

Monthly Status Report
Prime Focus Imaging Spectrograph
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K. Nordsieck
J. Percival

Optics

- As a part of a final reassessment of the optical design, the collimator has been re-optimized as follows

- replacement of the hygroscopic BaF₂ element by CaF₂
- opening up of the clearance for the waveplate mechanism.
- exchange a CaF₂ and silica element. This shortens the collimator by 75mm, decreasing the overall length and weight of the instrument.

Otherwise, the overall configuration is essentially unchanged.

- As a part of a final reassessment of the optical design, the camera has been re-optimized as follows

- by allowing refocus between imaging and the various spectroscopic configurations, eliminated a CaF₂ element while retaining original image quality
- by allowing a moderate asphere on the first surface, eliminated two more elements, including one of the NaCl elements and an entire group (reduces the number of air/glass surfaces by two). In addition, the imaging is sufficiently improved that the FK5 glass element and the crystal quartz field flattener elements can be replaced by fused silica. The FK5 is problematic in having some UV absorption; the crystal quartz may have availability issues. Consulted with Hilyard on production of the asphere. It is well within his capabilities, and the added cost should be more than offset by the reduction in elements and engineering simplification. The new camera design is about 75 mm shorter, allowing for a further weight reduction.
- With these changes, the number of different optical materials in PFIS has been reduced from six to three (CaF₂, NaCl, and fused silica), a considerable simplification.

- Performed an initial thermal analysis on the latest optical design. The thermal effects on the focus and imaging are large, dominated by the index of refraction change of the crystals. A tentative passive athermalization concept using Delrin or polyethylene spacers to move groups within the collimator and camera has been devised.

- Revisited the available focus travel, given the likely configuration focus travel and residual thermal focus travel. The PDR baseline, which uses the last doublet in the collimator, does not provide sufficient focus travel. We are investigating focusing the detector instead.

- Continued investigation of optical fabrication, mounting, coating, etc. issues through contact with instrument scientists of other large telescope spectrographs

- Produced Opto-Mechanics "Statement of Work" document, summarizing the main issues that will drive the design of the lens mounts.

Mechanical

- Tied up the design of the Waveplate Mechanism to a point where it can be left until the final 2D drawings are produced.. A draft specification for the mechanism has been written.
- Started the design of the Slitmask Mechanism. We have identified and modeled the major COTS and manufactured components and are now investigating some of the latching and release issues.
- Attended a design engineering trade show in Chicago and spoke to some of our vendors and identified some new useful components.
- Began an analysis of the lens mounting scheme, aiming at a better weight budget. The weight budget is seriously wrong in this area.
- Investigated materials to use for athermalization in the camera and collimator.

Control

- Procured the basic motion control system: PXI chassis, fiber connection, controller, driver, and a stepper motor. The motor has been identified as the likely waveplate rotator actuator. This system will be used to validate the baseline control philosophy, and to measure actual thermal loads for the waveplate motor, which is a thermal issue in the all-Stokes polarimetric mode.

Management

- Completed interviews for management intern and hired one to start in June.
- Continued to study project management techniques
- Completed a budget re-projection for the quarterly report.

Activities for the next month

- Attend semi-annual consortium meeting in Cape Town, and consult with SALT personnel on mechanical, electrical, and control interfaces
- Mechanism designs:
 - continue slitmask mechanism
- Continue defining interface details:
 - slitviewer interface
- Detector
 - updating budget for PFIS detector package
 - drawing up list of deliverables for PFIS detector package Final Design Review