Tracker Commissioning

Edward Overton

On Behalf of the tracker team..
… Alan Bross, Paul Rubinov, Geoff Barber, Mellissa Uchida, Chris Heit, Paul Kyberd, Craig McWatrers, Ken Long, Ray Gamet, (plus others I have forgotten)

- With many thanks to the Software & DAQ Guys..
  … Adam, Durga, Yordan, Rhys

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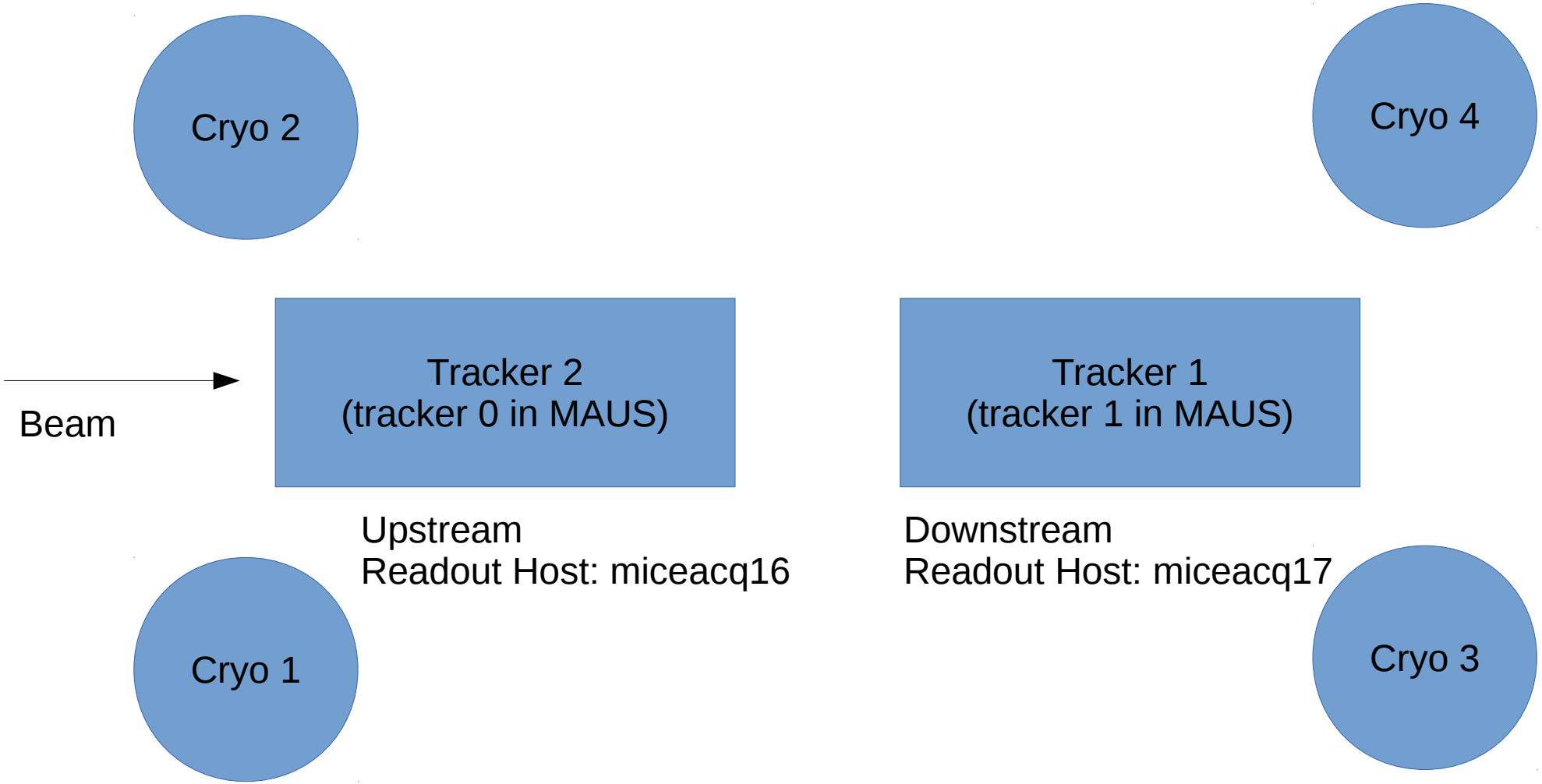
Status at CM41

- 4 Cold Cryostat’s
- Faulty PSU on Downstream Tracker.
- **Noise on all channels, above what was expected.**
- Triggered and read out noise.
- Displayed plots on Online Monitoring.
- Unpacking with MAUS was problematic.
- Internal LED was tested with a single waveguide
- New trigger interface started but incomplete.
- Controls and Monitoring was overly complex, slow & prone to crashing.

System Overview



Issue Resolution I

- Faulty PSU on Downstream Tracker:
  - Turned out to be caused by a loose fuse in the PSU to backplane connections.

- Noise on all channels, above what was expected:
  - Experimented with a number of grounding schemes.
  - Most noticeable change was caused by a overly optimistic integration gate, we reduced this from 200ns to 180ns. (its now 190ns at the board).

- Number of boards were diagnosed with faults and swapped:
  - Invalidated Calibrations from Lab 7 Cosmics.
  - We would have needed to redo these anyway.

- Controls and Monitoring:
  - Improved orignal codes exception safety to prevent common crashes.
  - Extended functionality with a new derrived class, which wrapped and used the original code base.
  - Wrapped Hardware Interface code with a new EPICS IOC.

Issue Resolution II

- Trigger Integration:
  - Yordan reviewed the modifications and implemented in the firmware.
  - This was tested during Mock Data Run 3.
  - More issues were found in MDR3 with the data quantity.
    - These were fixed post MDR3, in a two day post MDR3 debugging period.

- Unpacking issues:
  - A push on this was part of the MDR3 unpacking and good progress was made.
  - Some data quality issues caused unpacking exceptions which ultimately hindered the effort.
  - Following getting good data from the upstream tracker, data was read correctly into MAUS.

Calibration, Waveguides and Beam

Week 1 (1 June):

- Complete bias calibrations on the upstream tracker (using the external pulser).
- Tuesday/Wednesday Connect the Waveguides.
- Thursday: Begin Bias Calibrations on downstream tracker.
- Saturday/Sunday: Begin first pass timing using upstream tracker and TOF0.
- ? Timed in upstream internal LED system.

- Week 2 (8 June):
  - Monday replace boards with readout issues on Cryo4, update firmware, and run calibration scripts.
  - Monday/Tuesday: Move external LED pulser around to complete calibrations.
  - Wednesday/Thursday: Begin attaching downstream waveguides.
  - Friday: Begin looking at internal LED on downstream.

- Week 3 (15 June):
  - Monday: Started using TOF1 for trigger, retimed to a pion beam @ TOF1.
  - Tuesday: Connected the upstream tracker and saw digits!
  - Thursday: Connected the downstream tracker..
    - GeoID's were wrong, fixed.
    - Saw Digits!

Preliminary Characterisation

- See Chris Heidts Talk (also attached to this slot)

Status Now

Tracker is in ***Alpha***:

...Its mostly working, but not all there.

- Upstream is in pretty good shape.
- Downstream has some known issues.
  - Two banks (256 channels) have readout problems.
  - Station 4 looks interesting... probably related to mapping / readout issues.
- Timing is not perfect (a good estimate at this point). Do not expect ultra high space point finding efficiency.
  - Reccomend placing cuts to require hits in tracker if looking for data.

Plans

… Getting to V1.0 ...

- Fix Readout issues on the two bad banks.
- Understand/Fix issues with station 4
- Re-check calibration
- Careful timing studies...
- Efficiency studies along the way...