in the X-ray generator room.
- 10:52 am Wayne turned on the X-ray generator with half power.
- 10:54 am Full power (30 kV 1 mA)
    - Lindsay and Dan confirmed that the room radiation was okay except for the door crack.
- 11:05 am Lindsay walked around outside the building to confirm the radiation was okay.
- 11:07 am Wayne turned off the X-ray generator.
- 11:09 am Wayne turned on the X-ray generator with full power.
    - Lindsay walked around the building to check the radiation.
- 11:11 am Wayne turned off the X-ray generator.
- Lindsay was standing at the northeast corner and Dan was at the southeast corner.
    - 11:19 am Wayne turned on the X-ray generator with full power.
    - The northeast corner was okay. The southeast was okay if you are sitting.
    - The northwest corner was okay. The southwest was okay.
- 11:24 am Wayne turned off the X-ray generator.
- 11:27 am Wayne turned on the X-ray generator with full power.
    - Lindsay checked the radiation.
- 11:29 am Wayne turned off the X-ray generator.

Prep for x-rays

run2

- Taking full mode pedestal
- 12:15 pm power cycled all CdTes
- 12:19 pm biased to 200 V (after 100 V first)
- 12:20 pm starting taking data
- 12:06 pm stopped taking data, saved, extracted raw from DE

run3

- Taking sparse mode pedestal
- 12:32 pm deleted DE files, set sparse mode.
- 12:33 pm started taking data
- 12:37 pm stopped taking data

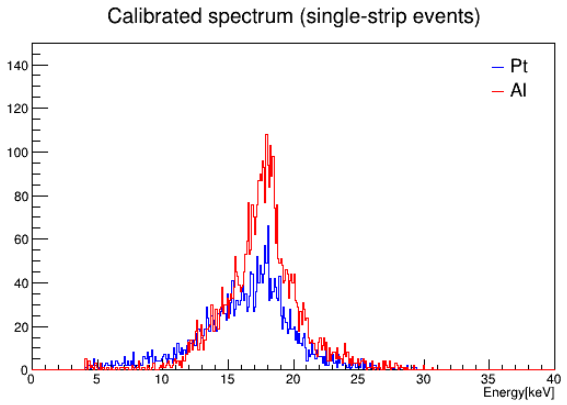
run4

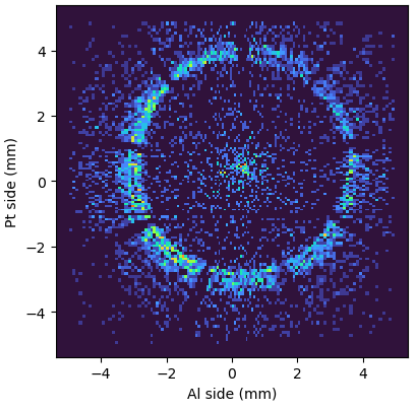
- Was planning to start x-rays, but not ready this run.
- LN2 as low as Kris could get
- -19.8 ºC, 200 V bias
- 12:41 pm or so started new GSE file

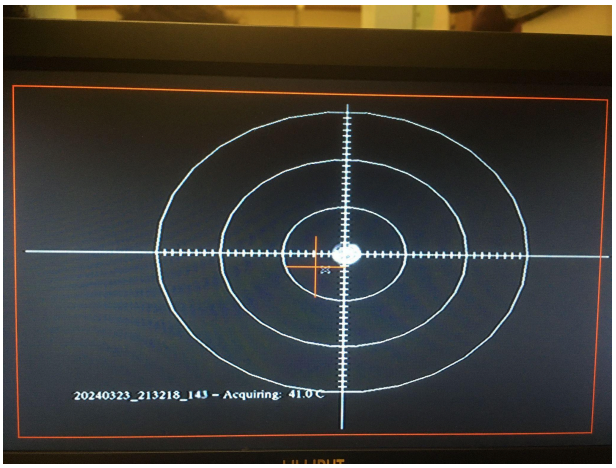
- 12:43 pm started taking CdTe data
- 12:50 pm powered on SAAS
    - Need to align SAAS with laser. No x-rays. Pausing to align.
- 12:55 pm stopped CdTe data taking
- 12:55 pm started Timepix, deleted all CMOS onboard data. Plan going forward will be to observe with all detectors for all runs, for flight-like-ness.
- 12:58 pm see Timepix data coming in
- 1:27 pm SAAS aligned

run5

- 1:30 pm started GSE and CdTe readout, deleted data first
- LN2 on, -19.6 ºC, 200 V bias, x-rays in pos 2.
- 1:31 pm starting x-ray generator
    - 30 kV, 1mA
- 1:36 pm stopped CdTe data taking and stopped GSE, saved out DE files.
- cdte4 plots (from GSE files, after calibration):



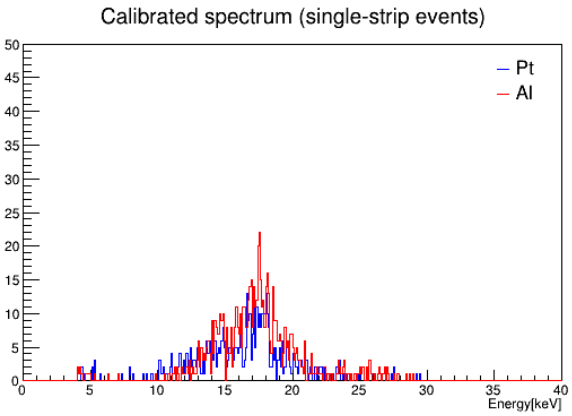


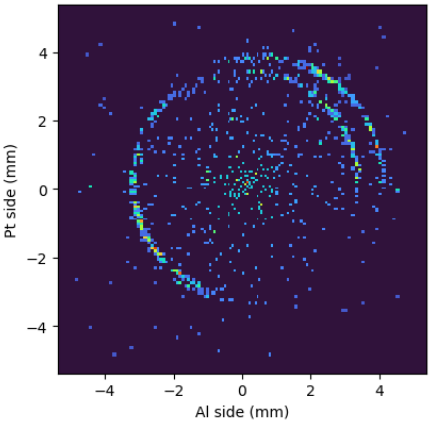


run6

- 1:42 pm aligning for pos 3
- 2:00 pm deleted CdTe data.
- 2:01 pm started CdTe and CMOS observation.
- LN2 low, -20.3 ºC
- 2:03 pm starting x-rays

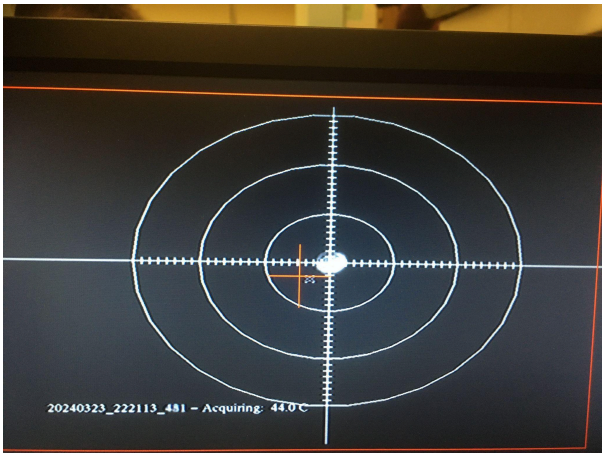
    - 30 kV, 0.1 mA
- 2:05 pm not seeing ring on GSE.
- 2:07 pm see rings, but image is odd.
- 2:08 pm stopping x-rays.





run7

- 2:17 pm going to take more data in the run6 configuration
- 2:18 pm stopped CdTes, deleted data, stopped CMOS
- 2:19 pm starting CdTe observation
- 2:19 pm starting x-rays
    - 30 kV, 1 mA, full power
- See ring faster this time
- 2:24 pm stopping data collection, ramping down x-rays



run8

- 2:28 pm moving to pos 4 – no realignment necessary
- Deleted CdTe onboard data
- 2:31 pm starting CdTe data taking
- Focal plane at -19.7 ºC
- 2:31 pm starting x-rays
    - 30 kV, 1 mA
- 2:33 pm not seeing ring on GSE, but see ghost rays in pos 3 and pos 2
- Note on GSE: livetimes still jumpy.
- 2:40 pm stopped taking data, SOC GSE saw something different from PAB GSE.
- This was after PAB GSE had Clear Images'd the GSE
- Going to try again.
- Screenshot from broom closet for this run indicates, oddly, a ring on CdTe4?

run9

- 2:44 pm restarted SOC and PAB GSEs.
- Confirmed we should be sending _stop and _readout_stop to stop CdTe observation (not de_end). This is how we have been operating.
- At -19.7 ºC, bias 200V
- 2:45 pm started taking data with CdTe.
- 2:46 pm starting x-rays
    - 30 kV, 1 mA
- 2:52 pm stopped x-rays
- 2:53 pm stopped CdTe observation and GSE, copied out DE data
- 2:56 pm set CdTe bias 100 V
- 2:57 pm set CdTe bias 60 V
- 2:58 pm powered off CdTe subsystem via uplink command
- 2:59 pm powered CdTe DE back on
- 3:01 pm powered CdTe canisters back on, they ping well.
- 3:05 pm stepped through init, standby, obs, bias 100 V
- 3:07 pm bias 200 V

run10

- 3:14 pm started GSE and CdTe observation
- 3:15 pm ramping up x-rays
    - 30 kV, 1 mA
- 3:25 pm stopping x-rays
- 3:25 pm stopped CdTe observation
- 3:26 pm ish stopped GSE
- 3:28 pm saved out data from DE
- 3:30 pm deleting raw data from DE
- 3:31 pm lowering CdTe bias, then powered off CdTe system
- 3:36 pm powered CdTe system back on

Observations/interpretations:

- In some of the previous runs, it seems like “zombie data” persists from earlier runs. This does not seem to be an issue confined to the GSE, indicating that it’s somewhere farther back in the data stream.
- In run 10, which was after a full power cycle of CdTe detectors and DE, we could see the expected ring on the detector (though a bit faint). In runs 8 and 9 (before that detector power cycle) there was no sign of the ring at all. (Look at DE data to confirm this.)
- Zombie data investigation: suggest to compare telemetry packets and DE data for the same runs (as well as they can be matched up). Update (4 pm): Yixian determined that the zombie images do ***not*** show up in the DE data.

3:30 pm: Kris opened the valve slightly on cooler because pressure had dropped slightly. Temperature was at -19 deg C. Update: upon closer inspection, the cooler computer macro had stopped. The temperature was actually a bit lower than that. Kris restarted the macro. No problem.

run11

- 4:01 pm aligned in pos 5
- Focal plane at -20 ºC
- 4:02 pm started taking data
- 4:02 pm started ramping x-rays
- 4:03 pm full power x-rays
    - 30 kV, 1 mA
- 4:07 pm not seeing anything. Reinitializing CdTe system.
- 4:11 pm bias back up to 200 V
- 4:11 pm starting obs again
- At 4:14 pm, PAB and SOC saw a ring appear at the same time.
    - This indicates its not a delay just for SOC or PAB.
- 4:17 stopped taking data, turned x-rays off.

run12

- 4:31 pm aligned for x-ray generator in pos 0, CMOS 1
- Generator in position 0

- 5:05 pm started taking data with CMOSes and CdTes
- Focal plane at -20 ºC
- 5:08 pm turning on x-rays
    - 30 kV, 1 mA
- 5:09 pm full power x-rays
- 5:19 pm stopped x-rays, stopped CMOSes and CdTes
- Pulled data out of DE.

run13

- 5:31 pm aligning for x-ray generator in pos 1, CMOS 2
- 5:34 pm aligned
- Focal plane -20 ºC
- 5:37 pm deleted CdTe DE data
- 5:37 pm starting CdTe observations
- 5:38 pm starting CMOS observations (stop to start)
- X-ray generator 1 mA, 30 kV
- 5:53 We have a zombie image on CdTe1; we are restarting the GSE to see if that fixes it.
    - It fixes it, no longer see ring in CdTe1 on PAB GSE.
- 6:10 pm stopping CMOS data collection and CdTe data collection. Also X-rays off.
- Done with this position, switching to position 6, Mini-X2, Timepix.
- 6:18 pm started Wireshark recording on PAB GSE

6:34 pm

- Installed Mini-X2 in position 6
- Used same setup as at WSMR: generator taped to source holding fixture, fixture unscrewed in top right corner to allow fixture to tilt forward, screw in left lower corner unscrewed slightly in order to allow the tilt.
- Gave it 7 turns this on the upper right screw this time (actually about 7.25 turns). This may make it more or less aligned than what we saw last time, but Lindsay wanted to make absolutely sure we weren't cutting off the flux. (Don't have a way to see it live with Timepix.)
- Meanwhile, they're working on the alignment. 6:37 pm we are aligned.
- Temperature of focal plane is -2 deg C at 6:37 pm.

run14

- 6:41 pm aligned for x-ray generator in pos 6. Timepix is working, has bias up already.
- 6:44 pm restarted GSE, Timepix data not displaying but being logged. Milo confirms filesizes look good.
- 6:45 pm deleted Timepix data, starting x-rays
    - With Mini X2
    - 30 kV, 125 µA
- 6:46 pm deleted Timepix data again
- 6:47 pm started taking CdTe data
    - Sparse mode, 60 V bias, temp 3.7 ºC
    - Immediately unixtime is jumping around

    - Even the cdte1 pedestal looks like a mix of a full and sparse pedestal (very thin superimposed on noise)
- 6:52 pm stopped CdTe, ramping down x-rays
- 7:10 pm Milo got the CdTe data out
- 7:10 pm powered off all systems
- 7:17 pm stopped GSE pcap

[Analysis of zombie images here]

SAAS Alignment

For the filters, Dan switched them out to 0.3 and 0.6 ND filters. We put the flight/helio filters back in their boxes and I put the box in the gray saas box along with the ring tool. We used the pinhole for the SAAS laser.

For the SAAS, we took images each time which are documented in the notes here.

After alignment: return the OG SAAS filters that are currently in the box

Monday, 25 March 2024

Plans

- Remove CMOS data
- Remove SAAS data (post turn-on test, in afternoon)
- Work on zombie data
- Turn on test with uplink downlink from SOC
- Find (from NSROC) a Dsub splitter for redundant command uplink
- Todo tonight:
    - ☐ Buy a long (10 ft or more) HDMI, if ∃
    - ☐ Buy a small SSD, just to get data up the hill/off the range faster.

Morning

- 8:59 am Shimizu san took data out of both CMOSes.
- 9:01 am shutting down both CMOSes, powering off Exp for move to turn on test.

Power check with NSROC

- 11:03 am Exp rolled out into main PAB to mate connectors with TM.
    - Thanasi plugged in laptop to check formatter turns on. Cannot yet send uplink or receive telemetry at SOC, just verify power.

- 11:08 am Mario (NSROC) mated just power connector to Exp, no data will flow through TM anyway right now.
- 11:10 am powered on Exp, 420 mA total. Can ssh to Formatter via umbi.
- 11:12 am powered off Exp. It powers off too!
- NSROC will get ready for post-lunch TM work.

Turn on test with NSROC (TM + uplink)

- 10 am or so Thanasi set up GSE (1a6cfb8) in SOC. Still need the uplink RS-232 to USB connector from PAB to close the loop.
- 12:10 pm Lindsay plugging in uplink, EVTM, and SAAS BNC connectors to payload in PAB.
- 12:20 pm all TM/Exp interfaces connected:
    - Power connected
    - EVTM connected
    - Uplink connected
    - Flight events connected
    - SAAS BNC connected

run1 (stored on SOC GSE)

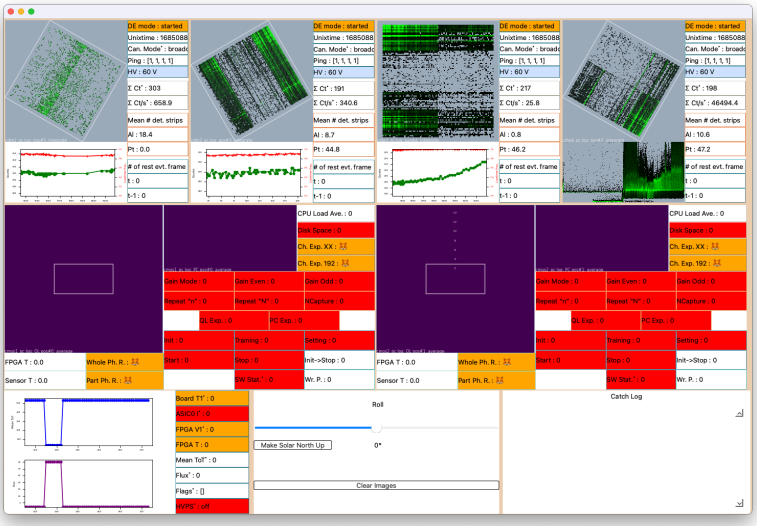
- 12:32 pm started GSE, records
- Will try to receive Exp data via TM, uplink + downlink.
- 12:45 pm Exp still off. Sent a bunch of random commands just to Hox to confirm uplink path.
- 1:05 pm Exp power on (via PLC)
- 1:05 pm Exp uplink CdTe DE power on, looks good
- 1:07 pm PLC confirmed Exp power supply has current limit 5.19 A
- 1:07 pm uplinked CdTes on, all ping back good.
- 1:09 pm uplinked CMOS 1 on
- 1:10 pm uplinked CMOS 2 on
- Both ping back
- 1:12 pm powered SAAS on
- 1:14 pm no SAAS image in uplink room yet, standing by for Garrett to check
    - The feed is here on Hox's monitor
- 1:15 pm starting CdTe data taking
- 1:16 pm startin CMOS 1 data taking,
    - Then can no longer click on GSE!
    - Wait. Can actually click on the GSE fine, just not on the Command dropdown of the uplink window.
- 1:18 pm starting CMOS 2 data taking
- All CdTe and CMOS data looks good. Downlink data rate ~1.2 Mbps
    - Recording in wireshark.
- 1:22 pm Milo asked to turn on Timepix for 5 minutes (4 minutes booting + 1 minute time on).
- All systems on now, drawing 4.2 A from Exp.
- 1:25 pm see SAAS image now. Garrett messed with decoder in TMA to get it working.

- 1:26 pm see Timepix data
- 1:27 pm sent Timepix HV ramp up start
    - No change on read_rates
    - Sent again
    - No change on read_rates
- 1:28 pm powered off Timepix
- 1:31 pm stopping and shutting down CMOSes
- 1:32 pm powered off CMOSes
- 1:35 pm powered off CdTes
- See no more data coming down
- 1:36 pm enabled a little power and RTD data, receive on GSE. So link is still good, systems are just off.
- 1:38 pm stopped GSE, saved files out to mar25/run1.
- (re: zombies: got good unixtime the whole time, 33 minutes)

CdTe DE investigation

run2 (stored on PAB GSE)

- See notes here. Implementing the Plan at bottom.
- 3:35 pm set up Exp back in garage, powered on from bench supply.
- 3:37 pm powered on CdTe DE
- 3:38 pm powered on all canisters
    - Ping good
- 3:39 pm starting CdTe data taking (sparse)
- 3:40 pm power on Timepix
- 3:41 pm first few points on the CdTe lightcurves look normal
- 3:56 pm sent some Timepix commands.
- 3:57 pm powered off Timepix.
- 3:58 pm unixtime still looks fine
- 3:58 pm, working on Formatter implementation of fix:
    - On PAB GSE
    - On latest main.
    - Subfolder mar25/run2/backup_formatter contains:
        - Current (mar25) formatter binary
        - Current TransportLayer.cpp, which is about to be modified.
- 4:09 pm unixtime still ok on GSE
- 4:24 pm unixtime still ok. But this is a weird lookin pedestal in CdTe 4:



- 4:25 pm finished Formatter code changes. Looks good when running foxsimile, but can't yet check that last frame in ring buffer will be handled correctly.
- 4:26 pm zombie data is here.
- 4:33 pm second zombie data.
- 4:33 pm going to reboot formatter only, via ssh. GSE and CdTe system wil continue running.
- 4:34 pm rebooted formatter
    - Also started a packet capture
- 4:34 pm get more data.
- 4:35 pm cleared images on GSE. Unixtime keeps on jumping. So formatter reboot doesn't change it.
    - CdTe 3 and 4 are still increasing time normally.
- 4:39 pm hard power cycling formatter via uplink.
- 4:42 pm getting no data down
- 4:46 pm can't restart Formatter software. Failing to connect to HK board. Will need to restart whole test.
- 4:47 pm stopping GSE, building new Formatter software with proposed fix.
- 4:50 pm: note: Formatter storage was full. Deleted logs.

run3 (stored on PAB GSE)

- 4:51 pm building new formatter executable onboard.
- 4:57 pm reload systemcl daemon, disable/enable service.
- 4:57 pm power cycle Exp.
- 4:58 pm Formatter did not launch. Systemctl could not find getty After requirement implemented for Timepix UART troubleshooting. Remove the requirement and reloaded.
- 5:03 pm powered on Formatter.
- 5:04 pm powered on CdTe DE
- 5:05 pm powered on CdTe detectors
- 5:06 pm starting CdTe data

- 5:10 pm put previous formatter binary back in, systemctl daemon-reloaded and enabled and started service. Then power cycled system. Need to use this to confirm jumpy unixtime before switching to the new binary.
    - The **new binary** is just in formatter:foxsi-4matter/
    - mv it back in bin once confirmed with old binary
    - systemctl fighting tooth and nail
- 5:18 pm started previous (x-ray alignment version) formatter again, powered on DE.
- 5:20 pm powered on canisters
- 5:21 pm starting taking data
- 5:21 pm unixtime jumping
- 5:22 pm restarting GSE so unixtime jumps are obvious

Run4

- Started GSE 5:22 pm, DE taking data
- 5:55 pm still normal unixtime
- 5:57 pm zombie data in CdTe 4
- 5:58 pm ssh'd, stopping formater.service.
- 6:00 pm moved new binary in place, daemon reloaded, systemctl enabled, rebooted
- 6:01 pm stopping and starting GSE for a fresh image.

run5

- Started GSE 6:02 pm
- So far so good, no jumps in unixtime

Tuesday, 26 March 2024

Plans

- Validate zombie data fix
- Thanasi should talk to Hi-C's Jim Cecil about IP address allocation.

SAAS

- 8:45 am Tamar connected SAAS double USB breakout, use to pull data out later
- 12:12 pm powered on SAAS
- 12:20 pm not seeing SAAS on VGA, seems like loose VGA connection inside bag. Tried power cycle SAAS, no luck. Get in later.
- 4:10 pm SAAS flight ND filters (4.0 + 0.3) were put back into the baffle.

Cooler Controller Issue

- More details on this issue can be found in the explanation
- The cooler appeared to not execute any commands sent after the first one
- It would found that the controller was starting up with the PROGRAM setting instead of IMMEDIATE
    - Send command `SI` to make sure the controller is in IMMEDIATE mode

Zombie data work

run1

- 8:46 am powered on system
- 8:46 am powered on DE
- 8:47 am powered on canisters
- 8:48 am started taking data
- 9:37 am still no zombie data
    - Started capture
- 9:53 am still no zombie data
- 10:58 am still no zombie data.
- 11:27 am still no zombie data.
- 11:53 am still no zombie data.
- 12:12 pm powered on SAAS (still no zombie data)
- 12:20 pm not seeing SAAS on VGA, seems like loose VGA connection inside bag. Tried power cycle SAAS, no luck. Get in later.
    - Still no zombie data
- 12:25 pm power cycling CdTe system. Stopped data collection then cycled.
    - Pedestals were just so noisY

Meeting about data

- (These notes are not perfectly chronological—this meeting occurred during run1, around 10 am)
- Nagasawa san checked DE source code, write pointer value is updated *before* data is written in buffer. This is consistent with the observed behavior.
    - Shimizu san confirmed the CMOS updates its write pointer *after* the data is done being written to ring buffer.
- Minami san is concerned that the counter for unsaved data frames is almost always zero in the downlink data.
    - Concurrence is that this is not mission critical, we will work on rate calculation instead.
- If we continue to see zombie data today after Formatter fix, we could:
    - Handle this with a filter on the GSE?
    - Continue trying to fix with onboard software?

Plans:

- Let DE run for a long time
- Take sealed source data
- Consider doing x-ray generator data
- Kris and Lindsay discuss CMOS image implementation in GSE
- Take sealed source data for all detectors.
    - Also need to check CMOS parser

run2

- 12:29 pm starting CdTe data collection after power cycle
    - Data looking fine
- 12:33 pm powered on CMOSes for Shimizu san to change exposure setting for sealed source test.
    - Note on exposures: this is implemented in CMOS by symlinking a new binary to run. The flight binary is still in the CMOS filesystem.
    - After this test, need to symlink the flight binary again and validate.
- 12:45 pm Shimizu san updated both CMOS exposure times. Now send stop_to_start to both to validate
    - Shimizu san confirms CMOS images look ok in the GSE. Exposure times are correct for both.
- 12:48 pm stopped data taking for both CMOS and shutdown, then powered off.
    - After power off see CdTe data come back in.
- 1:06 pm no zombie data
- 1:16 pm Yixian notices CdTes 2 and 3 look strange, should see noise counts. CdTe 2 hasn't updated in a while.
    - Will try stopping CdTe 2 and 3 observation, power cycle, and start again.
    - Power cycled only CdTe 2 and 3, but reinitialized DE, so all CdTe got reinitialized.
- 1:20 pm CdTe 3 looked normal after power cycle, but no data back from CdTe 2. Power cycle the whole CdTe subsystem.

run3

- 1:25 pm power on DE
- 1:28 pm power on canisters
- 1:28 pm initialize and start taking data
- 1:31 pm data looks fine
- 1:42 pm data looks fine
- THOUGHT ON FORMATTER IMPLEMENTATION: HOW DOES THIS CHANGE THE USE OF LAST_WRITE_POINTER?
    - This should be ok. I return the value that is decremented as the last_write_pointer. So CdTe should all be referenced to the decremented position, and CMOS should be unaffected.
- 1:46 pm livetimes look weird. Closing LN2 from ½ turn to ¼ turn open.
- 1:47 pm moving LN2 to ⅛ turn open
- 1:51 pm opened LN2 valve back up to cool
- 2:00 pm things are fine
- 2:15 pm getting out sealed sources
- 2:24 pm stopping GSE

run4

- 2:24 pm starting GSE
- 2:26 pm bias CdTes 100 V
- 2:27 pm bias CdTes 200 V

run5

- 2:35 pm run start. bias CdTes 200 V, focal plane temperature -20.1 C
- 2:38 pm source inserted in front of CdTe DE 3. Bias CdTes 200 V. Focal plane temperature 20.1 C
    - Source can be seen. Uniform illumination
- **To Do**: Ask Kris if pedestals 1 & 2 are being cut off?
- 2:42 pm run finishes and source removed

Run6

- 2:43 pm run start. bias CdTes 200 V, focal plane temperature -20.0 C
- 2:44 pm source inserted in front of DE 3. Lindsay tried to illuminate just a corner. Initially, radiation looked uniform.
- 2:45 pm Source removed.
- 2:47 run ended. Bias V and temperature same as above

Run7

- 2:48 pm run start. bias CdTes 200 V, focal plane temperature -20.0 C
- 2:48 pm Am 241 source inserted in front of CdTe detector 2. Uniform illumination
- 2:51 pm source removed and run finished. Voltage and temperature unchanged.

Run8

- 2:52 pm run start. bias CdTes 200 V, focal plane temperature -20.0 C
- 2:54 pm source inserted in front of CdTe detector 1
- 3:00 pm run ended. V and temperature values unchanged.
- 3:01 pm GSE was shutdown and software updates were pulled. GSE then restarted.
    - Uniform radiation observed in CdTe detector 1, as before.
- 3:02 pm All CdTe system was power cycled.
- 3:08 pm UnxT-init was seen to increment each second or so from ~-1950. Kris said he was using first frame which Thanasi said may be garbage. Kris will revert a change in the software.
- 3:12 pm observation recommenced. bias CdTes 60 V, focal plane temperature -20.0 C
- Started CdTe observation here, before 200 V bias. Flight-like.
- 3:13 pm bias CdTes increased to 200 V
- 3:14 pm CdTe pedestals no longer cutoff at bottom
- 3:14 pm GSE restarted.
    - Pedestals look to be at a reasonable level
    - Photons seen on detector 1
    - UnxT-init no longer negative
    - ~5 minutes of data taken.
- 3:22 source removed. Run finished

Run9

- 3:24 pm run started. bias CdTes 200 V, focal plane temperature -20.0 C
- 3:24 pm source placed in front of CdTe detector 2 (pos 3).
- 3:25 pm Pedestal looked better but some strips still below range. Image was cleared, but new integration revealed same behaviour
- ~5 minutes of data were taken
- During run9, DE filenames were:
    - foxsi4_cdte_20230526_053213_det1_0000001
    - _053213_det2_
    - _053216_det3_
    - _053216_det4_
- 3:31 pm run ended. V and T values unchanged

Run10

- 3:34 pm run started. bias CdTes 200 V, focal plane temperature -20.0 C
- 3:34 pm source placed in front of CdTe detector 4 (pos 2). Uniform illumination seen straight away.
- 3:39 pm Cleared image and then photons did not show up very cleared. Turned out that the X-ray source had fallen down.
- 3:43 pm Source was put back in place. Photons started appearing again.
- 3:48 pm run finished. V and T values unchanged.

Run11

- All CdTe detectors already done. Test will now be of Timepix
- 3:53 pm pulled new GSE version (PR #70) that reverts CdTe unixtime display edit that came in with PR #69.
- 3:57 pm powered Timepix on.
- 3:55 pm run started. bias CdTes 200 V, focal plane temperature -20.0 C
- 4:02 pm see Timepix data in GSE
- 4:02 pm Timepix delete_data command is successful.
    - This (plus receiving Timepix in GSE) validates the Formatter edits of yesterday for Timepix.
- 4:04 pm ramped up HV bias to Timepix
- Discussion with Milo:
    - Looks like after last week's switch to 9.6 kbaud makes HK packet no longer get to Formatter. Just a couple at the beginning.
    - No time to implement Savannah's request for 0x8B instead of 0x8A flags.
    - So for flight we will send Timepix bias_ramp_up_start a bunch of times, and watch for rates telemetry data to update.
- 4:22 pm recording current DE file names:
    - foxsi4_cdte_20230526_063040_det1_0000000001
    - foxsi4_cdte_20230526_063040_det2_0000000001
    - foxsi4_cdte_20230526_063039_det3_0000000001
    - foxsi4_cdte_20230526_063041_det4_0000000001

Run12

- 4:24 pm run started. bias CdTes 200 V, focal plane temperature -20.0 C. Source not present at this time.
- 4:27 pm source placed in front of TimePix. No change in count rates in GSE. But Milo sees changes on direct TimePix monitor.
- 4:28 pm source removed.
- Since TimePix behaviour nominal in Milo's display, it was decided to proceed. If we fly blind with the GSE, we should still get good data.

- **4:37 Am-241 source should not be removed from its container as its window may be breached.**

Run13

- 4:41 Fe source placed in front of CMOS detector 2.
- 4:42 pm run started. bias CdTes 200 V, focal plane temperature -20.0 C. Current was 2.3A. Both CMOSes turned on. Went up to 2.7A.
- 4:43 pm Started taking data with both CMOses.
- 4:47 pm not seeing anything in the GSE for CMOS.
    - Suspect this is because we have a different exposure time than the background image was designed for.

- 4:47 pm started a Wireshark recording to play back later, if we need to validate background subtraction.
    - This capture was stopped in run18, at 6:18 pm
- 4:52 pm still going. Will try to crudely scale background image.
- 4:53 pm Run ended. CMOS left on.

Run14

- 5:00 pm Kris scaled CMOS background images in GSE based on current exposure time, bkg / 4 * 200 . This is in the hope that the GSE will show real time data from CMOS.
- 5:03 pm run started. bias CdTes 200 V, focal plane temperature -20.0 C. CMOS still on from previous run
- 5:03 pm No immediate change in GSE display. CMOS panels still black.
- 5:05 Kris changed scaling: bkg / 4 (200 times greater than previous attempt) and restarted GSE. CMOS panels were all green. Correct scaling must be in between this and previous attempt.
- 5:07 Kris changed scaling to bkg / 2 and restarted GSE. CMOS 1 panel was black. But CMOS 2 panel was black with specks of green that faded away.
- 5:10 Kris changed scaling to bkg / 3 and restarted GSE. CMOS panels were mostly green. Too much bkg subtracted.
- 5:20 pm CMOSes stopped. Run ended.

Run15

- 5:22 pm run started. bias CdTes 100 V, focal plane temperature -20.0 C. CdTede turned on.
- 5:28 pm bias CdTe changed from 60V to 200 V.
- 5:29 pm GSE shutdown down. Run ended.

Run16

- 5:30 pm run started. bias CdTes 200 V, focal plane temperature -20.0 C. GSE turned on. CdTe detectors turned on.
- 5:36 pm. Fe source placed in front of CdTe detector 1 (pos 5).
- 5:37 pm X-rays seen, but faint
- 5:37 pm stopping GSE for LN2 change
- 5:38 pm Closed LN2 value 1/8th of a turn.
    - X-rays not clearly visible
- 5:41 pm Focal plane temperature up to -18.3 C. LN2 valve opened a smidgen.
- 5:44 pm Focal plane temperature continues to rise -17.7. Lindsay confirms source still there.
- 5:45 pm run ended.

Run17

- 5:47 pm Fe source placed in front of CdTe detector 2 (pos 3).

- 5:47 pm run started. GSE on. CdTe detector on. bias CdTes 200 V, focal plane temperature -16.8 C. LN2 valve opened a little more to stop/slow warming.
- 5:49 pm Images cleared. But no Fe X-rays visible.
- 5:50 pm Detectors were power cycled to see if it improves the ability to see X-rays.
- 5:51 pm Focal plane temperature at -15.3 C
- 5:52 pm GSE was power cycled.
- 5:54 pm CdTe detectors turned on. CdTe detector on. bias CdTes 60 V, focal plane temperature -13.7 C.
- 5:56 pm Bias V turned to 200 V.
- 5:57 pm 1st CdTe frame is garbage and caused an issue with the GSE's display of count rate and livetime. GSE restarted. Fixed issue.
    - This is because of zombie data fix: if the Formatter gets the 1st-position (in DE ring buffer) write pointer immediately after the DE powers on, there will not yet be data in the end of the DE's ring buffer. But the Formatter will still wrap around and try to read the end of the DE ring buffer, receiving uninitialized memory.
- 6:00 pm focal plane temperature -11.4 C
- 6:01 pm LN2 value opened a quarter turn deg turn. The aim is to get back to -12 C or at least cooling again.
- 6:04 pm Temperature continues to rise. LN2 opened another quarter turn.
- 6:05 pm Bias CdTe V changed to 60 V.
- 6:10 pm started warm up. Focal plane was already warm.
- 6:10 pm Shimizu san modified CMOS 1 and 2 exposure setting back to flight.
    - Sent stop_to_start to both, Shimizu san confirms exposure settings.
- 6:14 pm sent stop to both CMOS.
- 6:15 pm stopping this run.

run18

- Mostly just monitoring warmup. Fe source still in position 3.
- 6:18 pm stopped earlier pcap file, started in run13, 4:47 pm. This CMOS data had non-flight exposure setting.
- 6:24 pm sounds like LN2 cooler has reached passive warmup.
- 6:25 pm source Lindsay placed source.

run19

- Lindsay placed Fe source in front of position 1, CMOS 2
- 6:26 pm started up GSE again
- 6:26 pm sent CMOS 1 and 2 stop_to_start.
- Focal plane at 0.7 ºC.
- 6:29 pm stopping CdTe data collection, powered of CdTe subsystem.
- 6:30 pm started Wireshark capture for validation later.
- 6:43 pm Kris added CMOS PC image threshold of 60, then restarted GSE.
    - PC image display is all black now.
- 6:51 pm change CMOS PC image threshold from 60 to 15.
- 6:55 pm stopping GSE
- 6:55 pm Kris changes the CMOS PC image threshold from 15 to 10.

    - 6:56 pm relaunch GSE
- 6:58 pm modify CMOS PC image threshold back to 15 (from 10).
- 6:58 pm stopped GSE, Kris is changing something. Don’t think it panned out. Last state of GSE code is on PAB GSE, check it out tomorrow.
- 7:10 pm stopped and shutdown CMOSes.

After the runs

- 7:10 pm or so plugged into SAAS to pull out images from x-ray check
- 7:15 pm powered on DE to pull data out
- 7:16 pm copied out Formatter (flight binary, foxsi4-commands, logs).
    - Deleted logs.
- 7:18 pm copying out DE.

Wednesday, March 27 2024

Planning

- Get longer HDMI for uplink GSE
- Get some SSDs
- Get a second monitor attached to GSE uplink computer
- Gotta get longer headsets/rearrange in uplink
- Gotta move count clocks

Data copying

- 8:15 am SAAS and DE powered on to copy out data.
- 8:30 or so power cycled SAAS
- 8:51 am SAAS has changed saving cadence to 1/12 of all images, imaging ~2 Hz
    - Tamar and Dan confirm.
- 8:57 am powered SAAS on to check through BNC
    - Tamar and Dan approve! Fly it.
    - “SAAS is ready for flight”–Dan
- 8:58 am powered off SAAS.
- 9:04 am powered off CMOS.
    - Shimizu san confirms ready for flight
- 9:05 am DE is flight ready. “No problem”–Dr. Nagasawa san
- 9:14 am Milo confirms Timepix is ready.

Cooler-rail setup and check

- Cooling apparatus, which is attached to the chiller plate, has been secured to the rail.
- The shut-off box connector and the PID controller serial connector were epoxied (with RTV).
    - The serial connection to the PID was also taped over, first with blue tape then with stronger duct tape
- Other cables were routed to be as behind the blast shield as possible
    - Some were zip-tied to the chiller plate, others were zip-tied to the metal straps securing the apparatus to the chiller plate.
- Duct tape was used in addition to zip-ties to ensure cables stayed low
- Cables and hose were secured in a way such that there was slight slack between where it was secured and its connection to the cooling apparatus
- The plugs for the shut-off box and the PID controller were plug into extension cords that ran up to the chiller plate
- The cooler was tested with the laptop after the serial cable was run to the bottom of the rail
    - The extension cords each box was plugged into was identified and tagged at the plug end with its box

- First test was to plug in the extension cords, supplying power to the cooling apparatus, switching the PID controller to REMOTE mode and connecting the cooler laptop to the serial cable on the ground
    - The command `ptc` worked and returned the usual values for T1, T2, and S1 confirming communication between the laptop and the cooler
    - Commands to change the temperature like `gt 25` did not change the S1 field since the RTD connection was open (no focal plane connection)
- The second text was to **leave the dial on the PID controller at REMOTE** mode, unplug the PID controller extension, then plug it back in
    - Before unplugging, communication was verified with the `ptc` command which returned the usual values again
    - Cord was unplugged and communication via the laptop ceased, couldn't even type anything into the MobaXterm session
        - This is expected when cooler is off
    - Extension was then plugged back in
    - After a few seconds (~5 seconds), the MobaXterm session became active again allowing the `ptc` command to be typed and sent
        - This returned the usual values again confirming that the cooler can be switched to REMOTE mode, unplugged from the wall, then restore communication after it is powered back on

Flight configuration

- See this checklist
- 9:15 am Hunter installing SAAS lid
- 11:51 am getting ready to connect to TM section
- 12:06 pm Thanasi taped down unused connectors to skin
- (Sometime, forgot when) Thanasi removed double USB for SAAS from external umbi plug. Pins are out of connector. Double USB is still connected inside the experiment to the umbi inner connector.
- 12:34 pm all TM/Exp connectors are connected, torqued, and harnesses tied.
    - Thanasi checked, it looks good! Fly it.
- 12:44 pm mechanically mated with TM.

Sequence test

- Presequence: powering on Exp to verify umbi connection.
- 1:59 pm powered on Exp
- 2:00 pm ping good to 192.168.1.8 via umbi
- 2:00 pm can ssh formatter.
- **Note:** during the first sequence test, the CMOS 2 always-on issue emerged on the power board. The post-flight (Fall 2024) investigation of this issue is documented in this document and these slides.

run1 (recording on SOC GSE)

- 2:22 pm started SOC GSE
- 2:39 pm trying commanding
    - Powered on both CMOSes
- 2:40 pm powered on CdTe DE
- Uplink commands work through both Hox's uplink decks.
- 2:51 pm powered on CdTe detectors, ping good.
- 2:52 pm Timepix and SAAS powered on.
- 2:53 pm deleted CdTe DE data, CMOS data, Timepix data
- 2:56 pm relaunched GSE, couldn't click on uplink.
- 2:58 pm dropped CdTe bias to 0 V, then started taking CdTe data
- 3:03 pm starting clock at T–10 minutes
- GSE note: CPU load avg for CMOSes sometimes gets to 62, turning red. Rare.
- GSE note: on the SOC GSE on the giant monitor, sometimes I cannot click on the dropdown menu for commanding, which would be bad. When this happens on the Command dropdown, I can ESC out, then click on the System dropdown, reselect a system, then pick a Command and send normally. This also happened once on the System dropdown, and I had to quit and restart the GSE to fix it.
- 3:10:10 pm, T–3 minutes, on internal power.
- Note for SOC setup: move main clock somewhere higher where it's more visible.
- 3:12 holding count, resetting clock to T+3 minutes. Lost compressed video (SAAS) due to downlink noise.
    - Back on external.
    - Got SAAS back.
- 3:19:00 pm starting at T+3 minutes.
    - Exp data still good.
    - Getting some nonzero Timepix HK data!
- 3:22:00 pm launch
- T+30 s CdTe bias to 60 V, confirmed went through in one try on GSE.
- T+35 s or so raised Timepix bias, sent command several times. No change in read_rates trace on GSE.
- T+460 s powered off Timepix successfully, then lowered bias on CdTe to 0 V.
- T+8:48 s finished stopping taking data and shutting off everything.

run2

- This will be second sequence test.
- 4:36 pm GSE started, Exp on
- 4:38 pm powered on CMOS 1
    - I thought I powered on CdTe DE?? But CMOS 1 came on? Check uplink log later.
- 4:39 pm powered on CdTe DE (actually this time).
- 4:40 pm sent power on to CMOS 2 twice. No luck.
    - I was mistaken. I was trying to turn on CMOS 1. Both CMOSes turn on.
- 4:43 pm powered on SAAS, then back off after boot.
- 4:47 pm powered on CdTe detectors.
- 4:48 pm powered on Timepix

- 4:50 pm started CMOS and CdTe data.
    - Data hits GSE
- 4:52 pm get Timepix data in.
- 4:59:00 pm T=0
- T+30 s ramped up CdTe bias
- T+40 s or so ramped up Timepix bias 3 times (sent command three times, hopefully didn't ramp it three times).
- Downlink rate right around 1.3-1.4 Mbps.
    - Same as last test.
- 5:08 pm power cut to Exp. Didn't stop or shutdown CMOS.
    - Got Timepix off, cut CdTe bias and stopped data before power cut.
    - GSE note: during this test, and in earlier tests today, GSE uplink window did not take mouse clicks when either System or Command window were expanded. Sometimes, when stuck selecting Command, could ESC-out of the dropdown, reselect System, then successfully pick and send Command. But sometimes had to quit and restart GSE.
- Saved out data.

Notes from sequence:

GSE troubles

- Notes in the run notes above.

Room layout

- Switch to two separate GSE machines: data watching and uplink command. Will need to buy another machine for the science room to watch data.
    - Allows Lindsay to click around GSE without stealing the mouse from commanding.
    - Feed uplink GSE to one monitor on uplink desk, feed science data monitor to big TV.
    - Also lets one GSE get swapped out if uplink fails.
- Room layout as-is at end of day works well.
- Buy a couple USB-C to HDMI
- Buy another monitor (higher resolution)? Please Lindsay?
    - Or we find a monitor on the range?
- Talk to Chris Bennet (network on range) about patch ports available for GSE for viewing

Computers

- Use GSE and backup GSE in uplink room for visuals + uplink
- Use cooler computer in uplink room for cooler monitor
- Find:
    - Computer for flare prediction station (use Lindsay's spare mac laptop)
    - Computer for science room data feed
    - Computer for downstairs data feed

- Thanasi bring Linux computer from MN?

Plans for tomorrow:

- Tomorrow is pyros and phasing (NSROC side)
- Morning, Lenz will try to set up serial connection from cooler to SOC.
    - Hunter and Kris go to rail and do it.
- Pack up PAB
- CdTe discussion
- Discuss proposed changes to CMOS
- Planning flight
    - Decision tree
        - Get an updated version out by end of day
    - Develop plan for operations during countdown and hold
    - Go/no-go checklist
    - Network overview
    - Get list of commands that could possibly be sent in flight
        - Scenario in which command would be needed
            - Get to specific quantitative criterion for sending command
        - Outcomes of sending command (on data taking, saving, etc)
    - Tour de rail (tie in with network document)
    - Thanasi talk to Jim Cecil about IPs

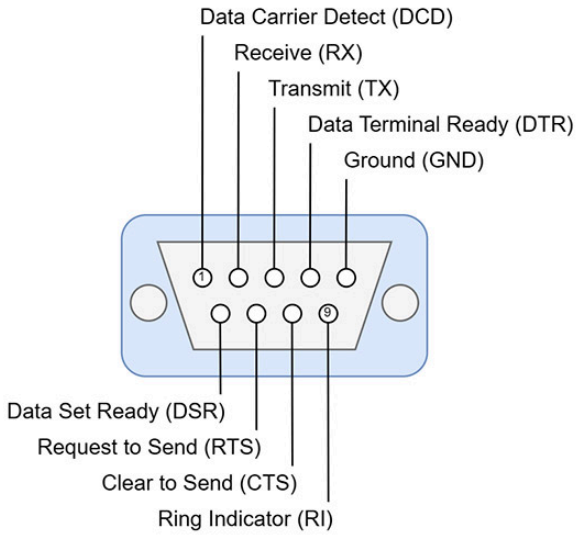
Thursday, March 28 2024

Planning

- Work on cooler connection on rail.
- Countdown discussion—noonish?
- CdTe meeting—2 pm.
- CMOS meeting—4 pm.
- ~~Talk to Jim Cecil, confirm downlink IP~~
    - We're good, stay on 224.1.1.118:9999. Hi-C is on a private network of some kind.
- Documents:
    - Decision tree
    - Go/no-go checklist
    - Countdown activities timeline and discussion
    - Setup guide for new monitoring GSEs

Cooler connections to SOC

- The cooler interface is RS-232 over a standard 9-socket connection:



Source.

- To get to the SOC, this 9-socket (9S) D-sub RS-232 follows this chain:

cooler <==> 9S <==> 9P <==> BNC splitter <==> BNCs <==> optical encoder <==> fiber line <==> optical decoder <==> BNCs <==> BNC joiner <==> 9S <==> 9P <==> USB-A <==> control laptop.

whew.

Garrett is setting this up on the rail. We should not have to provide any additional equipment. There is a BNC fiber converter box visible in the SOC uplink room that we will use to interface in cooler signals. Garrett will also provide the 9-pin adapter that interfaces with this BNC.

GSE checks

- Set up backup GSE in uplink room as well.
- Tried “sending” lots of uplink commands from the backup GSE computer (192.168.1.119), using both mouse/keyboards. No issues at all.
- Tried that again on yesterday’s GSE computer, using wired mouse/keyboard again. Also no issues. That’s too bad. Will need to test while receiving data. Monitor system usage (CPU, RAM, disk) while everything is going.

Operational discussion (for prelaunch)

- Taking notes here

Networks

- Thanasi requested another internet-visible wired connection in the uplink room (for flare prediction). The dedicated port for SDO/AIA data feed works.

CdTe discussion

Weird pedestal

- Yixian’s notes here
- Thanasi look through data collection notes referenced in Yixian’s document. Add uplink command times from uplink.log files.
- Yixian list run numbers this is observed in.
- Seems to show up more often in CdTe 1 & 2
- Believe power cycle clears this issue.
    - Need to know time delay after power cycle before onset of problem.
    - Yixian has seen as low as 5 minutes (CdTe 2), also 6-7 minutes (CdTe 1).
- Yixian saw gain shift for sealed source data while the pedestal has drifted down.
- Previous experience:
    - This has been observed at IPMU before, but only after many hours of operation with bias. Due to polarization.
- Actions:
    - Commands to send or avoid sending?
    - Power cycling/reinitialization cadence?
    - Is imaging affected in flight?
    - Check if the 1 s periodicity visible in the zoomed data is also present when cooler has been turned off.

Operating plan

- Delete data once per day, end of day. Delete raw data, ppslog, runlog.
- Should be able to operate without power cycle for 4 hours continuously. Outcome of weird pedestal investigation may drive this lower.
- Count rate discussion:
    - Count rate value has always been too high. Calculation seems reasonable.

    - Counts and livetime plots do not line up correctly.
    - Kris will investigate the recorded data, and confirm GSE.

Monday, April 1 2024

Network

- How are umbi and EVTM lines switched/not switched in TMA? Do they appear on the same network?
    - Will we see 2x of every packet if there is a diamond in the network?
    - Would be good to have umbi data peace of mind, e.g. after commanding is paused pre-launch, but during a telemetry dropout
- For the future: ROC wants us to ask them for IP addresses, then set up Experiment-local IPs based on their masks.
    - Not sure if this is practical—how do we change e.g. SPMU-001 IP address? How about CMOSes? (→ We could change via serial connection (We need to connect each CMOS). You can use any numbers you like for IP address. RS)

Turn on test

- For this test, we will not see downlink through EVTM, but should have uplink commanding. Will have umbi connection.
    - So we should just be able to pretend like we have EVTM data. Will see the multicast packets on the umbi interface.
    - If there *are some* EVTM packets, not sure what would result.
- 2:40 pm powering on Exp.
- 2:41 pm no ping to 192.168.1.8
- 2:42 pm thought Exp power was too high
    - TM2 bus 1.15 A without Exp on, 1.8 with us on. Later clarified that the “1.8 A” value reported included EVTM and other stuff on TM2.
- 2:45 pm power cycled Exp
    - Still no ping, or multicast data after trying CdTe DE power on command.
        - Command makes it to Hox’s deck; light blinks.
    - Chris Bennett checks, Ether switch at the pad never receives any new connections. So 192.168.1.8 has not appeared at all. Want to check connections between Exp and that switch.
- 2:53 pm powering off Exp. Will go to rail and check it out.
- 4:56 pm ready to test again.
    - In between, found and replaced bad Ethernet in line from Umbi out to Ether switch in mini blockhouse.
    - Checked ping in mini blockhouse and in SOC, both good.
- Started GSE for this run at 5 pm
- 5:00 pm sent uplink command power on CdTe DE
- 5:03 pm no telemetry.
- 5:04 pm at 0.7 A
- 5:06 pm sent power on command to CdTe DE

    - No change in current
- 5:07 pm sent power on command to CMOS 1
    - No change in current
- 5:10 pm ssh'd in Formatter. Notice the service is not running, and not starting correctly.
    - It is always failing with `code=killed, signal=ABRT`.
- 5:15 pm rebooted Formatter via terminal.
    - Still not running correctly
- 5:27 pm 1.86 A current from TM2
    - Includes transmitter and EVTM
    - Exp was ~700 mA before the TM stuff was turned on.
- 5:28 pm powered on CMOS 1 via GSE to Housekeeping direct command.
    - 2.3 A immediately after
- 5:31 pm powering on CMOS 2 via GSE to Housekeeping direct command.
    - Didn't see any change in current from 2.2 A. Tried a few times, and restarted command_loop software on GSE computer.
- 5:40 pm or so power cycled Exp.
- 5:45 pm shutdown Formatter via ssh.
- 5:47 pm running command_loop
    - Baseline current: 1.89 A
- 5:48 pm command_loop to turn on CMOS 1
    - 2.3 A
- 5:49 pm command_loop to turn on CMOS 2
    - No change in current. Very odd.
- 5:50 pm command_loop to turn on Timepix
    - 2.9 A
    - 5:52 pm, 2.9 A steady
    - PLC notes voltage is drooping to 26.8 V
- 5:56 pm power cycling Exp.
    - One issue: Formatter disk is full. foxsi-4matter/log/ is only a few 100s of MB.
    - All consumption is in /var/log/. Try deleting some logs
- Could ping housekeeping from Formatter. Could ping SPMU-001 from Formatter.

Troubleshooting

- Formatter has read-only disk.
- Formatter's /var/log/syslog, */syslog.1, */daemon.log, */daemon.log.1 are the big ones.
- I cannot delete them. When I try (including with sudo), I get -bash: sys.log: Read-only file system.
    - Also vi displays error (related to logging) when exiting, etc.
    - Also cannot delete log files from Formatter
- Tried permanently entering superuser (sudo su), still no luck removing.
- Options to look at:
    - fsck
    - ~~Ntfsfix~~
- Thoughts:

    - Very risky to try to repair filesystem over ssh. Don't have another option at this point.
    - It will not be possible to reinstall OS over SSH alone, if I do mess it up. This is possible in theory: partition the SD card, flash (dd) OS onto a partition, then boot from the partition. This presumes there is space on the SD card to do all these things.
    - Narukage san had a good suggestion to see if there is a secure/safemode boot. Need to see if this can be entered without keyboard input during bios.
- Resources
    - Entering safemode on reboot.
    - Another option for entering recovery mode on boot.
    - An external SD card would show up for the df command as something like /dev/sda or /dev/sdb. I don't think the SD card in the Pi will show up like this, because it is the boot volume. Indeed no such mountpoint appears when I ran df on the formatter Pi.
    - fsck
        - How to run on reboot
        - Alarming but helpful responses to a generic question about read-only filesystem
        - When checking filesystems, see what comes up in /etc/fstab. These are the devices fsck will check when run with the -A flag.
        - fsck will normally not want to repair the root filesystem, which is always mounted. It can repair during boot, or while booted in recovery mode.
        - Try this:

```
% sudo fsck -AVN
```

            - This will:
                - A: check all filesystems (see /etc/fstab for list)
                - V: verbose
                - N: don't modify anything, just print what would be done.

    - Many places suggest this to run fsck on reboot:

```
% touch /forcefsk
```

        - Just creating the file is apparently enough.

    - This may be handy for running fsck on root system on reboot on Pi
    - Also thorough notes to running fsck on root system on boot

Tuesday, April 2

Formatter troubles

- Thanasi taking notes on his laptop.
    - These are now uploaded here. These notes detail the validation and implementation of the Formatter fix.

Turn-on test

run1

- This is the first power cycle of three (for turn-on test)
- The very strangeness of this test is that CMOS 2 powers on when Formatter does. How odd.
- 1:54 pm Exp power is on, Formatter is running.
    - Current is 0.74 A
    - Appears CMOS 2 was on already??
        - Sent stop_to_start, data is coming in.
    - 1:57 pm current to Exp is 0.85 A
- 1:58 pm sent cmos_stop to CMOS 2
- 1:59 pm shut down CMOS 2
- 2:00 pm cut power to CMOS 2
- 2:06 pm shutdown Formatter via umbi
- 2:07 pm power cycle Exp.
    - Current 0.7 A
- 2:09 pm remounted Formatter root filesystem as read/write.
- Notice CMOS 2 packets are already coming through.
- Going to keep powering systems on, see what happens.
- 2:13 pm power on CMOS 1
    - Current 1.05 A
- 2:14 pm powered CdTe DE on
    - Current 1.25 A
- 2:15 pm powering on CdTe detectors
    - All ping back good after sending update_ping command
    - Current 1.8 A
- 2:15 pm powering on Timepix
    - Current 2.4 A, shortly after power on
- 2:16 pm powering SAAS on
    - Current 3.0 A
- 2:18 pm taking data from CdTe
    - Pedestals are there
- 2:19 pm taking CMOS data
    - PC image jumping around
- 2:20 pm Timepix data here too

- 2:24 pm stopped all data collection, brought down power to subsystems, shutdown formatter via ssh.

run2

- Second of three turn-ons for turn-on test.
- 3:07 pm got Exp power.
    - Current 0.8 A.
    - This looks like CMOS 2 is powered on as well.
        - Is there something in the Formatter boot that turns on CMOS 2?
- 3:10:00 pm remounted Formatter filesystem read/write
- 3:10:25 pm see CMOS 2 data come through.
    - 0.7 A
- 3:11 pm powered CMOS 1 on
    - 1.0 A
- 3:12 pm powered on CdTe DE
    - 1.25 A
- 3:13 pm powered on canisters
    - 1.75 A
- 3:14 pm powered on Timepix
    - 2.4 A
- 3:15 pm powered on SAAS
    - 3.0 A
- 3:15 pm started CdTe data
    - Looks fine
- 3:16 pm started CMOS data
    - Looks fine
- 3:17 pm powered off SAAS
- 3:18 pm stopped CMOS and CdTe data
- 3:18 pm shutdown CMOS
- 3:18 pm get Timepix data back, including nonzero HK
- 3:19 pm powered off CMOS
- 3:20 pm powered off CdTes and Timepix
    - Current is 0.7 A. I had commanded CMOS 2 power off. This current measurement indicates CMOS 2 is still on.
    - Later got 0.68 A
- Shutdown formatter

run3

- 3:26 pm power cycled Exp.
- 3:27 pm remounted Formatter filesystem read/write
    - Seeing CMOS 2 data. Suspect this is powered on whenever Exp is.
- 3:28 pm powered on CMOS 1
    - Get data
- 3:29 pm powered on CdTe DE
- 3:30 pm powered on canisters, ping ok
- 3:31 pm powered on Timepix

- 3:32 pm powered on SAAS
- 3:32 pm started CdTe data
- 3:32 pm started CMOS data
- 3:35 pm powered off SAAS somewhere in here.
- 3:35 pm got Timepix data
- 3:36 pm stopped CdTe data, stopped CMOS data
- 3:37 pm shutdown, powered off CMOSes
- 3:39 pm powered off CdTes and Timepix
- 3:40 pm shutdown formatter.
- 3:50 pm or so power cycled Exp.

run4

- 4:54 pm think Formatter is fixed. This run is to check.
    - Took data from, then shutdown CMOS 2 after Formatter reboot using uplink command.
- 4:56 pm Exp power cycled.
- 4:58 pm commanded CdTe DE on.
    - Not seeing CMOS 2 data yet.
- 5:00 pm powered on CdTe subsystem.
    - Pings good
- 5:01 pm still no CMOS 2 data in downlink (checked Wireshark).
- 5:01 pm commanded CMOS 1 on.
    - No data back
- 5:02 pm commanded Timepix on.
- 5:02 pm commanded DE init
    - Gets through, see status change.
- 5:03 pm sent CMOS 1 and 2 power off commands.
- 5:03 pm started CdTe data.
- 5:04 pm commanded CMOS 1 on.
    - Get data down.
- 5:05 pm start taking CMOS 1 data.
- 5:05 pm get Timepix data down.
- 5:05 pm commanded CMOS 2 on.
    - No data back
- 5:07 pm enabled double commands for CMOS 2, sent reboot command. Still no data.
- 5:09 pm powered on SAAS.
- Total current: 3.2 A
- 5:11 pm turned off SAAS and Timepix.
- 5:12 pm shut down CMOSes
- 5:13 pm powered off CMOSes and CdTes
    - Now at 0.7 A. So CMOS 2 has been on all the while, but not booted.
    - 31 V
- 5:19 pm copied out Formatter logs (and binary and foxsi4-commands/commands and foxsi4-commands/systems.json and formatter.service and syslog), then shutdown.
- 5:22 pm Exp power is off. Wait a couple minutes before power on.
- Next: Thanasi should check diff on prefsck, postfsck, and remote commands lists. Is anything corrupt, and running in the formatter boot that would power on CMOS 2?

run5

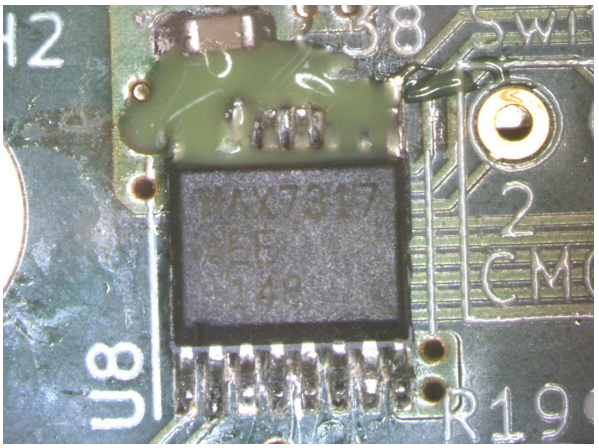
- 5:49 pm Exp power back on. 0.75 A immediately.
- CMOS 2 is on, sending data.
- 5:53 pm commanding CMOS 1 on.
    - Get data.
- 5:54 pm commanding CdTe DE on
    - Get data.
- 5:56 pm commanded all canisters on
    - Ping good.
- 5:57 pm commanded Timepix on.
- 5:58 pm deleted data from CMOS 1 and CMOS 2 and CdTe
- 6:00 pm started CdTe data
- 6:00 pm getting Timepix data.
- 6:01 pm started CMOS data
    - Looks good.
- 6:02 pm powered SAAS on.
- 6:05 pm powered SAAS off.
- 6:06 pm stopping data collection, shutdown CMOSes, powered off subsystems.
- 6:20 pm copied logs and syslog out of formatter. Then deleted logs and truncated syslog.
- 6:45 pm shutdown formatter

Other

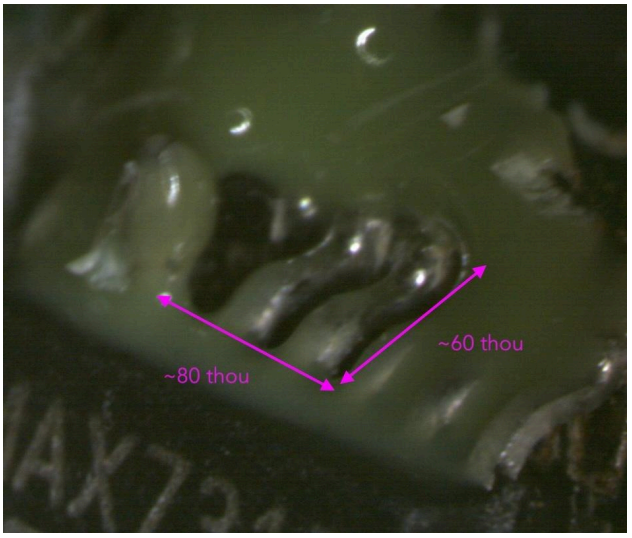
- GSE version run was soc-gse-compare. Now that Formatter is alive, pull main on both.
- Today, had lots of issues with GSE unable to click for commanding.
- Thanasi: made a end-of-day checklist for the campaign (complementing go/no-go checklist).

Closing thoughts on CMOS

- Look at power board for short sites
- Consider skin/chassis ground issues
    - Sounds unlikely
- Tomorrow:
    - Try power cycle formatter command, see if that is evident in CMOS 2.
    - Try reading power HK data from Housekeeping board, see what CMOS 2 current is.
        - Likely to not give new information, but eliminates some class of rarer shorts.
    - Check power board photos
    - Confirm (from telemetry and pcaps) that this was not happening at the PAB.
    - Find better board photos of power board.
- Started this document to track this issue.

- The Formatter and CMOS enable pins are the two visible pins on the left photo.
- These were taken prior to the flight vibe test at SSL.
- An conductive object would need to have size ~80 thou, or a radius of curvature ~80 thou at the point it contacts the chip in order to cause a short. A photo with rough dimensions annotated:



Plans for tomorrow

- Discussing with Sean, Brittany, Sabrina
- Lindsay giving update on status: Formatter looking healthier, CMOS 2 is very confusing.
    - A possible explanation is a short between Formatter's power enable line and CMOS 2's power enable line on the Power PCB.
    - Boom test?
    - See §*Closing thoughts on CMOS* above.
- Sean should provide Exp power data from GPS rollout
    - Check if this was an issue during GPS rollout
- Vertical check could shed some light
    - Would also be risky.
- Brittany will setup call with EEs in Wallops around noon to help.
- Plan for vertical check tomorrow.
- Campaign dress rehearsal Friday, first day Saturday.

- Start tomorrow with CMOS-related troubleshooting and cooler communication checks in the morning. Proceed to cooling test after that is done.

Wednesday, April 3

Planning

- Morning: work on cooling, turn on Exp and try a couple CMOS things.
- Afternoon: go vertical, check out CMOS 2 problem, try cooling.
- All day: Julie and Marianne are here, work on campaign.

GSE work

- 11:08 am git pull'd on PAB GSE (Mac mini). Now should be up-to-date with accepted CMOS and CdTe GSE changes.
- 11:10 am checked out main on SOC GSE (Mac studio) and pulled. Now should be up-to-date with accepted CMOS and CdTe GSE changes, and current with main (rather than in soc-gse-compare branch).
- 5:40 pm hooked up Ethernet switch for telemetry. Both GSE machines (mac mini and mac studio) plug into this switch now, both should be able to see EVTM data.

CMOS problems

run1

- Tracking issue here
- This is running on latest GSE `main`.
- 11:43 am power on Exp. Now running main GSE on SOC mac studio.
    - See CMOS 2 data
    - Current 0.7 A
- 1:17 pm enabling Housekeeping power data downlink
    - Current still nominal, 0.7 A
    - In order to check current through CMOS 2 hall sensor.
- 1:18 pm powered on CdTe DE
    - To get reference current for through Housekeeping for that system.
    - 0.9 A total current on the Altair
- 1:20 pm shut down CMOS 2
- 2:43 pm Exp power off.

Holdup. This has all been wrong. CMOS 1 is CMOS 2 on the power board.

- Analyzing at HK power measurements from run1 (above), CMOS 2 (called CMOS 1 in Power board designs) is drawing ~0.36 A. CMOS 1 (called CMOS 2 in Power board designs) is drawing -0.01 A (not on).
- Exp. is seeing 30.37 V input.
- CdTe DE is drawing 1.47 A off 5.5 V supply
- Regs drawing 0.7 A
- Voltages are

- 5V5: 5.75 V
- 12V: 12.68 V
- 5V: 5.36 V

Cooler work

- 10:53 am switched rail cooler equipment on, current consumption 10 mA (seems too low)
- Nevermind, not too low, we are just monitoring relay coil current. Don't have a monitor for AC rail equipment current consumption.
- 11:00 am or so shut off rail mount equipment. Need to find Lee to get communication (fiber) up the hill.

run2

- Plan:
    - Turn on Exp., should have CMOS 2 on.
    - Set up current trace for Exp. on Altair
        - Done. Thanks!
    - Verify getting CMOS 2 data
    - Shutdown CMOS 2
    - Uplink Formatter off command to reset Formatter
    - See what happens to current
        - If current dips to ~0.35 A, just Formatter was cut.
        - If current dips to 0 A, both were cut (considered unlikely at this point).
- 3:22 pm powered on Exp.
    - Current 0.7 A. Trace looks good.
- 3:25 pm starting GSE recording
    - Getting CMOS 2 data.
- 3:26 pm stop_to_start CMOS 2.
    - New GSE looks good!
- 3:27 pm stopping CMOS 2 data.
- 3:28 pm had to reopen GSE.
- 3:29 pm shutdown CMOS 2.
    - Steady at 0.66 A after shutdown
- 3:31 pm Sean starting an Altair recording
- 3:35 pm no commands through Housekeeping. Power cycling.

run3

- Trying the last test again. Power cycled
- 3:37 pm stop_to_start CMOS 2, get data.
- 3:38 pm shutdown CMOS
    - After shutdown, steady 0.65 A consumption for Exp.
- 3:39 pm sent Formatter power off command, it worked (got dropped from SSH). Saw small blip, ~0.1 A dip in current a bit after power off command. Not sure what this means.

        - Because we had continuous current monitoring, I think we would see more blippiness if CMOS 2 had its power cut, even if the transient was short.
        - After the Formatter power reset, we returned to 0.65 A. If CMOS 2 booted again, we would see higher current.
        - So it looks like
- 3:41 pm powered off Exp.
- Saved run data on GSE.

Thursday, April 4

Meeting with Phil

- TL;DR Phil thinks a D-S short of a CMOS switch (G3VM-61WR) is a very feasible failure mode, more likely than a FOD short.
- He suspects D-S short of the G3VM relay. Thinks this could be caused by too hot, or too much inrush.
    - If the battery voltage drooped during sequence, and the CMOSes continue to ask for inrush, could that cause excess heating resulting in fusing on the die?
    - Thanasi check with Lenz about which sequence had the battery voltage anomaly. Check with Garrett for current/voltage traces from sequences. Look at T–3 minutes for transients during switch to internal.
- Another option is a D-S short of the MAX7317 P7 output. Could be caused by transient on 5V line.
- Would be helpful to compare CMOS 2 input voltage before/after the event. If the power switch has failed closed (fused), would expect more voltage drop across that switch after failure.
    - Could check baseline Formatter + CMOS steady-state current before event and after event. Would need decent resolution though.
- Would like to know input capacitance of CMOS system.
- In Phil's bench test of these CMOS switches (G3VM-61WR), they turn on with a ramp. Which would help if there is big inrush demand.

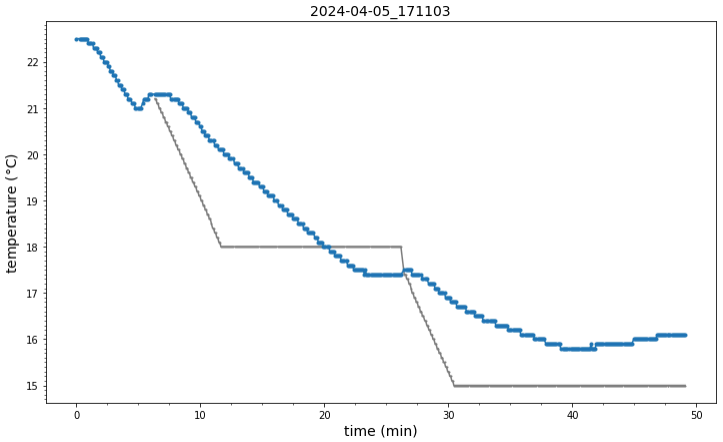
Friday, April 5

- Timing for getting to CU room from various launch-watching locations:
    - Assumed people start moving at T+12s
    - Used a comfortable, careful walking speed
    - From outside platform (up one flight of outdoor stairs) to CU room: 55 s
        - Appropriate time for anyone involved only in the observation time.
    - From aurora viewing room to CU room: 24 s
        - Appropriate time for e.g. Julie, Thanasi

Cooling test

- 2:11 pm ready to start cooling test

    - Cooler communication okay, T1 = 22.5. Rocket is horizontal.
- 2:11 pm send “gt 21” via laptop
    - See temperature dropping immediately, it works!
- 2:16 pm reach 21 deg
- 2:17 pm send “rr 18 0.6” to test ramping
    - It cools but the cooling rate is a little bit slow and can’t really catch up with the ramping speed
- 2:30 pm reach 18 deg
- 2:36 pm it overshoots a little bit, T1 = 17.4
- 2:37 pm send “rr 15 0.6”
    - Still slow
- 2:53 pm T1 = 15.9, it would not cool any further. Should ask NSROC to open up the LN2 valve more.



- 3:18 pm start to warm back up
    - Send “rr 20 0.6” but don’t see a change in setpoint temperature
    - Send “si” first, then “rr 20 0.6”. This works.
- 3:21 pm T1 = 16.1. Warming up rate is very low. Okay to cut cooler power.

Power on tests

run1

- Happening in parallel with cooling
- 2:38 pm got Exp. power. CMOS 2 is on.
    - Get CMOS 2 data
- 2:39 pm powered on CMOS 1
    - Get data
- Able to see GSE updating on both computers
- 2:40 pm powered on CdTe DE
    - Get data
- Garrett asks if we can see EVTM data. We have no way to tell, because we also see umbi data.

We should resolve this. Need to see if EVTM works for flight.

- From Thanasi's very quick check of packets in Wireshark, don't believe we are seeing duplicates at least.
- 2:47 pm powered on canisters
    - All ping back ok
- 2:48 pm powered on Timepix and SAAS.
- 2:50 pm see SAAS image.
- 2:50 pm start taking CdTe and CMOS data
    - Nice noisy pedestals with cooling!
- Garrett is recording EVTM data to play back later, can use to confirm EVTM.
- 2:52 pm powered SAAS off.
- 2:58 pm Mario notes voltage at Exp was around 25.4 V when SAAS (plus other Exp subsystems) were on. Supply voltage is 34 V currently to compensate for line drop. Going forward, announce before systems are shutdown to allow for supply adjustment.
- This next sequence is done, confirming with Mario before each power off:
    - 3:01 pm stopping CdTe and CMOS data
    - 3:04 pm deleted CMOS and CdTe data
    - 3:05 pm deleted Timepix data
    - 3:06 pm shutting down and powering off CMOS 1 (and shutting down CMOS 2)
    - 3:07 pm powering off canisters
    - 3:08 pm powering off DE
    - 3:10 pm powering off Timepix
- 3:11 pm copied out formatter logs and shutdown
- Had lots of GSE command dropouts during this test. Switch to mac mini for commanding next test.
- 3:14 pm Exp power off.

~~run2~~

- Garrett playing back EVTM recording from last test to confirm.
- Not working so far. Would still be good to do at some point.
- Playback of compressed video (SAAS) works, and Altair data. Not seeing EVTM though.
- Later found out we didn't get *any* EVTM data last test. So still need to watch for duplicate packets. Troubleshooting in TMA.

Raising the rail

- Around 3:25 pm start elevating launcher.
- 3:32 pm pause at 60º elevation for checks.
- Lost cooler communication after the rail went vertical

Run2

- Rail now vertical.
- 5:06 pm powered on Exp

    - Get Exp power consumption of ~0.7 A, consistent with last few days testing.
    - Total 1.8 A with other TM buses on
- 5:07 pm getting CMOS data to ground via Formatter
- Commanding from mac mini computer
- 5:09 pm powered on CMOS 1
    - Total 2.4 A
    - Get data (and getting data from CMOS 2 already)
- 5:10 pm powered on DE
- 5:11 on powered on canisters
    - Not getting any ping
    - Tried powering off and back on all canisters, no change in current. No ping. Suspect HK commands not getting through?
    - Can still init DE.
- 5:13 pm tried powering on Timepix, no change in Exp. current.
- 5:16 pm tried powering DE off, no change in Exp. current, still get DE downlink.
- 5:16 pm can still command to change DE mode. So commands get through.
    - Suspect HK board has gone sour. Try cycling Exp. power.
- 5:18 pm cycled Exp power.
- 5:19 pm powered on CMOS 1.
    - 2.2 A
- 5:20 pm powered on DE
    - Levels ~2.4 A
    - Now not getting telemetry
- 5:21 pm tried powering DE off, didn't seem to work.
- 5:22 pm tried powering Timepix on, didn't seem to work.
- Still at 2.4 A
- 5:29 pm power cycling Exp.
- Suspect the last set of issues caused by powering CMOS 1 too soon after Exp. power applied.
- 5:30 pm Exp on, see CMOS 2 data normal.
- 5:30 pm trying DE power on.
    - No change in current, no downlink.
    - Tried Timepix, CMOS 1 as well, no change.
    - Notice no downlink from CMOS 2 now.
- 5:39 pm power cycled Exp
    - Will try Timepix on first
- 5:40 pm have Exp. power, see CMOS 2 downlink.
- 5:42 pm still getting CMOS 2 downlink, trying to turn on SAAS.
    - Current increase to 2.3 A or so
    - See SAAS data.
- 5:44 pm powered off SAAS, command went through.
- 5:47 pm powered on Timepix
    - See current increase, 2.4 A or so (SAAS is off)
- 5:50 pm powered on CMOS 1
    - See current increase, 2.9 A total or so
    - Get data
    - Current settled to 2.8A
- 5:51 pm get Timepix data down

- 5:51 pm powered on CdTe 1
    - See current increase, ~2.9 A
- 5:52 pm powered on CdTe 2
    - See current increase, ~3.1 A
- 5:53 pm powered on CdTe 3
    - See current increase, ~3.2 A
- 5:53 pm powered on CdTe 4
    - See current increase, ~3.4 A
- 5:55 pm shutdown and power off CMOS 1
    - Down to ~2.9 A
- 5:56 pm powered on DE
    - ~3.2 A
- 5:58 pm don't see DE telemetry, can't power things off, no telemetry at all
- 6:01 pm don't see Formatter logs growing.
- 6:05 pm trying reboot of Formatter
    - Can ssh
    - Formatter seems hung, last log entry (syslog) is post display of the first test DownlinkBufferElement. Likely the culprit is not in the log, which is inability to TCP connect Housekeeping board.
        - Can ping it from Formatter though?
    - Can get to it from command_loop on the GSE.
        - Used to power of DE
    - Then killed command_loop (6:12 pm). See if Formatter software can restart.
    - 6:13 pm still no, maybe we are in connect_timeout?
- 6:13 pm rebooted formatter (via umbi ssh).
- Still no downlink. Could be SPMU issue?
    - Power cycle Exp. via command_loop on GSE.
- 6:16 pm see downlink from Formatter.
    - This indicates an lockup/reconnection issue with SPMU-001 in the Formatter.
- 6:20 pm shutdown CMOS 2
- 6:20 pm shutdown Formatter.
- 6:22 pm cycled Exp. power
    - Getting CMOS 2 data.
- 6:23 pm powered on DE.
    - Current up to 2.0 A from 1.8 A.
    - Get DE data, still getting CMOS 2 data
- 6:24 pm powered on canister
    - All ping back good.
- 6:25 pm taking CdTe data
    - Looks fine.
- 6:27 pm powering CMOS 2 on
    - Get HK data
- 6:28 pm powering on Timepix.
- 6:29 pm taking CMOS data. Looks fine.
- 6:31 pm going to try a box test.
- 6:32 pm getting Timepix data
- 6:36 pm still getting everyone's data.
- 6:40 pm moving the rail

- 6:42 pm stopped moving.
    - Saw telemetry continuously, saw stable current/voltage
- 6:47 pm stopped CMOS data
- 6:47 pm powered of Timepix
- 6:48 pm powered off canisters
- 6:49 pm powered off DE
- 6:49 pm powered on DE
    - Current increases
    - Get normal HK
- 6:50 pm powered off DE
- 6:51 pm powered on DE
    - Get normal HK
- 6:52 pm powered off DE
- 6:54 pm powered on DE
    - Get normal HK
- 7 pm pausing to make the switch from our ethernet hub to their device.
- 7:15 pm have new (managed) switch set up
- **Item for Thanasi: find another machine, use it to mirror ports from umbi connection (so umbi traffic is differentiated on the network).**
- 7:20 pm using EVTM now for downlink, getting downlink.
- 7:25 pm taking CMOS data, trying to take CdTe data, no luck.
- 7:26 pm powered off DE and canisters
- 7:27 pm powered on DE
    - HK data fine
- 7:28 pm powered on canisters
- 7:29 pm started taking CdTe data
    - Get data

Saturday, April 6 2024

Planning

- Save out, then delete Formatter logs
- Delete Timepix, CdTe, CMOS data.
- Shopping list:
    - FIND UMBI FWD COMPUTER
    - Buy command hooks
    - File folder for paper docs

Cooler troubleshooting

- 9:09 am rail is horizontal and the cooling system works okay
    - NSROC did not edit wiring on rail. Yesterday, after vertica didn't work, Sean made sure the Fiber to RS-232 converter in the SOC is connected correctly.
- 9:50 am cooler communication works still. There was some messing with power supply on the rail.

    - Mario noticed the power cable to the serial to fiber converter loose (power strip side and converter side). Power cable was replaced with a 90 degree connector (on converter side) and was resecured to the converter and the power strip. System was powered back on and established good communication to SOC.
- 10:53 am rail is vertical and the cooler communication stops working again

Horizontal check

- Doing this to see if anything changed since yesterday.
- Plan:
    - Power on:
        - CMOS 2 (of course)
        - CMOS 1
        - Canisters
        - Timepix
        - SAAS
        - DE
    - See if there is DE data.
    - Sean plugging in umbi Ethernet for this test, we will not have telemetry.

run1 (recorded on mac mini)

- 10:09 am started GSE
- 10:10 am powered on Exp.
- 10:11 am get CMOS 2 telemetry
- Power on:
    - CMOS 2 (of course)
        - Baseline 1.8 A
    - CMOS 1 (10:11 am)
        - Sent command a few times, no change in current.
        - Now (10:14 am) CMOS 1 powers on.
    - Canisters
        - Up to 2.3 A or so
    - Timepix
        - 10:14
    - SAAS
        - 10:15 am, see compressed video
    - DE
        - Sent power on command 10:15 am
- 10:15 am taking CMOSes data
- 10:16 am taking CdTe data
- 10:17 am get pedestals from everyone
- 4.5 A total current
- Saw a bunch of length 8 packets arrive a while ago. Very strange. Investigate in the capture later.
    - My eyes deceived me. Everything was fine.
- 10:18 am get Timepix data

- 10:18 am stopping and shutting down.

run2 (recorded on mac mini)

- Now vertical
- Will use EVTM, no umbi.
- Power on:
    - Exp power on 10:57 am
    - CMOS 2 (of course)
        - Yep, it's on
    - CMOS 1
        - Good
    - Canisters
        - Seeing current increases
    - Timepix
        - On
    - SAAS
        - On
        - Get video
    - DE
        - 11:01 am powered on DE
        - No change
        - No more telemetry
        - Not sure if this is an EVTM problem or a frozen Formatter.
        - Plugging in umbi to confirm
- Umbi was plugged in. Can get in Formatter, no problem.
- 11:16 am cycling Exp power.
- Tried power on DE.
    - It works, powered on all cans, ping good.
- Then powered on CMOS 1
- Then powered on SAAS and Timepix
    - SAAS boots
    - SAAS data looks good
- Started CMOS data
    - Looks good
- So everything looks fine now.
- Sitting around 4.5 A on Altair
- Getting Timepix data now
- 11:27 am deleted Timepix data
- 11:39 am trying out simultaneous transmit with Hi-C
    - See more variability in data rate (wireshark)
    - This is between ~11:36 pm and ~11:40 pm
    - Also before Hi-C transmitters were turned on, saw two ~40 second long complete dropouts in data.
- 11:44 am Garrett turning off EVTM to see delay for getting data after startup.
- 11:45 turned EVTM back on, immediately see telemetry.
- 11:47 am stopping, powering off subsystems for test.
- 11:49 am cutting Exp. power.

Starting dress rehearsal

- Station checks
- Umbi unplugged for these
- Then vertical checks
- Then hot count
- Then lunch
- Then we'll see
- Todo:
    - Add callouts to go/no-go checklist
    - If we are no-go during a poll, how to respond?

Vertical checks (run3 on mac mini)

- See paper notes
- Todo: prepare separate go/no-go script for vertical check, for different exit state than holding loop.

More cooler troubleshooting

- 4:11 pm start with vertical, no cooler communication
- 4:12 pm start lowering to horizontal, keep trying talking to cooler during that
- 4:18 pm all the way to horizontal position, still no cooler communication
- Keep trying regularly, no communication
- 4:26 pm Now the cooler works! Nothing was changed on the EXP or range side. No idea what prompted the change.
- 5:06 pm still in horizontal position and the communication is okay.
- NSROC start to mess up with some stuff on their side, trying to break the communication
- 5:49 pm communication drops, but maybe in a different way?
    - Usually when typing something in the Mobaxterm terminal, there is a light inside the serial-to-usb adapter that flashes, even during the times when we lost communication earlier. This time the light is not flashing and there is some sound from the laptop too.
- 5:51 pm communication back
- 5:58 pm communication still okay
- Note made from the dynamic rail duo (Kris and Hunter)
    - Notes from troubleshooting at the rail

Next plans

- Stop rehearsals
- Take photos
- Hi-C arm
- FOXSI cooler troubleshoot
    - Get to cooling test tomorrow
    - Arm cooler tomorrow
- Tomorrow more rehearsals, not campaign.

- Activity is low; should be fine.

Sunday, 7 April 2024

Cooler equipment check while rail is vertical

- Garret and Mario inspected the cables at the rail to check there were no obvious problems and that all cables were secure from yesterday's troubleshooting
- At ~10:25 am communication with the cooling equipment was checked while the rail was still horizontal with the `ptc` command
    - Communication was successful
- At ~10:28 am the rail started to move towards its vertical position
    - During the full movement to vertical, cooler communication was verified to still be operational using the `ptc` command
- At 10:37 am, the rail was vertical and cooler communication remained operational
    - Again, verified with the `ptc` command
- After the communication check while vertical, at 10:37 am, the cooler apparatus was power cycled
    - Powered off for ~5-10 seconds in which communication was not possible (this was good to verify as the cooler should not draw power from some mystical dimension to power itself!)
    - Power was then restored to the cooling system on the rail and after a few seconds (<5 seconds) communications were verified to be restored using the `ptc` command
- At 10:38 am, another power cycle test was performed finding the the same behaviour as the one performed at 10:37 am
- At 10:39 am, the cooling system on the rail was powered off to allow the LN2 system down at the rail (dewar, etc.) to be set-up
    - Once the LN2 equipment at the rail is set up then we can proceed with a cooling test while the payload is in a vertical position

Locally Running PFRR WAFFLE software

- Instructions for the locally running PFRR WAFFLE software can be found in the PFRR Local Waffle Set-up file
- These instructions include
    - the set-up on Kris's laptop to give working access to all files that may need to be viewed and/or edited
    - Paolo's instructions on how to actually interact with the WAFFLE software

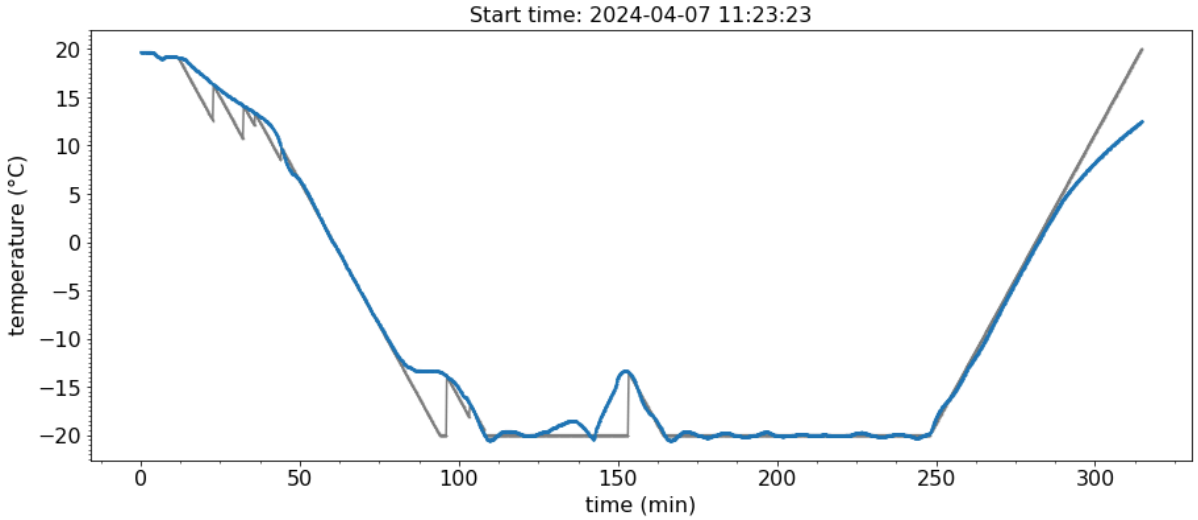
LN2 cooling test while payload is vertical

- 11:23 am: cooler power on, T1 = 19.7, S1 = 30.0
- 11:23 am: Henry opens ~~25%~~33% of the nitrogen valve

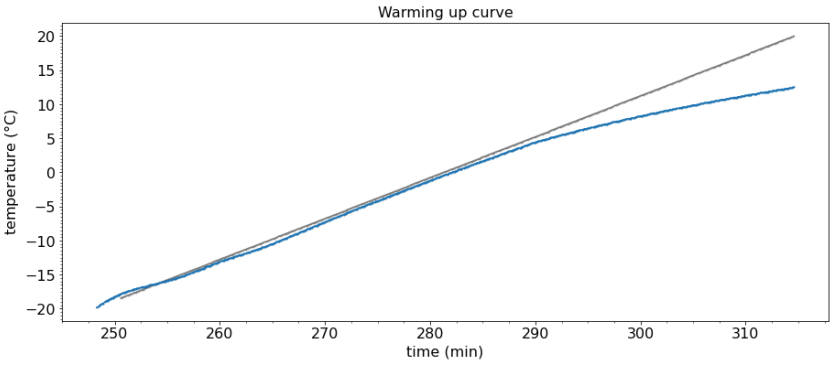
- 11:24 am: “gt 19”
- 11:29 am: reach 19.0 °C
- 11:34 am: Henry opens up to ~~50%~~66% of the nitrogen valve
- 11:35 am: “rr -20 0.6”
- Can cool but a bit slow
- 11:45 am: Henry opens up to ~~75%~~100% of the nitrogen valve
- 11:46 am: T1 = 16.4, restart ramping “rr -20 0.6”
    - Still slow
- 11:51 am: experiment power turned on
    - Getting CMOS 2 data
    - Powered on DE, it comes on no problem.
    - CMOS 1 on
    - 11:54 am powered on canisters, pingback good, started taking data.
- 11:54 am: Henry confirms the nitrogen lines are frosted up as far as he can tell
- 11:54 am: Henry raises bottle pressure to 50 psi
- 11:55 am: restart ramping “rr -20 0.6”
    - Still slow
- 11:58 am: Henry raises bottle pressure to 60 psi; we restart ramping
- 12:06 pm: cooling is faster now
- 12:07 pm: restart ramping “rr -20 0.6”
- 12:09 pm: notice that cdte 2 pt-side pedestals look very weird
    - ASIC 0 shows nothing and ASIC 2 shows a few very strange strips
- 12:10 pm: power cycled cdte 2
    - CdTe 2 still weird and there are pedestal shifts in CdTe 3
- 12:15 pm: power cycled the whole CdTe system
    - All pedestals look normal
- 12:17 pm: cooler seems okay; T1 = 4.1, C0 = 4.0
- 12:21 pm: see CdTe 2 pedestal shift
- 12:25 pm: power cycled DE + all CdTes
- 12:27 pm: no pedestal shift any more
- 12:30 pm: cooler is doing well; T1 = -3.9, C0 = -3.9
- ~12:30 pm: Henry lowers bottle pressure to 50 psi because there was some venting on their relief valve
- 12:31 pm: cdte 2 and 4 look noisier than cdte 1 and 3, but usually it’s the opposite way. Why is that?
- 12:34 pm: CdTe 2 pedestals shift again
- 12:36 pm: restart ramping “rr -20 0.6”
- 12:39 pm: CdTe 1 pedestals also get weird
- 12:42 pm: cooling seems to be a bit slower now; keeping watching
- 12:46 pm: cooling rate is roughly 0.1deg/15sec instead of 0.1deg/10 sec
- 12:52 pm: cooling rate really slow, basically holds at -13.4 deg
- 12:52 pm
    - CdTe 1 and 2 still show pedestal shifts; CdTe 3 is really noisy; Cdte 4 seems okay
    - All “time to read” values keep dropping while the count rates are ~6e5 cts/s; this doesn’t make any sense at all
- 12:59 pm: restart ramping “rr -20 0.6”, cooling rate somehow gets faster
- 1:05 pm: some venting on Henry side

- 1:06 pm: restart ramping
    - Cooling rate seems ok
- 1:10 pm: power cycled CdTe system
    - CdTe 1 and 3 look pretty noisy but this could just be a nitrogen thing
- 1:11 pm: reach -20 deg
- 1:13 pm: clear GSE images and CdTe 1 looks fine now
- 1:17 pm: interestingly, CdTe 2 and 4 look noisier than CdTe 1 and 3
- 1:18 pm: CdTe 1 and 2 pedestal shift, CdTe 3 also noisy
- 1:39 pm: it warmed up a little bit; T1 = -18.6 °C
- 1:41 pm: see temperature coming back down; good.
- 1:45 pm: NSROC need to swap our dewar because it's almost empty
- 1:51 pm: CdTe system power cycled
- 1:52 pm: dewar swapped; temperature keep increasing
- 1:55 pm: notice that CdTe 1 and 3 pedestal look very noisy; not sure when this starts
- 1:55 pm: temperature holds at -13.4 deg
- 1:56 pm: restart ramping "rr -20 0.6"
- 2:03 pm: CdTe 2 pedestals shift and get noisy too
- 2:08 pm: bottle pressure 52 psi, temperature back to -20 deg
- 2:10 pm: CdTe 1 and 3 very noisy; CdTe 2 shifts; CdTe 4 good
- 2:19 pm: temperature -20.2 deg; good.
- 2:31 pm: exp. power off
- 3:31 pm: start to warm back up "rr 20 0.6"

See below for the full temperature curve: (blue is actual temperature, grey is setpoint temp.)



Just the warming up part:



Telemetry forwarding

In order to avoid multicast diamonds in the network.

- Plan is to add Kris's personal Raspberry Pi to the mini blockhouse. It will run forward_formatter_to_pfrr.py, which will mirror all multicast traffic from the umbi
- 6 ish pm, did it. Pi is on in mini blockhouse. Need to ssh to start up software once Exp is powered on. Otherwise have no endpoint for Pi to open socket on (Experiment is disconnected when off).

Tuesday, April 9 2024

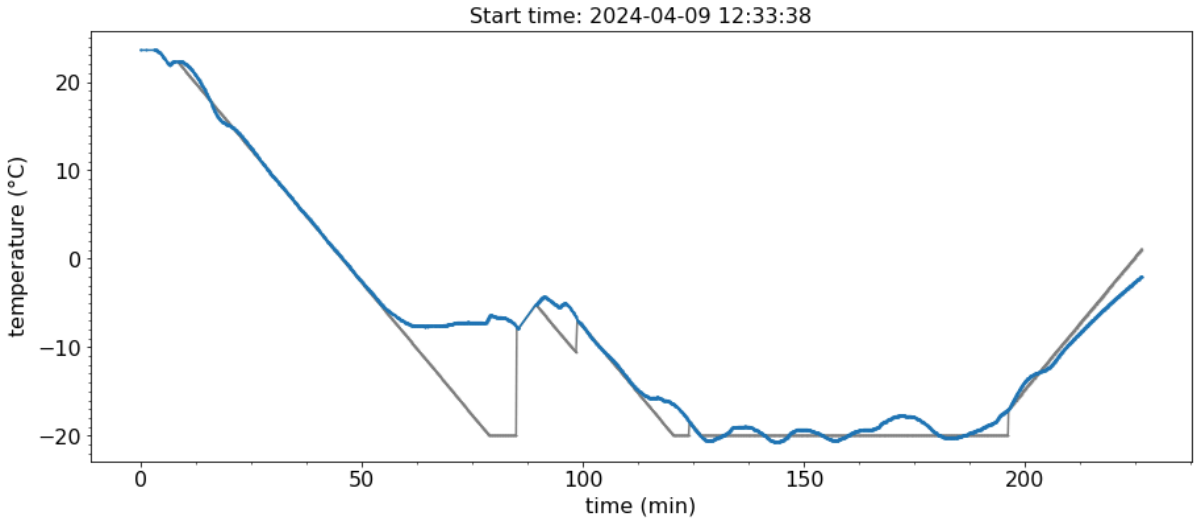
Hopefully a launch!

See paper notes (by Kris, Yixian).

Cooling

- Doing umbi device (in mini blockhouse) check before starting cooling.
- 12:15 could ping/ssh KrisPi in mini block
- 12:18 got Exp power, can no long ping/ssh mini block Pi
    - EVTM was off.
- 12:20 not getting Exp data, end test. Troubleshoot tomorrow. Proceed to cooling.

Temperature curve:



End of day meeting

- Tomorrow
    - Thanasi 7:30 am at range. Go to mini block and clean out Formatter (before start cooling). Try umbi network again if time permits.
    - Move countdown clock and clearcom system over to science area in science room.
    - Try a power cycle of just canisters to clear pedestal droop error.

Wednesday, April 10 2024

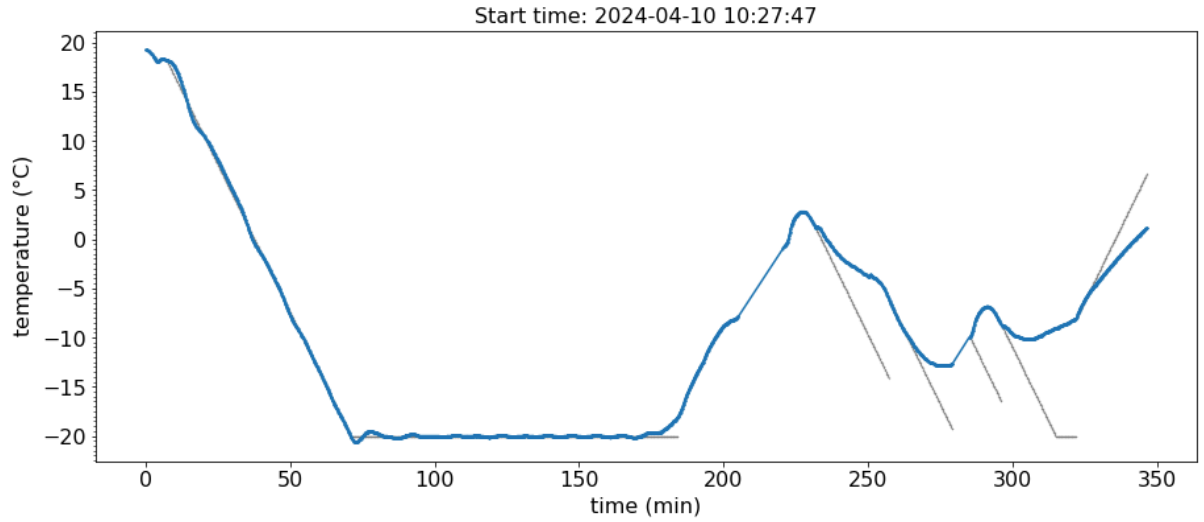
Morning

- Document revisions: decision tree and go/no-go list:
    - Added uplink check-in time with science room after vertical, and when entering hot count hold.
    - Moved bias command to T+64 s, when altitude is ~73 km.
        - SAAS verification and science target update (for SPARCS) has moved earlier in the tree instead, during the burn.
    - Changed idle bias voltage to 0 V in go/no-go.
    - Added Shimizu san's >35% df requirement to 15-minute checks.
    - Need to still add sparse command/pedestal droop correction to decision tree
    - Need to incorporate Kris's comments from yesterday in the go/no-go.

Miniblock

- Connected via umbi 8:50 am (got Exp power around 8:40)
    - Formatter running, getting CMOS 2 data. Looks good.
    - Saving syslog, logs, then clearing.
- Pulled data out to Thanasi laptop, apr9 log folder
    - Although this contains data from before apr9 as well
    - Cleared syslog, daemon.log, and foxsi-4matter/log/*. Now down to 34% disk utilization in Formatter (typical).

… cooler problems …



End of day

- [ ] Merge Kris's Timepix fix
- [ ] Pull on science room computer

- [ ] Test the science room computer with pcap playback from today, and with Narukage's code change running for additional display.
- [ ] If Timepix fix is good, pull on main uplink/display GSE computers

Science meeting

- Tomorrow campaign day as usual; likely down on Friday (for weather, before big active regions spins onto disk)

Friday, April 19 2024

- Thanasi request packing slip for MN oscilloscope from Benji
- Payload returned to PAB by helicopter early afternoon. There are several dents!
- Payload grounded to the bulding. There was some snow inside the parachu compartment. No clear evidence of snow in other parts of the payload. As a safe move, we left the payload dry over night.

SAAS meeting

- Thanasi + Orlando
- Do initial, brief power on check.
- Orlando will prep some short notes on how to connect VGA, keyboard, USB stick, and extract photos.
    - Expects < 8 GB to remove.
    - Believes timestamps are accurate.

Saturday, April 20 2024

- Morning (before 9:30) Opened up the payload. Disconnected from NSROC section. Grounded Exp chassis to building.
- Shutter door is WRECKED. An edge of it hit the ground and got dented (very close to payload 180 – Solar south). Struts are bent. Luckily, it opened with no issues, so we were able to detach it in the usual manner. We opened the door partway; Thanasi detached the harness and secured it safely away from the optics, and then the NSROC team removed the shutter door completely.
- Visual inspection: optics prefilters look fine.
- Milo found a small amount of water sitting on the skin on the optics side. Also possible water marks from some more water having been there and dried. This was on the part of the skin that likely sat on the ground (the same side with the dents). Photos of the payload before recovery did not show any snow sitting on top of the experiment section, so this may have come in through the damaged shutter door.
    - We also found one metal shaving on the optics side that probably came from the shutter door damage.
- TM side connectors look fine. Did not see evidence of water on that side.
    - Vestigial cooler signals were taped against skin, out of the way.

    - Tape held, but labels on those signals are very well cooked. Skins got hot.
- No evidence of water on detector end (Lindsay, Thanasi and Milo independently inspected this end with a flashlight).
- Umbi looks to have pulled away cleanly - both hose and electrical connector. No evidence of any pieces left over (not even a hose and clamp). No evidence of it having hit anything else either.
- 11:40 am we have moved Experiment onto the GSE alignment stand, removed the umbi assembly, detector-side skin, and rolled into the clean room.
    - In the clean room, taking off detector-side blanket for visual inspection and removing OBFs on optics side.
- 12:30 pm Sakuta san removed first OBF (the one on the long tower) in clean room. (Note: we are not operating the clean room as a clean room, but it is cleaner than the rest of the building.)
- Around 1:30 pm (approx) we removed the optics side skin. Hi-C tech helped remove the offset cruciform (torque) bolts and nuts that held on the shutter door harness clamps. Removed *both* optics skins.
- Observed more evidence of water after removing the optics skins. Optics skin joint was damp in one place. Photos of inside of remaining skin (still on the experiment) show a trail of dried water going all the way down to the ridge halfway down the skin. We do not see evidence of similar dampness or trails on the other side (closer to the detectors) but there may be isolated water spots here and there. We re-inspected the detector side skin interior and found the same (no liquid water, no tracks, but maybe some isolated water spots here and there).
- Based on what we've seen so far, we don't think the detector electronics would have gotten wet. We are proceeding with setting up for power on as of 2:15 pm.
- **Power on notes:**
    - 2:25 pm powering on. Current is 0.75A (probably appropriate for formatter +CMOS2). Settled to ~0.68A.
    - Note: before this, ethernet cables were plugged into the relevant boxes but not connected to anything,
    - Thanasi stopped the formatter software so that nothing else would be going on while data transfer happened.
    - Then Shimizu san connected to CMOS system via ethernet cable, ssh. Meanwhile, Thanasi copies out formatter log files.
        - Formatter disk 47% full

Packing

- Working on a packing list here. Box numbers currently carried over from the WSMR -> PFRR shipment.

Flight data extraction

- Following procedure here
- 2 pm set up in clean tent
- Probing out connectors
    - Power input (external side)

        - Good
    - Power input (Exp side)
        - Good
    - Uplink
        - Good
- For Ether to Formatter connection, using old, poor quality 9-pin (EVTM) interface built at WSMR. The umbi external connection was fried.
- 2:25 pm powered on, current nominal.
- 2:28 pm stopped and disabled formatter.service (systemctl)
- 2:35 pm Shimizu san started copying out CMOS 2 data.
- 2:40 pm Thanasi finished copying out Formatter files
    - foxsi-4matter/log, /var/log/syslog, and /var/log/daemon.log
- 5:30 pm pulled out DE data on GSE computer
    - CMOS 2 remained on
    - Current was nominal, ~0.95 A (includes CMOS 2)
    - 10% disk utilisation
    - Not many files—should be easy to find flare
- 5:40 pm setting up to pull Timepix data
    - 5:46 pm power on Timepix, current 1.2 A
- 5:50 pm Milo copied out pcaps and other files suggested by Savannah.
- 6:00 pm SAAS power test. It powered on, saw usual display on compressed video. Powered off.

Formatter timestamping

- Want to figure out unixtime of boot of flight formatter.
- From reading syslog/daemon.log, believe Formatter flight boot starts at onboard time:
    - Nov 30 2023 21:17:01 UTC / 15:17:01
    - Started log file 15:17:20. This checks out with longest log file name: auto_2023-11-30_21/17/20.log
    - While the log file name appears to get the (assumed) onboard UTC time, the time tags inside the log file are in (assumed) onboard local time, starting at

```
[15:17:20.321] main check debug log
```

Sunday, Apr 21 2024

Morning

- Tried powering system on after arrival. Only Formatter turns on now, no CMOS 2.
- Powered off, removed SAAS lid.
- Enabled, then started Formatter software, then rebooted. Still no CMOS 2 power on (rules out hidden Formatter software issue).
- Power cycled, still no CMOS 2.
- Tried commanding other systems on directly with command_loop (GSE to Housekeeping board direct interface):
    - DE: powers on
    - Timepix: powers on
    - SAAS: no power
    - CMOS 1: no power
    - CMOS 2: no power
- Powered off Exp.
- 8:50 am connected AC adapter power to CMOS 1 to power on
- 8:55 am can power and log in to CMOS 1
- 12:18 pm, after transferring out CMOS 1 data, power on Exp. CMOS 2 seems to come on. Had just tightened screw terminals on bench power supply. Suspect issue was bad GND or 28 V connection on power supply side.
    - Can ssh formatter
    - Can ssh CMOS 2. Shutdown with command.
- 12:20 pm powering on SAAS
    - It powers on (lights on camera)
    - Powered off
- 12:25 pm disconnected P11 in SAAS (VGA connector) and connected SBC-side to monitor.
    - Then connected double USB dongle to SAAS header (as indicated by Tamar in Slack). Connected USB keyboard to one. USB drive is not yet connected
- 12:29 pm powered on Exp.
    - Current nominal (for CMOS 2 being on)
- 12:30 pm powered on SAAS. Light comes on.
    - Shutdown CMOS.
- 12:33 pm pressed Q to stop SAAS software. It stops. Good. See Steven's terminal.
    - ls takes a long time!
- 12:40 pm plugged in USB stick. It appears as /dev/sdb and /dev/sdb1. /dev/sda already existed on SAAS boot.
    - The command `find . -type f | wc -l` returns 247675 (run in /home/schriste)
- 1 pm I think I started copying data?
    - Failed (after about 7 minutes), was getting USB out of disk space errors.
- Started again 1:31 pm.
- Having lots of problems with disk space on the USB stick. There is plenty of space, but OS doesn't want to fill it.
- 2:20 pm started again.

- 3:10 pm found a different drive to use. Starting transfer. Initially had ~5 GB used in SSD. There is ~11 GB data to transfer.
    - Expect transfer to take ~ 1 hr.