

HEP Project Status Report – May 2019
Large Synoptic Survey Telescope (LSST) Camera Commissioning

HOST LABORATORY: SLAC
 CONTRACTOR PROJECT MANAGER: Vincent Riot

FEDERAL PROJECT DIRECTOR: Hannibal Joma
 FEDERAL PROGRAM MANAGERS:
 Kathy Turner; Helmut Marsiske

1. SCORECARD AS OF April 2019

Forecast Commissioning Completion:		June 21, 2022	
Percent Complete:	13.7%	Start of Operation Baseline:	Oct 1, 2022
ETC:	\$15.9	Total Cost Estimate:	\$23.2M
Contingency:	\$4.7M (EAC)	Float to Start of operation:	74 Days
Cumulative CPI:	0.96	Cumulative SPI:	0.82

2. NEAR-TERM MILESTONES

Jan 2019 Forecast Finish	Activity Name	Float ¹	Comment
14-Jun-19	Ship ComCam Cryostat to Tucson	134	The ComCam acceptance review occurred May 29 th , 2019 and recommended shipping of the ComCam Dewar as soon as possible. This is expected to occur in June as planned
8-Jul-19	Summit Facility Camera Utility Room Ready	256	This was delayed due to partial completion of the scope of work expected to occur during the May trip to Chile. The refrigeration lines were not ready.
13-Sep-19	Ship Mass Simulator SLAC to Chile	79	This is the new effort added to the baseline to reduce shipping risks to the camera by shipping a Camera mass simulator as an exercise run. This is on track currently.
17-Jan-20	Need telescope refrigeration cabinet in Chile	208	Refrigeration cabinets are MIE deliverables and are expected to be completed in June 2019; this milestone is on track from the MIE project.
30-Jan-20	Transport container final design review	79	The preliminary design review was successfully completed in March 2019. This activity is on track, although scheduling was updated this month to align with changes at the project level.
22-Sep-20	ComCam Ready to Start Early System AI&T	9	ComCam shipment readiness review completed in late May 2019; the team is addressing the recommendations before shipping to Tucson for further integration by the telescope team.
29-Apr-21	Camera Ready for Full System AI&T	18	This milestone is the current camera MIE forecast. It is expected to slip by 3 weeks to accommodate MIE camera deliverable delays due to the power feedthrough vacuum leak repairs.

¹ float is computed to the current LSST Observatory Project completion date of 4/1/2022 as approved by the NSF MREFC project. The current Commissioning completion date of June 2022 is 58 days beyond this date, driven by the telescope mount assembly and dome, and is being assessed by the integrated project.

3. STATUS HIGHLIGHTS

Camera Summit Servicing Area Preparation

All hardware and tools are in place at the Camera utility room, except oxygen-deficiency monitors (ODMs), which will remain on shelves in Chile until June. A summit sprint at the end of March completed all infrastructure work that is required prior to turning-on and certifying the cleanrooms. The team conducted a second sprint first week of May to verify the readiness of the utility room to receive the refrigeration pathfinder and refrigeration cabinet in July 2019. The trip in May was not as successful as expected due to some delays in having the refrigeration lines installed and some additional equipment delivery. This is reflected in the cost variance for this month capturing the inefficiency. Additional scope will be added to the plan to provide additional support to accommodate preparation of the items that were not ready yet. Clean room turn on, inspection and certification are planned for the June/July 2019 summit trip as well as continued build out of

the refrigeration infrastructure in the Camera servicing area, but this may be delayed if needed telescope and site items are delayed.

Shipping, Receiving and Logistics

As reported, the team completed a successful equipment procurement review for the Camera saddle stand late last year; final approval of saddle stand drawings is underway. The saddle stand will serve two purposes: 1) I&T will use it at the SLAC IR2 Cleanroom Facility during Camera construction to cradle the Camera in a stationary horizontal position; and 2) the Commissioning team will use it to cradle the Camera in the interior of the Camera shipping container.

The team completed a successful preliminary design review (PDR) for the shipping container in early March. As reported, the team will develop a prototype to prove out design concepts. The prototype effort covers construction of a vibration-isolation portion of the container. Combined with the saddle stand, the prototype will be used to ship the Camera mass simulator from SLAC to Chile this summer.

Design efforts are well underway on the prototype shipping container. The team is working to design the prototype incorporating recommendations from the PDR committee, such as adjusting internal supports to allow shipment in an industry standard-shipping container.

Full instrumentation will be included in the shipment to allow the team to confirm that the safety system meets design requirements. The mass simulator was provided to the Camera I&T team by the Telescope and Site team. The simulator was used previously for hexapod and rotator testing and will be needed in Chile for telescope testing.

The Commissioning team has started working on the shipping plan for the refrigeration cabinets to be used for the pathfinder and nearing completion at SLAC under the project scope. A review is being planned in early June to evaluate the shipping approach ahead of the cabinets shipping in July 2019.

Commissioning Camera (ComCam)

ComCam work is supported by MIE and MREFC projects per the respective baselines. As reported, the ComCam main assembly was completed at IR2 late last year (Figures 1 and 2).

ComCam testing with ComRaft (schedule mitigation raft built by commissioning while the ETU2 MIE deliverable is used for camera early testing) has been completed, and the system performs well. The Commissioning team has requested that ComRaft remain in the ComCam cryostat when shipped to Tucson. All of the MIE ComCam deliverables were determined to be ready to ship to Tucson by the PreShip Review committee in late May. The quadrant box portion of the utility trunk will remain at SLAC for a few more months to allow work on the commissioning refrigeration pathfinder portions of the quadrant box. ETU2 (MIE deliverable ComCam raft) will also remain at SLAC for several months since ComRaft is the preferred raft at the moment to continue work in Tucson.

Refrigeration Pathfinder

The MIE project forecasts that pathfinder compressor cabinets will be available by June 2019. The two cold refrigeration cabinets have been assembled and verification is underway. Storage tanks for pathfinder cryo-system refrigeration have been filled at SLAC and have arrived at the summit.

Also, at SLAC, all of the internal components of the pathfinder refrigeration system are completed and will be integrated into the vacuum canister in June once received from the vendor, who has experienced several weeks of delays.

Camera Control System and Camera Data Acquisition system support

All of the MIE deliverables of the commissioning camera CCS and DAQ systems were found to be ready to ship by the ComCam Pre-Ship Review committee. For subsequent ComCam support, the CCS and DAQ teams will now be supported by DOE commissioning as the ComCam is finished in Tucson and then at the summit in Chile.

Management

As reported last month, the commissioning completion has been delayed in the forecast by nearly two months due to delays in completion of the dome and disassembly/shipping of the Telescope Mount Assembly (TMA). The integrated project is reviewing opportunities to recover some of these schedule delays by optimizing all the assembly, integration and validation efforts going forward. A re-plan is expected to be completed in July 2019. This delay has been impacting Camera commissioning efforts to date and is expected to impact ComCam use and the refrigeration pathfinder, but both are still important to the overall strategy. The delay will affect the level of DOE commissioning contingency to address the standing army cost of running commissioning longer than initially anticipated.

The Cost Performance Index is now showing some over-spending which is due to the partial completion of the work expected to be done in the May preparation trip to Chile as well as additional effort needed to complete the pathfinder heat-exchanger coil repairs and cleaning (which was anticipated based on the MIE similar effort for the I&T heat exchangers).

4. COMMISSIONING COST AND SCHEDULE SUMMARY (\$M)

	WBS	BAC	CTG	EAC	Contingency	Actuals
Project Office and Support	01C.01.01	\$4.9	\$4.2	\$4.9		\$0.7
Commng Management	06C.02.01	\$2.4	\$2.0	\$2.1		\$0.1
Commng Plng, Prep, Tooling, & Simulations	06C.02.02	\$4.5	\$3.8	\$4.8		\$1.0
Early System AI&T	06C.02.03	\$3.0	\$2.3	\$3.1		\$0.8
Full System AI&T	06C.02.04	\$2.5	\$2.5	\$2.5		\$0.0
Science Verification	06C.02.05	\$1.1	\$1.1	\$1.1		\$0.0
OPC		\$18.4	\$15.9	\$18.5	\$4.7	\$2.6
Cost Range		\$23.2		\$23.2		

5. Schedule summary:

Level	Milestone	Actual & Forecast	Baseline Finish
L2	COMP: C_CDR - Pathfinder	18-Jan-18 A	03/31/18
L2	COMP: C_PDR - Pathfinder	31-Jul-18 A	07/31/18
L2	COMP: C_FDR - Pathfinder	26-Oct-18 A	11/28/18
L2	AVAIL: Refrigeration Pathfinder to ship	08/07/19	04/02/19
L2	NEED: Refrigeration Pathfinder on summit	09/05/19	05/07/19
L2	NEED: MIE Chile (TMA) Compressors	01/17/20	08/08/19
L2	AVAIL: White Room Refrigeration System Ready for LSSTCam	04/06/20	11/09/19
L2	NEED: Access to TMA Refrigeration Lines	04/20/20	08/08/19
L2	AVAIL: Pathfinder for ComCam	04/27/20	11/09/19
L2	COMP: ComCam re-Verification Complete	09/15/20	07/01/20
L2	COMP: Calibration Telescope Ready for Operations	09/16/20	03/23/20
L2	NEED: Pathfinder in ComCam on TMA	10/06/20	11/09/19
L2	COMP: L1/L2 received at summit	12/16/20	01/17/21
L2	COMP: TMA Refrigeration Tests Complete	01/28/21	03/20/20
L2	COMP: Camera Reverification Complete	04/29/21	07/22/21
L2	COMP: ComCam Ready for Bulk Data Production	07/29/21	03/28/21
L2	COMP: DMS: Pipeline Testing w/ComCam Complete	07/30/21	07/13/21
L2	COMP: Engineering Tests w/ComCam Complete	05/11/21	07/14/21
L2	COMP: LSSTCam-Tel Integration Complete	01/21/22	03/29/22
L2	COMP: DMS- Integration Complete	02/02/22	04/06/22
L2	COMP: mini-Survey 1 Data Release Complete	05/23/22	08/22/22
L2	COMP: Calibration Products Production Verified	05/23/22	08/22/22
L2	COMP: Data Release Production Verified	05/23/22	08/22/22
L2	COMP: mini-Survey 2 Data Release Complete	05/23/22	08/22/22
L2	Operation Readiness Review Complete	06/21/22	09/30/22

6. FIGURES

Figure 1: ComCam Dewar mounted to its stage plate at the SLAC IR2 Cleanroom Facility.



Figure 2: View of the front of the ComCam Dewar.

