



# Heliosiesmic & Magnetic Imager

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## Monthly Progress Report June 2004

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## 1.0 Introduction

This is the monthly progress report for the month of June 2004 of the HMI program for the progress undertaken by LMSAL under the phase C/D/E contract with Stanford. The LMSAL team is in collaboration with Stanford University on the HMI/SDO solar physics investigation being led by Professor Phil Scherrer of Stanford University.

## 2.0 Summary

As usual, this first month of the summer has been very busy. The waveform generator testing at RAL has shown that the heritage ASIC will perform at 2Mhz. There are plenty of gold devices for the full flight program (both HMI and AIA) and they have been packaged. Some other highlights this month includes: the shutter life test continues (at 22 of 137 M exposures), a successful Michelson CDR was held, the SUROM code was completed and written to EEPROM, radiation analysis was completed on all items internal to the optics package, and the release of the ICD was supported. The HMI team continues to hold weekly team meetings with SDO Project, suppliers and internally.

## 3.0 Schedule and Milestones

An updated detailed schedule is submitted at the end of each month. Shown below are some key program milestones and activities, with an emphasis on those that will occur in the near term and have recently occurred.

Milestone	Date	Notes
Michelson CDR	June 22	Completed
E2v/RAL visit	July '04	
Software TRR	July '04	
First Quarterly	August '04	(at LM)
Receive SM Structure	Sept '04	
HMI CDR	Nov '04	(at LM)
Deliver HMI to S/C	Nov '06	
Launch	Apr '08	
* Five year baseline mission *		

## 4.0 Major Activities During March

### 4.1 Filters and Optics

The filter and lens orders are progressing, no change in delivery dates. The wave plate and powered optics request for quotes are with the suppliers. The ADP/KDP, glass spacers and wave plates for the Lyot filter were received. A few of the ADP/KDP pieces had defects and were sent back to the supplier. There are

enough elements for the Lyot assembly to continue. The thin thicknesses of calcite from the MDI filter were too small to polish to the HMI thickness, which caused a shortage in calcite. The supplier found some calcite in the basement and an HMI team member visited Lambrecht to evaluate the calcite. The calcite meets the requirements, but is not grade "A" or the best stuff. We technically have enough calcite, if we use the calcite available from Lambrecht. It is preferred to find better calcite. We are currently having Lambrecht quote on the calcite they have found, but we will evaluate other calcite sources and continue the search for calcite.

## **4.2 Mechanical**

The focal plan assembly design is ready for the peer review and the isolator tube drawing was completed and is being sent out for quote. The focus wheel and front door gearbox piece part drawings were released. The oven housing drawing was completed and the leg drawings are near completion. The metering tube drawing for the telescope was released and progress is being made on the assembly drawing. The radiation analysis was completed for all the items of concern interior to the optics package. Shielding is being added to the focus/cal wheel encoder assembly and the extreme rays of the CCD will be evaluated and potential shielding will be added.

## **4.3 Mechanisms**

The shutter life test continues at 22 of 137M exposures. The performance graphs are already indicating a preferred bearing and lubricant. The order was placed for the focus/calibration wheel prototype. The HCM life test motors and front door actuators are due in July. A capacitor is being added to the encoder boards to mitigate the deep charging affects without having to add shielding to the internal harness.

## **4.4 Electrical**

The mechanism, oven controller and oven pre-amp boards were sent to layout and then to fabrication. The mechanism board has returned from fabrication and is being assembled. The oven boards are not far behind. There was a design review of the housekeeping board and is next up for layout. Schedules have been reviewed extensively and updates are being provided this month.

## **4.5 Software**

The SUROM code has been completed, written to EEPROM and is running on the processor board. The internal reviews of the SUROM are going well, no significant issues. The software requirements documents have been reviewed with IV&V and have been updated. They are ready for release. The APID commands were changed at the projects request.

## **4.6 I&T**

The life test chamber is all ready to go except for the feed through connects, which are due at the end of July. Work is progressing on sub-system test planning.

## 4.7 Thermal

The focal plane detailed model has made significant progress. A gradient across the CCD of 40°C during decontamination only has been discovered (not during operation). The model is being refined to better understand the phenomena and the requirement is being determined. If it is determined that the design needs to be altered to reduce the gradient, there are two options to be evaluated. Change the CCD header material to Wolfram or implement a mechanical solution with flat heater.

## 4.8 Major Sub-contracts

### 4.8.1 CCD – e2v

A trip is scheduled for the end of July and marks the time to decide on the thin gate design. Five flight batches are in processing at various stages: one is complete and being probed, one is at 80%, 20% and 10%. Significant attention has been given to the evaluation of the charge transfer efficiency. An anomaly running at 5V has been discovered in the evaluation CCDs. There is nothing to report until a problem exists and is understood.

### 4.8.2 Camera Electronics - RAL

The waveform generator is a go with the SECCHI MK1 ASIC. All of the flight parts have been packaged. Though, hot off the press, the packaging quality is poor. This is a huge disappointment for the team and more tests will be performed before deciding on alternatives. The voltage regulator devices from STS are available and have been ordered. An updated schedule was received and the demonstration unit is due in October of this year. Significant progress has been made working through the action item list from the last visit.

### 4.8.3 Michelson – LightMachinery

The CDR was held and went very well. A lot of discussion occurred about the coatings. The coating test results have been reviewed and a coating design agreed upon. The flight beam-splitters are polished and will be coated in July. The engineering test unit was brought with the team for evaluation and show and tell. The mounting assembly was discussed and since then the ETU has been assembled into the mount and is ready for vibration testing.

### 4.8.4 Structure – Vision Composites

There has been several design exchanges and a technical interface meeting was held at Vision to resolve some design questions. 90% of the drawings are complete, all the material for the structural model is on order and technical interface meeting is scheduled for July (mark the point to begin an assembly). Manufacturing planning is progressing and the schedule maintains a delivery in early September. The envelope drawing, all critical interfaces to be inspected, is near completion.

## 5.0 Planned Activities For June

1. Finish procurement mirrors.

2. Continue to work with the AIA team to organize LMSAL personnel for both programs in an optimal manner.
3. Continue work on mechanical and electrical drawings and detailed design.
4. On a routine (mostly weekly) basis continue to participate in telecons with the complete SDO group, the combined HMI/AIA-Project specific telecons, CCD Working Group telecons, Light Machinery telecons, BAE telecons; and to conduct HMI team meetings as well as specific meetings on Electronics/ Software, Filters, and Mechanical topics.

## 6.0 Design Updates

Redundant thermostats were added to the focal plane assembly to protect the CCD from overheating to mitigate the potential of both decontamination heaters being inadvertently switched on. The focal plane assembly was moved in the +z direction a half an inch to accommodate the desired effective focal length of the image plane. The project provided envelope information of the star tracker field of field that can accommodate this change. The MID will be updated and an office CCR will proceed. Only one of the DC/DC converter type was removed from the common buy list.

## 7.0 Resource Requirements

The focal plane assembly design has matured tremendously in the past month, which has caused a mass hit. Shielding was added around the Tayco cables to fulfill the deep charging shielding requirement and the detector housing increased in size to accommodate the added connectors to split the video cables and the required headboard space. The HMI electronics box design was refined and an updated mass estimate shows a slight reduction in mass. No change in power.

## 8.0 Issues/Concerns

- I think this issue has been closed. No interaction has occurred. I will check before removing from this report. *The existing version of the SMCSLite chip that is used in the CEB and in the Camera Interface board needs to undergo radiation testing to verify it is acceptable, and we need to keep on top of whether the newer version of this chip will be available in time for our programs.*
- No new to report.