

HPS Software Update

Maurik Holtrop — HPS Collaboration Meeting, JLAB, May 31, 2019

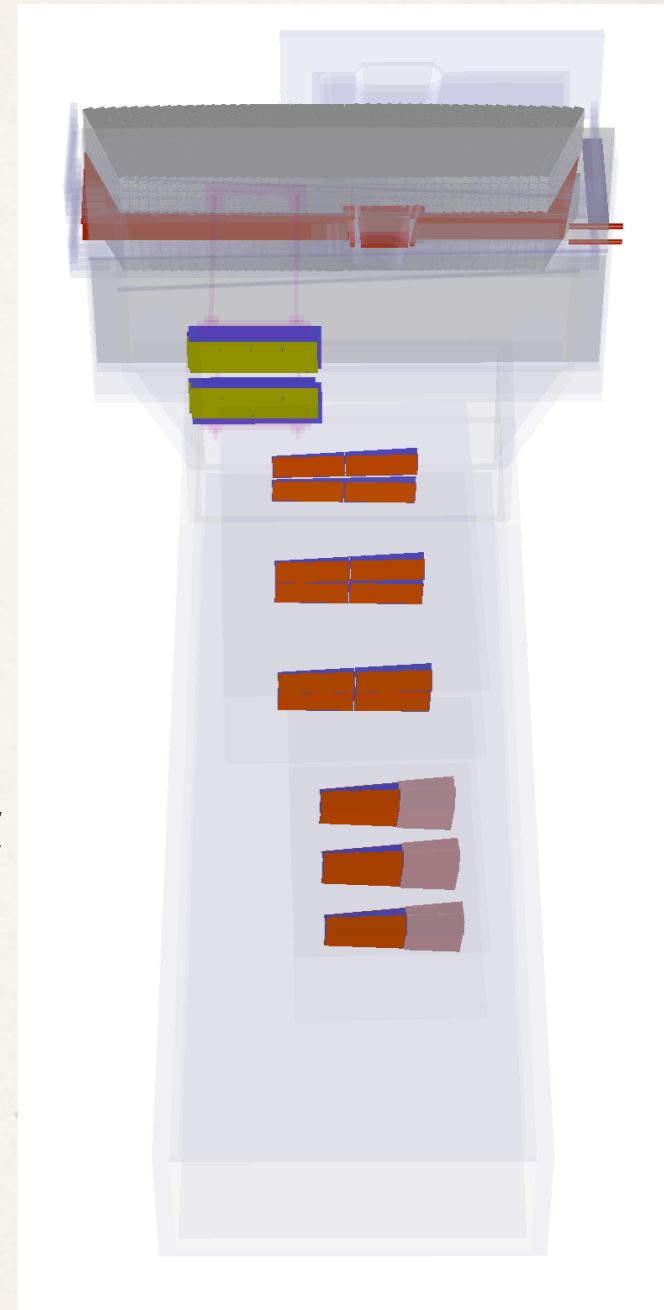
Date

Outline

- ❖ Current Status
- ❖ Recent Changes
- ❖ Outstanding Tasks and Issues
 - ❖ Critical
 - ❖ Important
 - ❖ Enhancements
- ❖ Conclusions

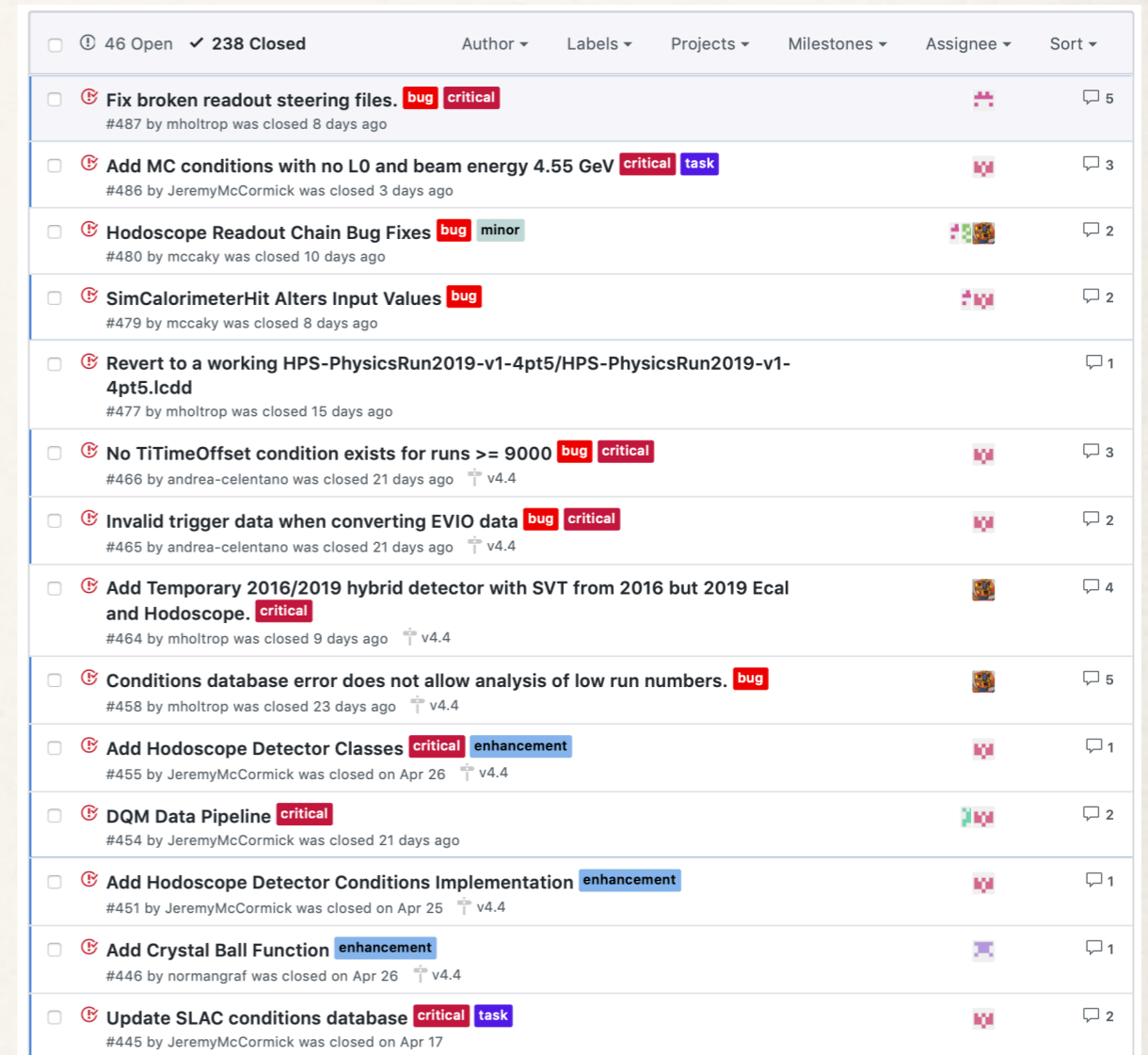
Current Status - MC & Recon

- ❖ Current MC detector model is a hybrid 2016 / 2019, with the old tracker, the hodoscope, and the ECal moved back 5cm.
- ❖ MC data was produced with this detector for trigger studies.
- ❖ Extensive changes were made to the readout code to accommodate the hodoscope and permit retention of MC “truth” data. (Kyle)
- ❖ EVIO converter and initial conditions database entries for Hodoscope created.
- ❖ New run number and conditions for 2019 MC: 1000011.



Recently completed issues

- ❖ Lots and lots of issues were resolved recently.
- ❖ Turnaround time to resolve “pull requests” has been rapid.
- ❖ Check GitHub for issue status. Highlights:
 - ❖ Fixed fieldmap bugs
 - ❖ MC SVT timing issue resolved.
 - ❖ Add run by run beam spot x,y coordinates for 2016 data.
 - ❖ Fix issue with beamspot constrained chi-squared.
 - ❖ DQM data pipeline setup, and initial JSRoot based webpage setup.
 - ❖ Lots of critical bug fixes.



A screenshot of a GitHub Issues page showing a list of recently closed issues. The page header indicates 46 Open and 238 Closed issues. The list includes various issues with labels like 'bug', 'critical', 'task', and 'enhancement', along with their titles, authors, and closure dates.

Issue ID	Title	Author	Labels	Closed
#487	Fix broken readout steering files.	mholtrop	bug, critical	8 days ago
#486	Add MC conditions with no L0 and beam energy 4.55 GeV	JeremyMcCormick	critical, task	3 days ago
#480	Hodoscope Readout Chain Bug Fixes	mccaky	bug, minor	10 days ago
#479	SimCalorimeterHit Alters Input Values	mccaky	bug	8 days ago
#477	Revert to a working HPS-PhysicsRun2019-v1-4pt5/HPS-PhysicsRun2019-v1-4pt5.lcdd	mholtrop		15 days ago
#466	No TiTimeOffset condition exists for runs >= 9000	andrea-celentano	bug, critical	21 days ago
#465	Invalid trigger data when converting EVIO data	andrea-celentano	bug, critical	21 days ago
#464	Add Temporary 2016/2019 hybrid detector with SVT from 2016 but 2019 Ecal and Hodoscope.	mholtrop	critical	9 days ago
#458	Conditions database error does not allow analysis of low run numbers.	mholtrop	bug	23 days ago
#455	Add Hodoscope Detector Classes	JeremyMcCormick	critical, enhancement	Apr 26
#454	DQM Data Pipeline	JeremyMcCormick	critical	21 days ago
#451	Add Hodoscope Detector Conditions Implementation	JeremyMcCormick	enhancement	Apr 25
#446	Add Crystal Ball Function	normangraf	enhancement	Apr 26
#445	Update SLAC conditions database	JeremyMcCormick	critical, task	Apr 17

Critical Issues

❖ **Trigger Studies.**

- ❖ Initial MC samples for trigger studies were produced.
- ❖ MC needs to be analyzed to set trigger parameters.
- ❖ Kyle volunteered to do this with Rafo's help.

❖ **Trigger verification code.**

- ❖ The code needs to be updated to correspond to new trigger setup.

❖ **Trigger efficiency code.**

- ❖ Same for the trigger efficiency code.
- ❖ This needs tracking to work.

Critical Issues - continued.

- ❖ **SVT Software.** (See Norman's talk yesterday).
 - ❖ We need the DAQ Map and SVT Readout working and verified!
 - ❖ We need to make sure we have at least tracking working on L2-L6.
 - ❖ We need to update all monitoring and DQM for L0 and slim-L1
 - ❖ We need to get tracking to work for L0 and slim-L1
 - ❖ Update alignment code and procedures for L0 and slim-L1.
- ❖ **Hodoscope.**
 - ❖ Finish the hodoscope reconstruction code. (Rafo)
 - ❖ Hodoscope calibrations.
 - ❖ Add hodoscope histograms to the monitoring app and DQM

Critical Issues - continued.

- ❖ Make sure we can efficiently process large (~10 GB or larger) EVIO files.
 - ❖ Test splitting files, update batch scripts
- ❖ Detector Geometry updates.
 - ❖ Update the detector geometry to be closer to reality.
 - ❖ L0 and L1 positions
 - ❖ Survey results.

Less Critical, but needed soon.

- ❖ Update the MOUSE standardized physics cuts for 2019 data.
 - ❖ First scale all the cuts for higher beam energy.
 - ❖ Initial optimization of the cuts.
 - ❖ This will speed up the start of data analysis.
- ❖ Update the dst-maker to include the Hodoscope reconstruction output.
- ❖ Initial alignment on early run data.

Longer term Issues

❖ Monte Carlo:

- ❖ Complete the transition to hps-sim
- ❖ Complete implementation of WAB biassing.
- ❖ Pulser beam background merging.
- ❖ Event mixing in real data.
- ❖ Propagate MC truth through the whole reconstruction chain.

❖ Improve MC - data correspondence.

- ❖ Are we simulating the SVT pileup correctly? (See Matt's talk)
- ❖ Dead/noisy channels - SVT bad channel knockout.
- ❖ Beam current, width, angle, position, on a run by run basis.
- ❖ More accurate timing, with noise.
- ❖ Get resolutions to agree with data!

Longer term Issues

- ❖ Move to the MC Python scripts (hps-mc).
 - ❖ Smooth out MC production.
 - ❖ Same procedure as JLab, SLAC, UNH.
 - ❖ Modify for use on Open Science Grid.
 - ❖ Needs to be pushed out and iteratively improved.
- ❖ Tracking improvements. (See Norman's presentation yesterday)
 - ❖ Implement Kalman Filter
 - ❖ Pattern recognition (track finding) using 1D strip hits.
- ❖ Improve reconstruction speed
- ❖ Improve and speed up SVT pulse fitting.
- ❖ Speed up ECal pulse fitting.
- ❖ Keep improving alignment procedures.

Last slide

- ❖ There is *lots* we need to do.
- ❖ Much of the basic code is there, a lot of the tasks are updates, not completely new concepts.
 - ❖ (Those can still be very time consuming.)
- ❖ We have excellent new people.
 - ❖ (But they need to get up to speed.)
- ❖ We keep improving and refining the code and the analysis, and we need to continue that cycle.