MODS Monthly Report 6 September 2006

Summary
Steady progress continues on all MODS sub-systems; some details of work completed in August are given below. The major news is that the blue camera corrector parent is complete and ready to be cut into the two pieces needed for the blue cameras.

Optics
Work on readying various optics for integration into MODS continues at a steady pace. In particular, the mounting flexures for the four collimators and three of the camera mirrors have been epoxied into the mirrors. Unfortunately, the fourth mirror must be sent back to SOML to have two of the mounting holes drilled to the correct size. Both blue collimators and camera mirrors are ready to be shipped to Newport for coating. The optics for MODS#1 front AGW unit have been epoxied and assembled in place. The guide camera optics have been verified to produce good images with the correct focal plane location. The wavefront camera needs to be tested requiring a test set-up that produces a pupil at infinity.

Major progress has been made on the blue correctors. Early in August there were multiple measurements of the surface map of blue corrector aspheric. These measurements were used to finalize a map for deterministic polishing at QED. The corrector blank was shipped to QED and an MRF run was completed. Ross Zhelem visited SOML on the day of blue corrector arrived from QED. He monitored the testing of the corrector blank and confirmed an improvement in the interferometric testing of the aspheric surface. Based on these initial tests we currently believe the blue corrector is now finished. We have delayed official acceptance of the figure until SOML prepares a detailed report and we have had an opportunity to put the as-measured surface into Zemax and confirm acceptable optical performance. We expect this final report in September. After acceptance Ross will supervise the process to cut the corrector into the two blue corrector lenses.

SOML also presented a plan to complete the red corrector. They plan to use traditional techniques, which failed to complete the blue corrector. They plan to build a full aperture test (replacing the existing sub-aperture test) and devote additional resources to the project. Their unbelievably optimistic estimates put the red correctors complete in March 2007. Internally we plan to closely monitor red corrector progress and suspect that we will push for QED finishing of the part in early-2007. Ross will continue weekly telecoms with SOML and monthly visits.

Other completed work includes the shipping of the MODS dichroic blanks to ZC&R for coating and collimator and camera mirrors to Newport for coatings. Both are expected to be complete and back in the lab in September.

Mechanical

The challenging camera focus mechanisms have been assembled, functionally tested warm, and functionally tested cold with good torque margins. One of the mechanisms was subjected to endurance testing and no problems were encountered. All four of these units are complete. Low Level PLC software has been written and tested for this unit. Assembly documentation is complete

The front AGW X-Y stages were both fully assembled and tested warm and cold. They are both ready for service. Low Level PLC software has been written and tested for this unit. Assembly documentation is complete

One shutter is now completely assembled with updated and improved documentation. The shutter has unique requirements for detecting various fault conditions. The hardware and software to detect a large assortment of failure modes is now under test. Endurance testing has begun on the shutter.

Preliminary design work and some prototyping have started on the MODS camera light tight enclosure. This is a tricky bit that must interface to the filter wheel and shutter and mirror cell and corrector cell. This enclosure is important to allow alignment and testing of the Blue camera.

Instrument Electronics

Work continued on installation of wiring harnesses for individual mechanisms. In particular, the final wiring is completed for all 12 collimator tip-tilt-focus mechanisms, all four camera focus mechanisms, two of the filter wheels, and both front AGW units. These units were fully tested and qualified using mechanism test code and sample controllers. Several challenging mechanisms are still to be done, including the grating turrets.

Work on the layout of the 16 axis controller boxes continued. In particular, prototype of a MODS microlynx array PC board has been finished. The goal was to provide the functionality of the "four wide boxes" in a wider format with nearly no point to point wiring. The prototype is two wide but the same manufacturer can make the same design in a four wide version. We have not found a manufacturer who can make an eight wide version but one may exist. Mechanism cables plug directly into the board (the mates for the mechanism cables are soldered directly to the board) the microlynx plug into and are supported by the board. Communications to the board are via an RJ45 jack, which uses a standard network cable to the Comtrol Ethernet to RS232 box. Two power connectors are used to bring +65 Volts and +24 Volts to the board. The power connector can be used to daisy chain power to subsequent boards. The mechanical design is compatible with the cooled plenum concept that is consistent with LBT services.

The motor PCBs were completed and ordered. The full complement of Microlynx controllers (100 units, including 20 spares) was ordered.

Detector Electronics

Several cool down cycles have been done on a 4k x 4K package instrumented with a RTD in the center and one in the corner. The relative calibration of the two sensors was checked by gas cooling the package (where a very small temperature difference would be expected). The gold plated package was cooled in the Dewar and showed a temperature difference, corner to center of about 1 K. The interior of the package was painted black and the predicted ~10 K temperature difference between the center and corner of the package was confirmed. One run has been done with an aluminum heat spreader was coupled to the package with a knit metal mesh. This configuration showed a temperature difference of less than 3K. The next run will be with a larger heat spreader and with the metal mesh bonded to the package and the heat spreader with 3M double stick tape type 926. These tests have been in the MDM 4k Dewar but are directly applicable to the 4K installations in MODS.

The first of the Gen III Clock Bias Boards is built and in a configuration that should drive the 4K chips. The equivalent of the Rx (Prescription) Board, the Rxs (read Rexcess) Board, which is the mate for the PCI express sequencer, plugs directly into the Gen III board. (The Gen III board will also interface to the Rx board). The Gen III board receives up to 4 of the PACO post amplifiers that have two channels and two 18 bit ADCs. The overall design of the HE for MODS is a Gen III board (with Rxs) and a Power Supply board (already prototyped as and air circuit). The power supply board will contain what used to live on the junk board.

Since the PCI sequencer has been delayed so long (and is still owed to Aluminizing) we have decided to skip a generation and go directly to a PCI express based sequencer. It would have an internal clock of about 100 MHz (as compared to the 10 MHz clock on the existing ISA sequencer) have sequences that are ~256 k deep instead of the current 65k and be 40 bits wide instead of the current 32. The interface to the HE would be a 2GHz fiber link and the link to the host computer would be a single PCI express lane, 2.5 GHz. Altera has given us, under their University Program, the required licenses to compile their PCI express design into a Stratix IIGX chip. The have promised us a supply of Stratix IIGX chips and offered a PCI express/Stratix IIGX demo board that can be programmed to be a reduced memory (about half the design goal) sequencer. The prototype board includes schematics and the PC board design giving one the hope that, since we can copy most of the prototype board, our design should be easy and low risk.

The Black MODS Dewar has been laid out and is ready to be assembled when the FR4 struts are glued. A set of Viton Orings has been bought. It should be noted that Buna N Orings should never be used in equipment for MtG. The local ozone on MtG can eat half way through a typical Oring in 1 year.

Software

Pogge is working on getting the AGW camera software and hardware working, so alignment of optics can done on the bench, which also involve evaluation of the software

for eventual MODS optical alignment. He also has been developing tools for scripting. Also evaluating tools that will be part of the MODS user interface

Mason has compiled the information to order our first computer that will meet the LBTO hardware specification (2U Altus 1300). He has been or is in the process of purchasing, packing, and shipping hardware that involve other parts of MODS. Some of the PC hardware setup that is needed for MODS existing computers has also been completed.

Gonzalez continues the ongoing process of documentation and is progressing at a snails pace because of other duties involving testing and evaluating instruments. The main Interjoined Software Logic (ISL) document has been given to D. DePoy for comments and editing purposes. Other MODS ISL related documentation is in progress.

Gonzalez has added a command (Comtrol) to the ISL Instrument Mechanism (ISLIM) part of the ISL Manager that can be used from the Instrument Control System (ICS), or from Standard Notation Tools (SNTools). Some items have been added to Shared Memory to compliment the AGW stage.

Gonzalez wrote and started a procedure in August to test general instrument software reliability and predictability. The procedure was started on the MODS Engineering System Interface (MESI) and involved 3 microlynx mechanisms. MESI ran the ISL Manager on lbt6 (PC with CentOS), moving the mechanism on the AGW stage every 4 hours or so August 10 - 30. Mechanisms have been turned on and operating for 408+ hours and are continuing to run without failure.