

HPS Software, Monitoring and Data Handling

To be updated

Maurik Holtrop,
University of New Hampshire
HPS DOE Review, July 11, 2013

Outline

- Introduction of Software group.
 - Available manpower.
- Overview of current software
 - MC & Data Analysis chain, Monitoring.
 - Status: Online monitoring & calibrations.
 - Data handling and storage.
 - Slow Controls.
- Software update schedule:
 - Simulation updates to production MC running.
 - Reconstruction updates.
 - Analysis updates.
 - Monitoring and calibrations updates.
 - Conditions system and data catalog.
- Conclusions.

HPS Software Group

The software team:

Very active and dedicated people working on the HPS software.

Very strong presence from SLAC group. Framework is SLAC based.

Varied group.

	Institute	Position	Availability
Stacy Karthas	UNH	undergrad.	15%
Sho Uemura	SLAC	grad. student	50%
Omar Moreno	UCSC	grad. student	50%
Per Hanson (Pelle)	SLAC	post-doc	50%
Sarah Phillips	UNH	post-doc	25%
Matt Graham	SLAC	researcher	50%
Andrea Celentano	INFN	grad. student	50%
Jeremy McCormick	SLAC	IT professional	25%
Norma Graf	SLAC	IT professional	25%
Homer Neil	SLAC	Physics staff	25%
Takashi Maruyama	SLAC	Physics staff	25%
Hovannes Egiyan	Jlab	Physics staff	20%
Raphaël Dupré	Orsay	post-doc	10%
Maurizio Ungaro	Jlab	Staff	10%
Yuri Gernstein+studer	Rutgers	Professor	25%
Maurik Holtrop	UNH	Professor	25%

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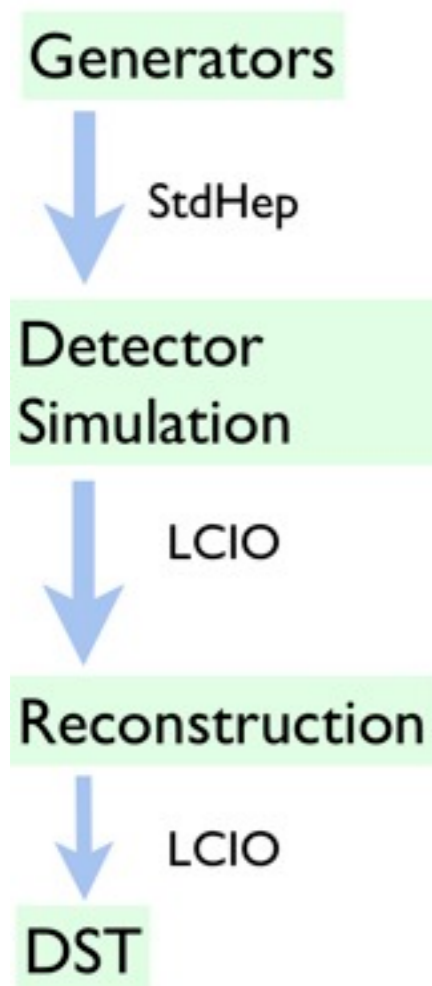
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Software Layout

The HPS software can be seen as three data streams, which have overlapping properties but also distinct features.

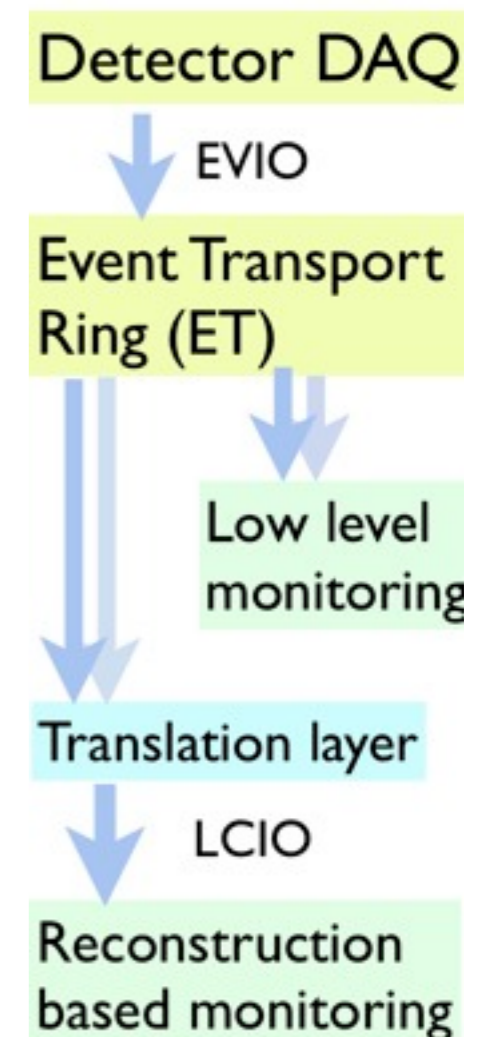
Monte Carlo



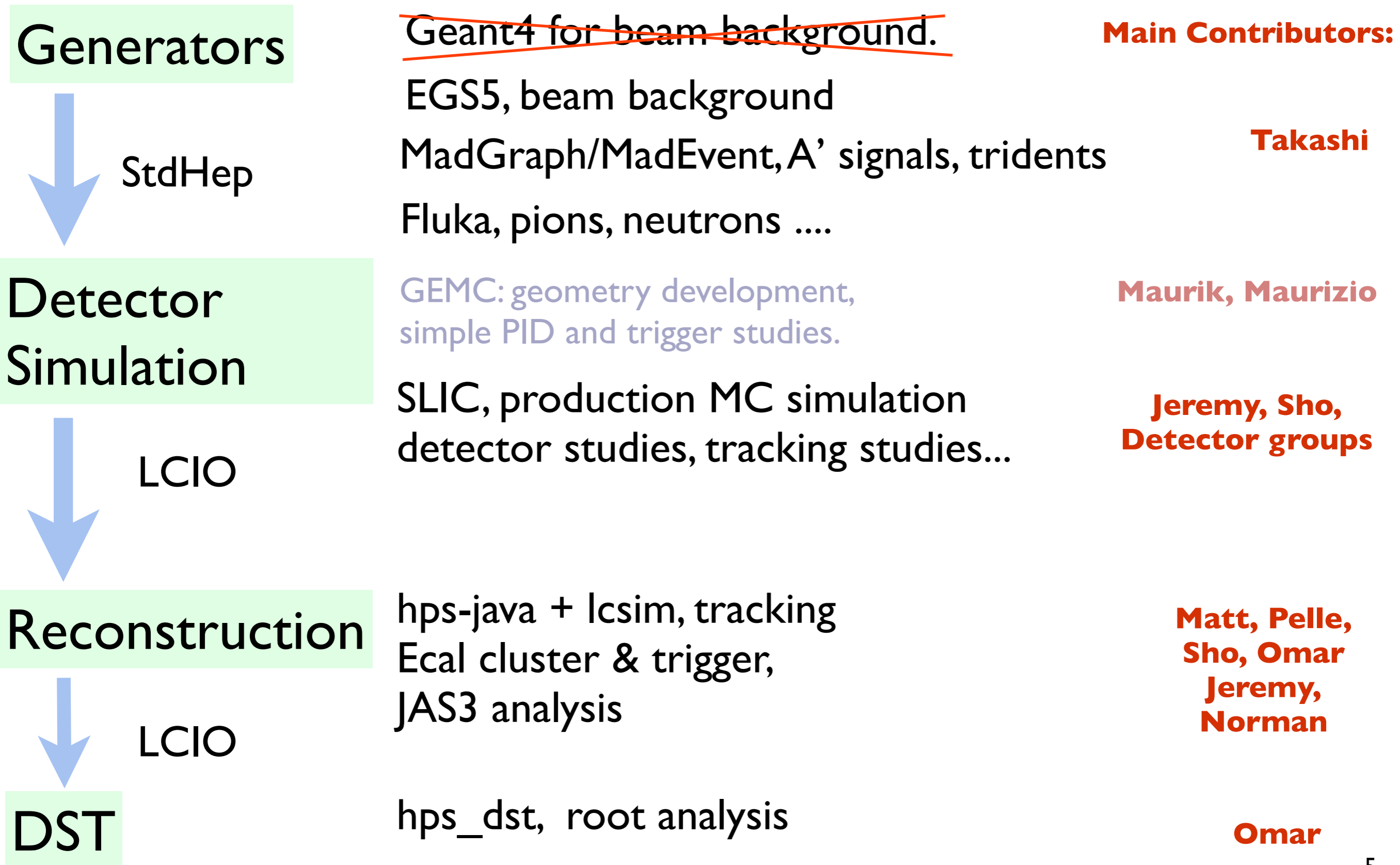
Data Analysis



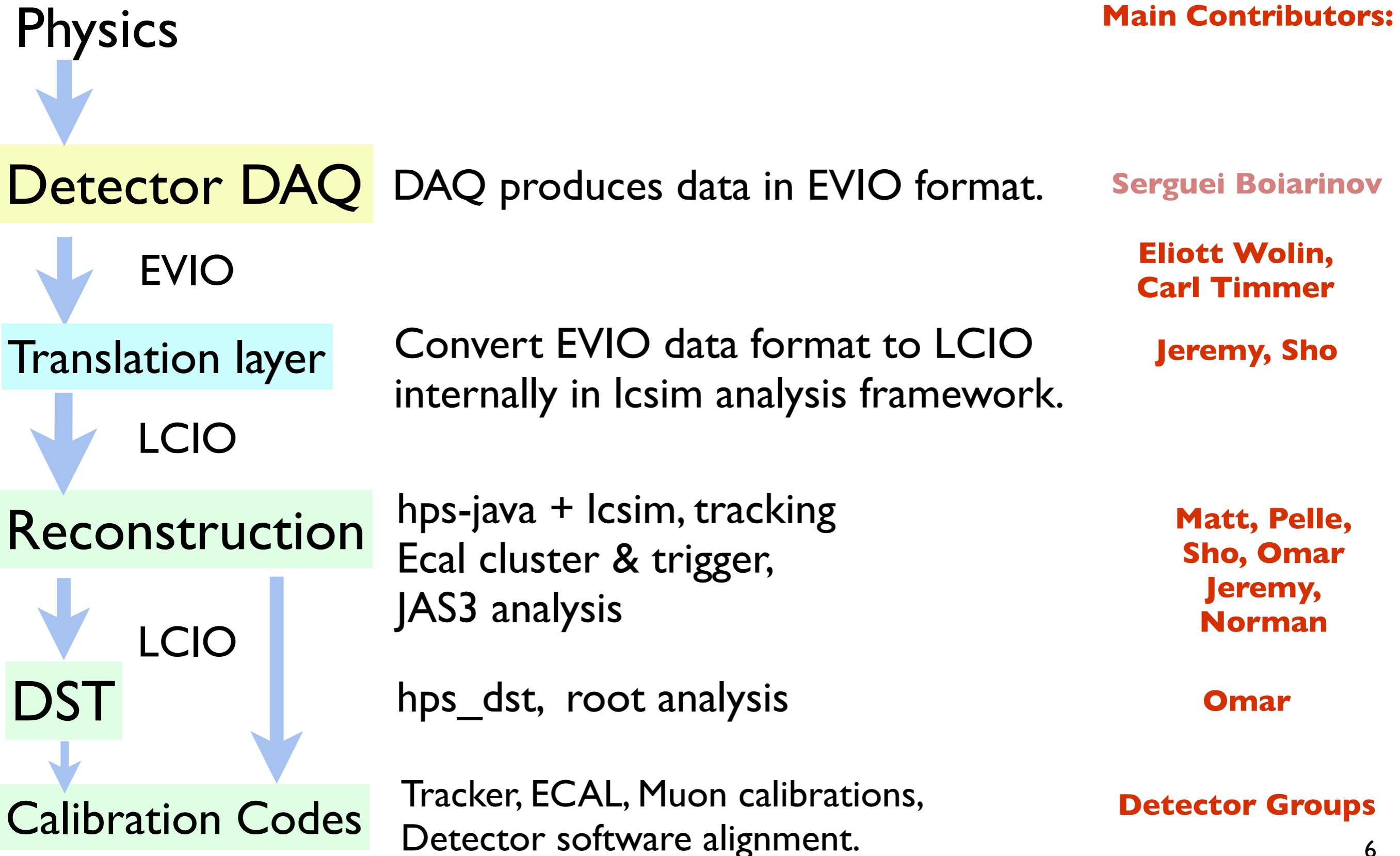
Monitoring



Monte Carlo Chain



Data Analysis Chain



Online Monitoring

Detector DAQ

DAQ produces data in EVIO format.



Event Transport Ring (ET)

Distributes data to multiple clients.



Low level monitoring

Specific programs for monitoring the detector hardware.

Translation layer

Convert EVIO data format to LCIO internally in lcsim analysis framework.



Reconstruction based monitoring

hps-java + lcsim, tracking Ecal cluster & trigger, JAS3 analysis

Main Contributors:

Serguei Boiarinov

**Elliott Wolin,
Carl Timmer**

**Detector Groups,
Stacey, ...**

Jeremy, Sho

**Matt, Pelle,
Sho, Omar
Jeremy,
Norman**

Slow Controls

**Main Contributors:
Hovanes,
Detector Groups**

- A software system separate from the main data analysis chain.
- Used to control and read-back the detector and beam line hardware.
- Uses EPICS: Experimental Physics and Industrial Control System.
 - Free open source software.
 - Familiar at JLab.
- Uses existing MEDM or SSC Boy software extension for visualizations.
- Uses existing Alarm Handler and Striptool
- Database backend for data archiving.

Slow Control Applications

- High & Low voltage control
- Motion control
- Temperature monitoring
- Monitoring of scalers
- Magnet control
- Monitoring of beam line
 - Beam position/current, Harp scans
- Interlocks
 - SVT interlock: temperature, coolant flow, beam quality.

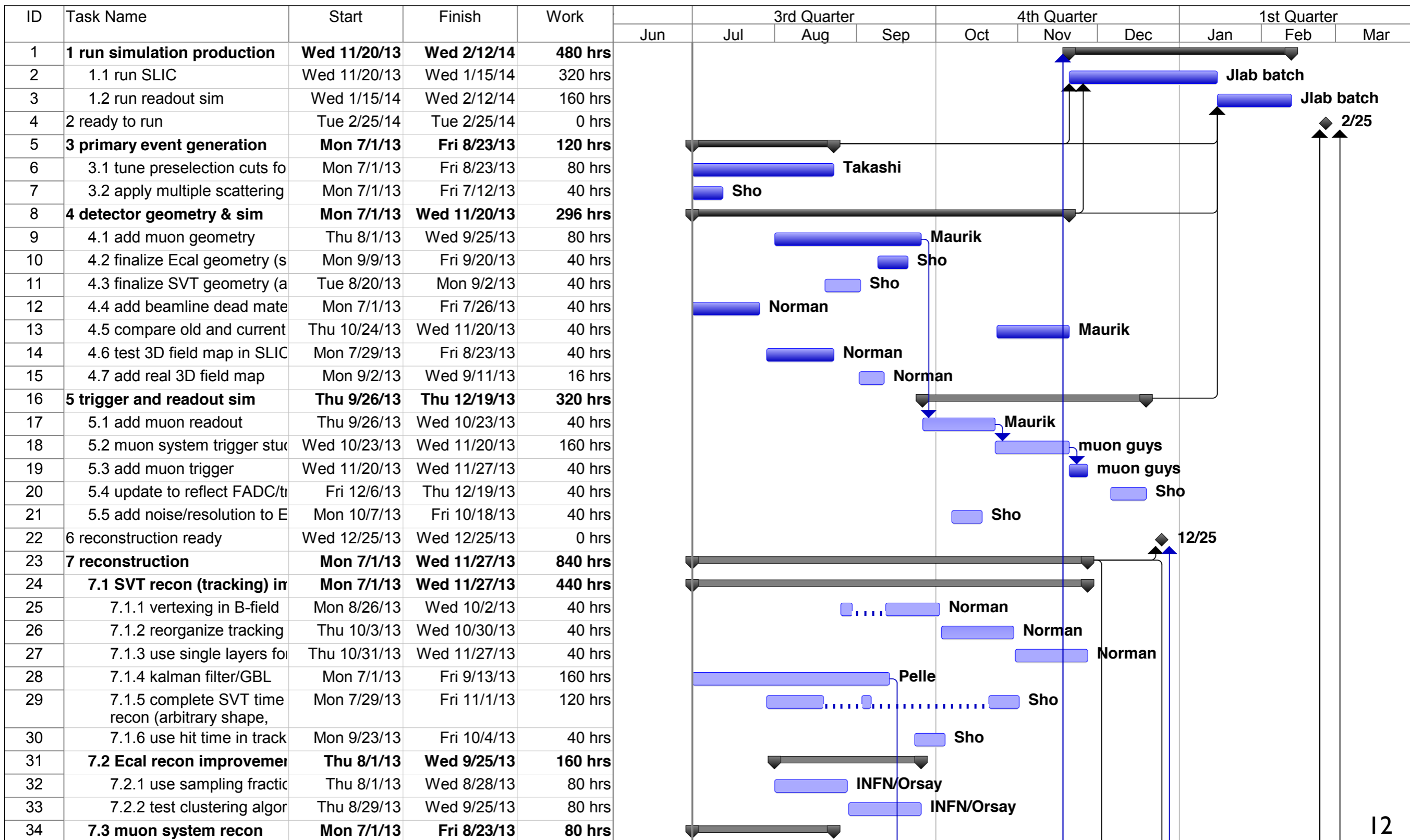
Software Status

- Test run showed we can take data and successfully analyze it.
- Many, many software updates since the test run:
 - MC geometry improvements.
 - Tracking improvements.
 - Analysis improvements.
 - Bug fixes.
- Many further updates (very) desirable.

Updates

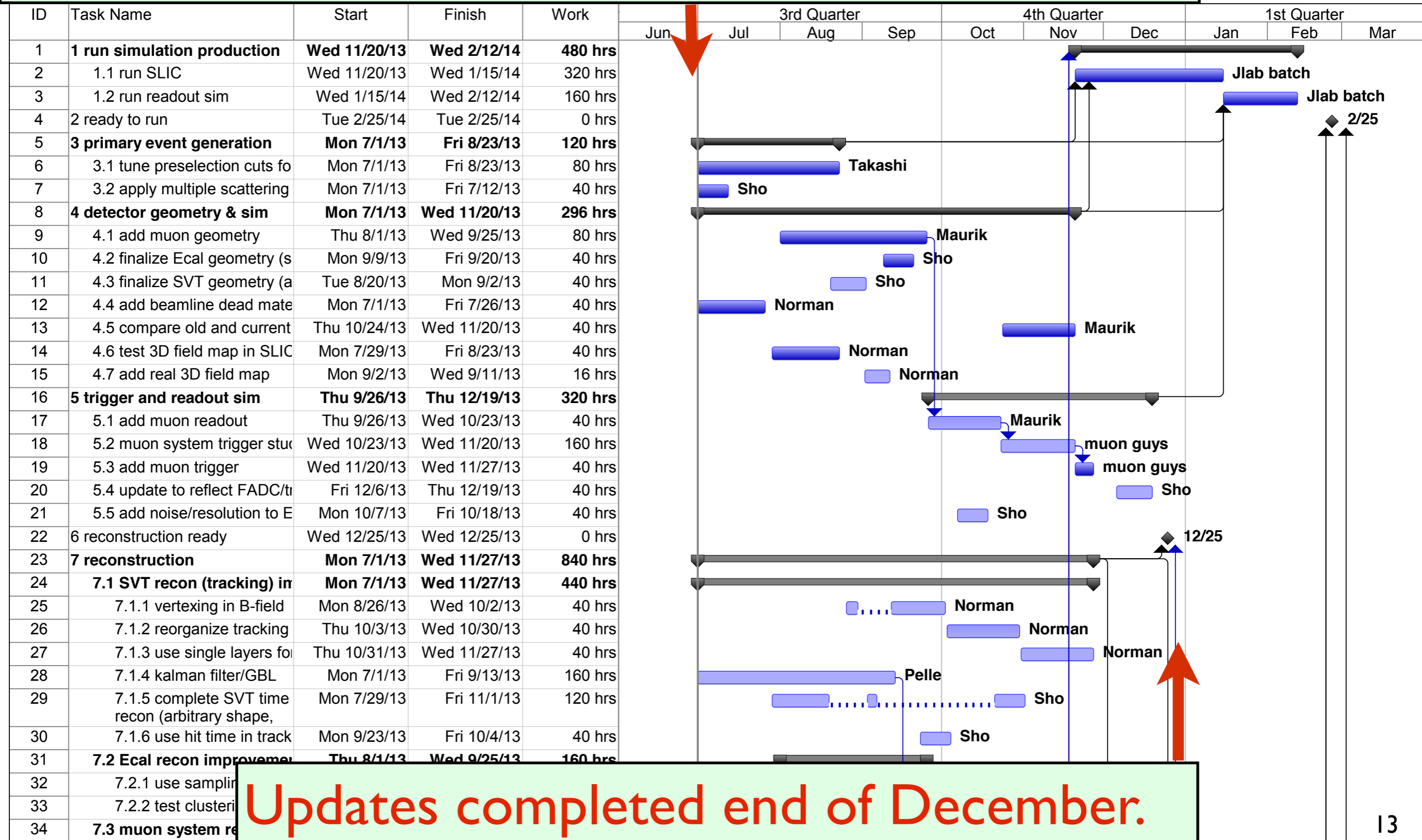
- **Monte Carlo:**
 - Geometry updates: Muon detector, refinements of ECAL and SVT, dead material.
 - Event generator tuning (make it faster).
 - Readout refinements (make it even more realistic).
- **Data Analysis:**
 - Improve tracking - fringe B-field - algorithm refinements.
 - Kalman filter.
 - ECAL cluster finder refinements.
 - Muon system readout/reconstruction.
- **Monitoring:**
 - Fast visual hardware monitor: HPS Event Display.
 - Individual detector monitoring apps.
 - Java reconstruction based monitoring improvements.
- **Slow controls:**
 - Detail implementations of controls.

Update Schedule



Update Schedule: Analysis

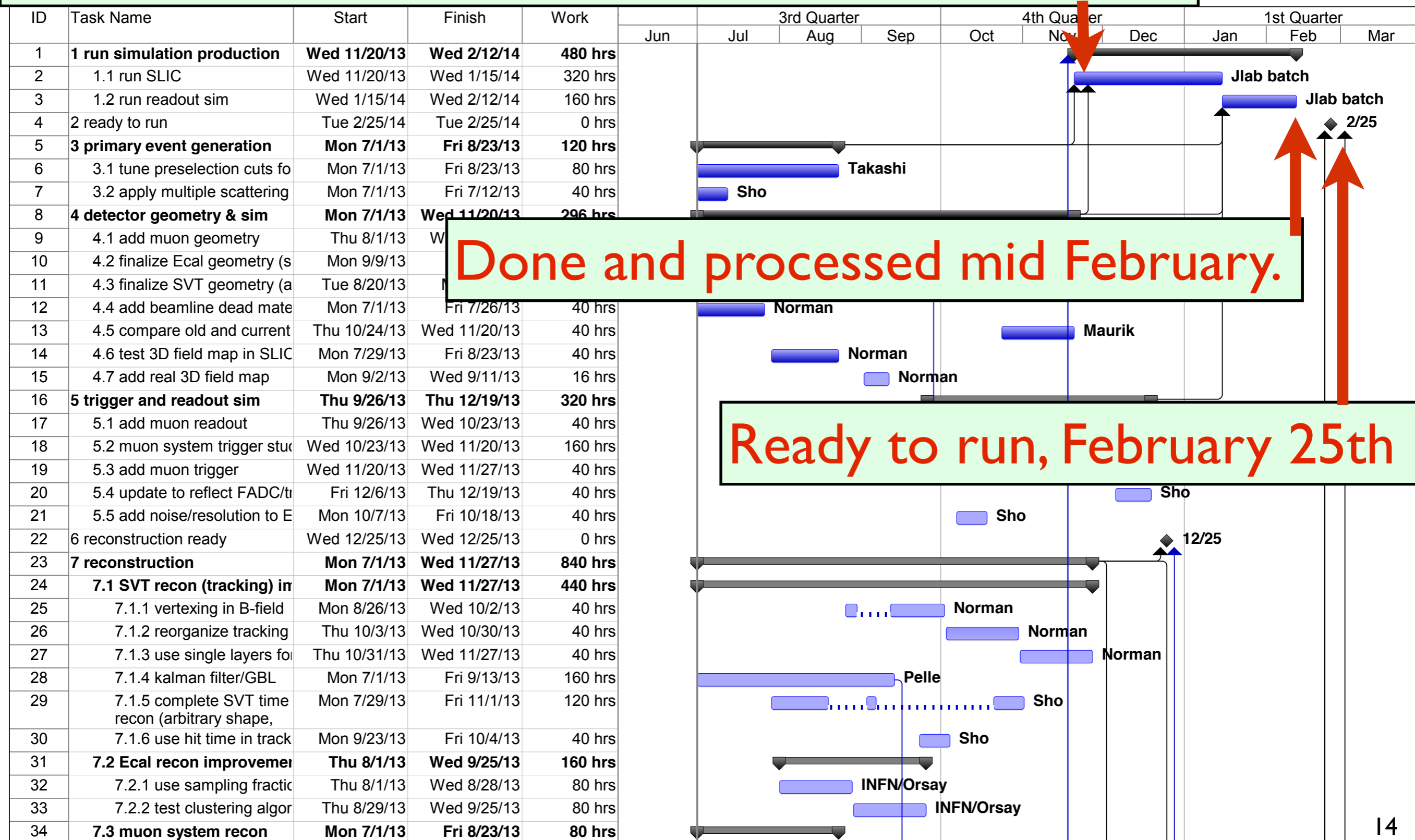
Analysis code improvements already started....



Updates completed end of December.

Update Schedule: Monte Carlo

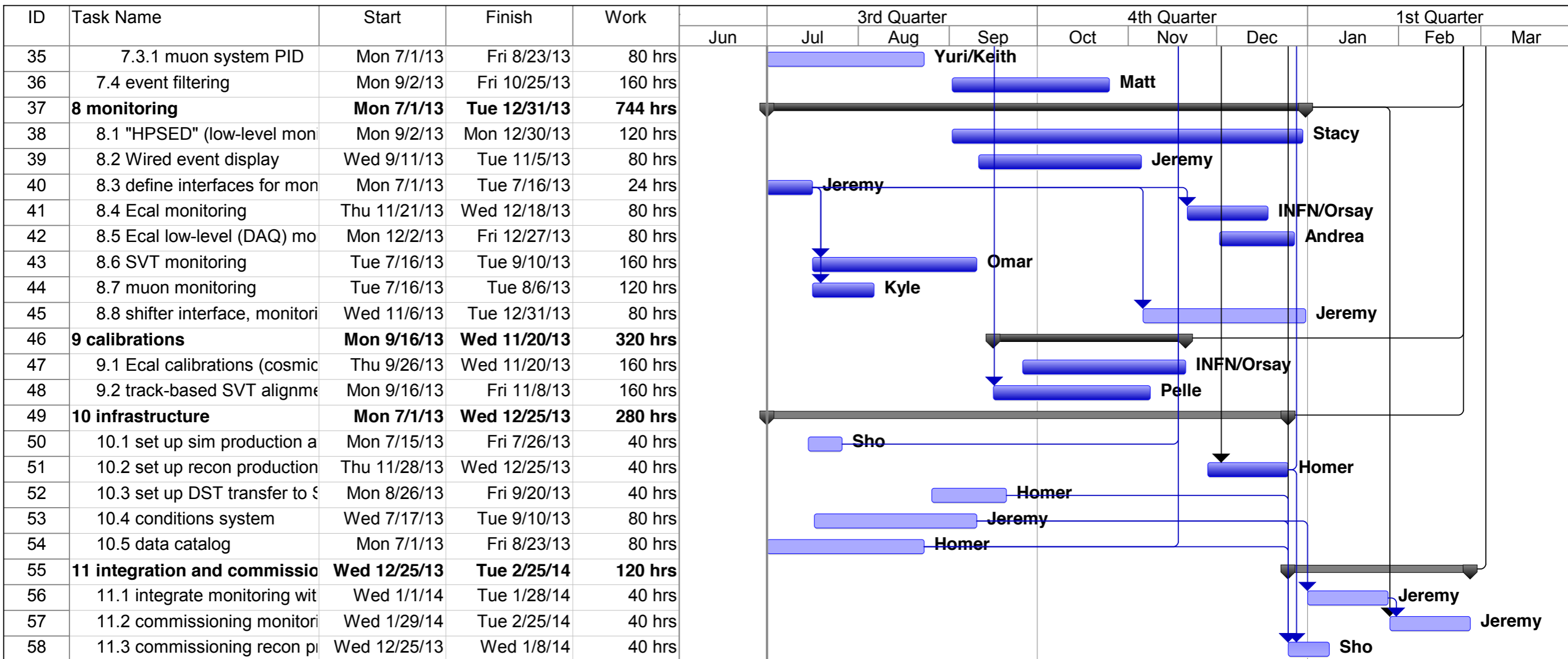
Simulation Production starting end of November.



Done and processed mid February.

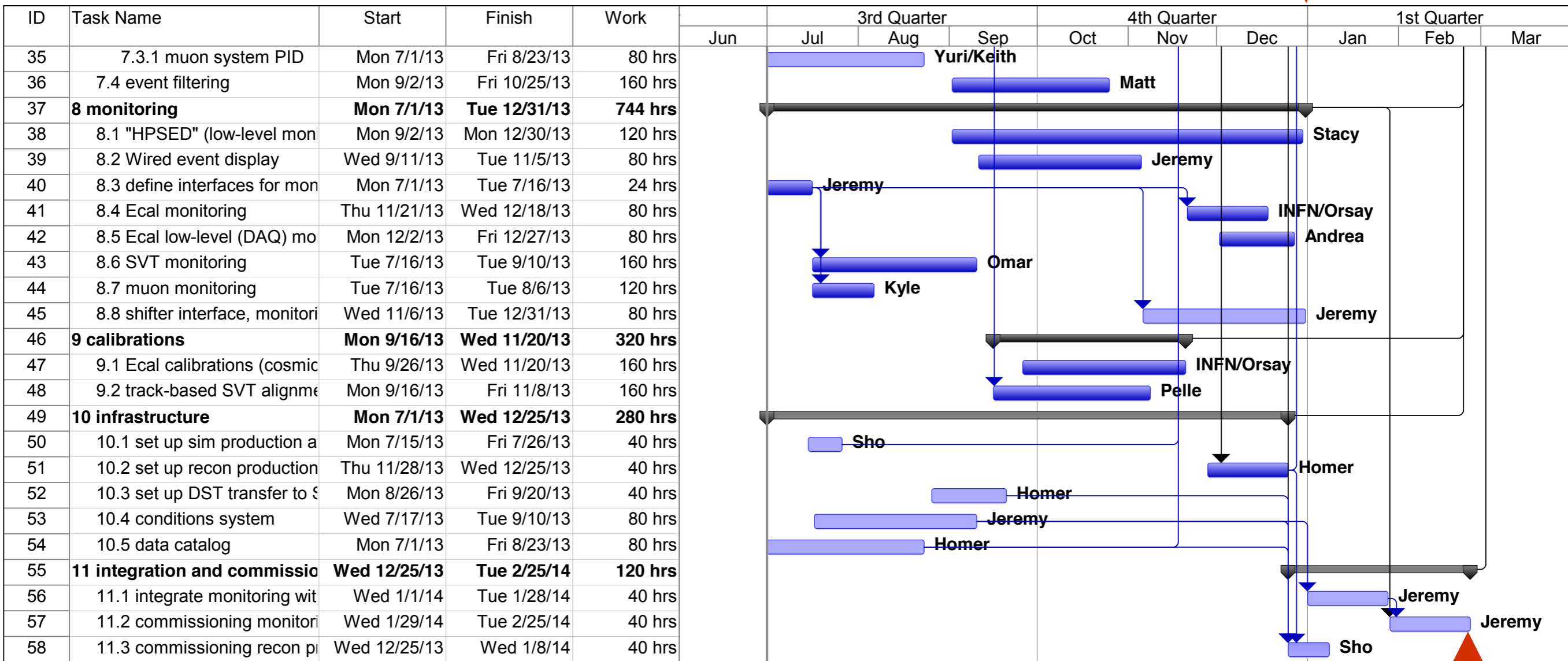
Ready to run, February 25th

Update Schedule, part 2



Update Schedule: Monitoring

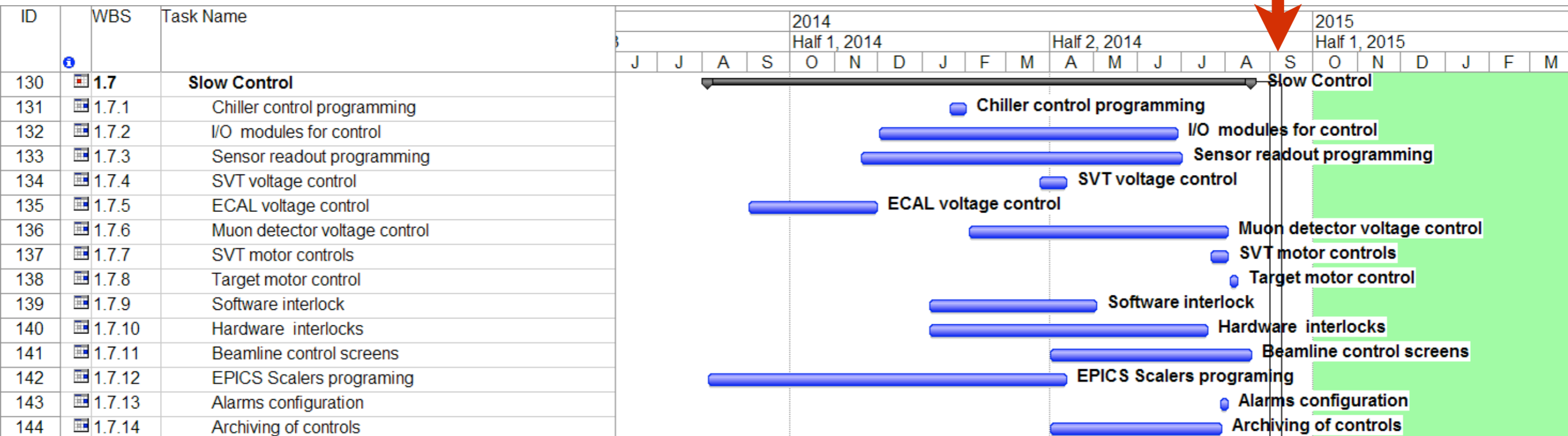
Monitoring codes ready end of December.



Experimental integration complete, February 25th, 2014.

Slow Controls Update

- Slow control updates run separate from main MC, Analysis, Monitoring updates.
- Has dependencies on hardware availability.
- **Systems ready September 1, 2014**



Conclusions

- HPS has a very dynamic and active software group.
- Most desirable updates of software are on a reasonable track.
- Test run shows we are capable of taking and processing the data.
- Software is difficult to schedule, but we have a good safety margin.
- There are always further improvements possible, we won't stop.