

LSST Telescope and Optics Status

William Gressler¹, V. L. Krabbendam¹, J. R. Andrew¹, J. D. Barr¹, J. DeVries¹, E. Hileman¹, M. Liang¹,
D. R. Neill¹, J. Sebag¹, C. Stubbs², O. Wiecha¹, LSST Collaboration
¹NOAO, ²Harvard Univ.

Progress continues on the final design of key elements of the LSST Telescope system thanks to private support. Rear surface polishing of the unique 8.4m M1/M3 monolithic mirror has been completed with the subsequent attachment of support loadspreaders and hardpoints. The mirror will now undergo the final two year planned effort of front surface grinding and polishing. The LSST telescope cell design has matured to accommodate on-telescope mirror support, pointing, and thermal conditioning requirements in addition to off-telescope optical coating requirements. Performance and environmental testing of hardware components has commenced to assist with prototyping and final design selection of the M1/M3 mirror support system. LSST has plans to design, fabricate, assemble, and deliver qualified subassemblies for integration of the M1/M3 and telescope cell in early 2012. Corning has completed and delivered the M2 ULE™ substrate. This 3.5m diameter, 100mm thick meniscus substrate has been acid etched to passivate any stress features and the convex surface has been finished via precision contour grinding to near net final shape. The substrate awaits construction funding to enable final optical polishing. The LSST Calibration System design utilizes a fiber-fed reflective projector system. An array of these projectors provides uniform illumination across the telescope field of view in tunable wavelength bands to calibrate the LSST camera CCD pixels versus wavelength. Finally, advancement continues forward on LSST support facility development via the award of an A&E contract to provide specific site design and development activities.

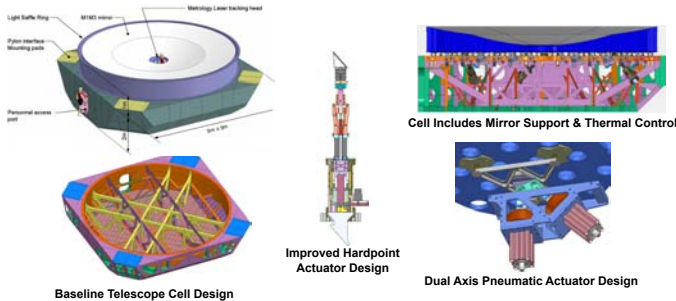
M1/M3 MONOLITHIC MIRROR



M1/M3 Fabrication Status

Polishing of the M1/M3 monolith rear surface is complete and mirror support hardware has been attached. Six hardpoint wedges define the mirror position and an array of 156 loadspreaders are designed to safely distribute force to correct figure error. Precision thermocouples have been bonded to the mirror front, back, and mid-plane locations to accurately determine temperature profiles of the substrate. The mirror will soon be rotated to commence front surface generation and polishing. The dual optical surfaces are scheduled to be complete in January 2012.

M1/M3 CELL & MIRROR SUPPORT



M1/M3 Mirror Support Status

The LSST telescope cell design meets stiffness and weight (<55,000 lbs) requirements to provide <1mm of deflection while supporting the mirror's weight in any orientation and under vacuum during coating. The hardpoint actuators along with the mirror support inner loop servo system have been designed to prevent breakaway during telescope slewing. Component performance and environmental testing of pneumatic and electromechanical actuators has commenced to support final design of the axial support system. The thermal control system consists of 97 variable speed fan assemblies to provide circulation with heat-exchangers for heat removal and an electrical reheater to fine tune the air temperature. The system works in conjunction with 146 embedded thermocouples which have been calibrated to <40mK. Performance requirements are achieved via preconditioning the mirror to 1C below expected ambient temperature at start of observation.

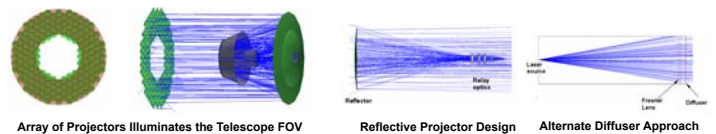
M2 MIRROR SUBSTRATE



M2 Fabrication Status

Corning has successfully completed and delivered the 3.5-meter diameter M2 ULE™ Substrate. The 100-mm thick meniscus blank met all dimensional requirements with a contour generated CX profile within 40 microns of final mirror figure. The acid etched rear and edge surfaces are ready for axial and lateral pad bonding. The blank was completed two months ahead of schedule and has been successfully transported to storage to await additional funding to enable final optical polishing.

CALIBRATION SYSTEM



Calibration System Status

The baseline Calibration System design includes an array of 162 fiber-fed reflective projectors (700mm diameter) which provide uniform illumination across the telescope field of view. An alternate approach utilizes a diffusing screen to direct light into the proper cone angle to fill the telescope pupil. Prototype design and testing will be used to determine the best approach. The system laser source illuminates in tunable wavelength bands to calibrate the LSST camera CCD pixels versus wavelength.

LSST SITE DEVELOPMENTS

LSST Site Status

Following the completion of the environmental permitting process and receipt of the building permits necessary for LSST construction and operation on Cerro Pachón, the Project contracted the civil engineering work to complete the rough excavation design and specification package. The project is now evaluating architectural and engineering proposals for designing the summit facility. This multi-year effort will support the completion of the summit facility design in preparation for construction.

