



Heliosiesmic & Magnetic Imager

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Monthly Progress Report September 2005

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1.0 Introduction

This is the monthly progress report for the month of September 2005 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 Executive Summary

September was moving forward with assembling the optics and recovering the schedule. Some highlights for September include: completed optical assemblies, started heater placement on the oven, completed wave plate assemblies, completed shutter and focus/cal wheel assemblies, completed the mechanism internal harness, received flex-cables and head board, completed moving the BBHEB, EGSE and spacecraft simulator to outside the clean room, flight parts kits shipped to RAL, and the HCM life test is at 141 M of 160 M moves. The HMI team continues to hold weekly team meetings internally, with the SDO Project and with suppliers. The daily stand up integration and test meeting continues.

3.0 Technical Progress Report

3.1 Filters and Optics

The wave plates have been assembled into their mounts and into the HCMs. The run-out was measured and is within the required two arc-minutes. The bonding of the optic will take place after the initial sun tests; in case, any adjustments are necessary. The Lyot elements have been aligned and characterized together and assembly of the Lyot is progressing well. The calcite was received and will be inspected this month. After the Lyot is assembled a new element one will be assembled with the better calcite in house. After the initial instrument testing is complete the oven will be removed to install the new element along with a new NB Michelson. The front window coating is finished and looks great. The first one is being assembled into the mount and is due to ship within two weeks.

3.2 Mechanical

The oven rework and fit checks were completed. The ISS mirror PZT mount parts were received and assembly is being completed of the ISS mirror. The remaining parts due in are radiators, cables brackets, and flex-cable shields. Once the Sun testing begins the mechanical team will start working on mechanical GSE: thermal vacuum support hardware and the shipping container.

3.3 Mechanisms

The HCM life test is up to 141 M of 160M moves. The flux and conformal coat staking material was received and the shutter and focus/cal wheel assemblies were completed. Functional testing is progressing and then the bake-out. The front door parts were ordered and the last bit of design updates are progressing (held until last to match the priorities on the schedule).

3.4 Electrical

There was a mechanical interference discovered with the pre-amp board and the mounting bracket was modified. The pre-amp can be tested and conformal coated. The flight board assembly work continues to be delayed due to part shortages. The delivery impacts have been folded into the schedule as well as the DCHRI and camera interface board late delivery impacts. The DCHRI and camera interface work is progressing well. There is a review each week and the requirements are well understood and the specification is being updated. Code development of the FPGS is now progressing. More schedule discuss forthcoming. The internal harness assembly for the mechanism is complete and the oven harness is near completion, pending receipt of back shells (due this week).

3.5 Software

The BBHEB, EGSE and spacecraft simulator was moved to out side the clean room, as well as, the RAL EGSE. All of the prototype mechanisms were testing the system is up and running. A safe to mate test is being performed on the mechanism harness prior to testing with the flight software. The sequencer development is progressing and the STOL procedures are being defined for the sun testing. The weekly integration and test meeting has switched over to STOL development.

3.6 I&T

The telescope was installed into the optics package and the assemblies of the ISS mirror (without PZT), ISS beamsplitter, BDS beamsplitter, BDS fold mirror and CCD fold mirrors were completed. The bonding is being held until the optical alignment, which will now begin.

3.7 Thermal

The spacecraft thermal model and the HMI thermal model are not in sync. The front door temperature is greater than predicted at the end of life (40 C). The spacecraft is going to provide an updated reduced thermal model. For, now the design will not change, most likely the temperature range requirement of the front door will be modified and a thermal test performed on the front door. MLI design will begin next month.

3.8 Major Sub-contracts

3.8.1 CCD – e2v

The visit to e2v went well. Two back-illuminated devices for AIA were accepted and received in house, one grade zero and one grade one. Two more are due late November (both of original process). Also, at the end of the November two front-illuminated devices of the modified process are due for HMI. They have passed the optical test and function great without any differed charge effects at 5V. These are favored for the flight instrument and if all goes well will be received in time. At home, testing of the in house flight CCD is progressing. The first CCD has been installed in the vacuum chamber and testing has begun.

3.8.2 Camera Electronics – RAL

The visit to SPUR went well. The team was impressed with their capabilities and is very hopeful that the boards will be delivered on schedule. The main driver is the receipt of electronic parts, which are being provided by LMSAL. The majority of the parts have been received and the kits for the first two flight cameras and one spare have been shipped to RAL (yippee). There has been a video gain issue has been resolved and requires a minor update to the board design.

3.8.3 Michelson – LightMachinery

The second set of beam-splitters is completed and the second narrow band Michelson is near completion. A visit to LightMachinery occurred to review the data for the narrow band and it looks great and will ultimately be used in the flight instrument. This Michelson will be installed in the oven during the same period the other items will be reworked.

4.0 Design Updates

No updates.

5.0 Resource Requirements

The mass and power updates are attached.

6.0 Schedule and Control Milestones

The base-line schedule has been submitted.

CM#	Line#	Task	Baseline	Sept	Oct	Slack	Status
CM01	14	Primary and Secondary Lenses Fabrication	11/24/04	11/24/04	11/24/04	0	100%
CM02	52	Fabricate Flight Blocker Filters	08/20/04	08/20/04	08/20/04	0	100%
CM03	300	Development Camera 2 Delivery (return)	02/24/05	02/24/05	02/24/05	0	100%
CM04	344	Structural Model Test Complete	03/15/05	03/15/05	03/15/05	0	100%
CM05	317	Test s/c Height Rate Interface Brass Board	02/10/05	02/10/05	02/10/05	0	100%
CM06	8	Critical Design Review	11/20/04	11/20/04	11/20/04	0	100%
CM07	130	Michelson Delivery (first set)	05/09/05	05/09/05	05/09/05	0	100%
CM09	321	Build 2 Test (Enhanced Kernel Complete)	12/13/04	12/13/04	12/13/04	0	100%
CM10	324	ISS (Build 4)	01/19/05	10/03/05	10/03/05	0	0%
CM11	160	First Lyot Filter Complete	08/01/05	10/07/05	10/28/05	6	0%
CM12	322	Mechanism Control (Build 3)	01/17/05	08/26/05	08/26/05	0	100%
CM13	93	Receive Pre-Amp Flight Electronics	10/03/05	10/03/05	11/22/05	9	0%
CM14	47	Fabricate Flight Aperture Filter	07/12/05	10/19/05	10/26/05	10	95%
CM15	261	AM Flight Assembly and Test	07/29/05	08/26/05	08/26/05	0	100%
CM16	109	Flight Structure Delivery	06/30/05	07/08/05	07/08/05	0	100%
CM17	319	BB HEB System Test	03/15/05	11/17/05	11/17/05	0	0%
CM18	92	HMI ISS BB Testing Complete	01/24/05	01/24/05	01/24/05	0	100%
CM19	318	BB Camera Interface and DCHRI Integrated Test	03/08/05	10/27/05	01/24/06	12	0%
CM20	251	Door Flight Assembly and Test	11/21/05	12/20/05	01/04/06	1	0%
CM21	230	Shutter Flight (2) Assembly and Test	08/26/05	10/03/05	10/17/05	12	98%
CM22	67	Telescope Assembly and Alignment	06/28/05	06/28/05	06/28/05	0	100%
CM23	239	FW Flight (2) assembly and test	08/05/05	09/26/05	10/17/05	3	98%

CM24	303	HEB Brassboard Ready	09/01/05	10/03/05	10/03/05	0	100%
CM25	221	HCM .7 quartz Optic Assembly	08/10/05	09/22/05	09/22/05	0	100%
CM26	189	Oven Controller Pre-amp Needed	07/15/05	08/22/05	08/22/05	0	100%
CM27	198	Flight Oven Complete	08/26/05	10/20/05	11/07/05	1	0%
CM28	292	Flight CCD (3rd set) Delivery New process	07/19/05	11/01/05	11/30/05	2	0%
CM29	301	ProtoFlight Cameras 1,2 Delivery	11/11/05	02/02/06	02/02/06	20	0%
CM30	336	Mass Model Delivery to SDO	01/10/06	02/13/06	02/13/06	0	0%
CM31	392	OP Integration Complete	02/06/06	02/03/06	03/08/06	0	0%
CM32	323	Oven Operation Heaters (Build 3)	NA	02/02/06	02/02/06	0	0%
CM34	305	HEB Flight Ready	03/01/06	04/27/06	04/27/06	23	0%
CM35	307	HEB-HOP Flight Harness Completion at Goddard	11/11/05	11/11/05	02/10/06	76	0%
CM36	397	FSW Acceptance Test	NA	06/08/06	06/13/06	0	0%
CM37	398	HMI CPT	05/15/06	06/22/06	06/27/06	0	0%
CM38	393	HMI Calibration (in Air)	03/20/06	03/20/06	04/26/06	0	0%
CM39	400	HMI Pre-Environmental Review	03/16/06	06/26/06	04/03/06	0	0%
CM40	423	Instrument Delivery	02/02/07	02/02/07	02/02/07	40	0%

7.0 Critical Path

The HEB schedule now has both the camera interface board development and parts delivery impacts incorporated and pushed the schedule out a month and a half, which reduced the schedule contingency significantly. The HMI schedule was reworked in an effort to recover the schedule contingency. A new integration and test flow was established and reviewed internally and at the weekly progress meeting with the project prior to submitting this schedule. It was agreed to reduce the schedule contingency to 40 days. The over schedule was modified to gain schedule slack on the deliveries of the electronics box and camera interface board. This was achieved primarily by splitting the HEB vibration testing from the HOP vibration testing and moving the HOP vibration testing to prior the receipt of the flight electronics box. The pre and post functional tests of the HOP will be performed with the BBHEB. The HOP will be a complete flight assembly including the cameras. Please see attached flow chart.

8.0 Risk Assessment

A risk management review board was held this month.

Risk ID	Title	Board	Status
RMHMI005	Calcite Availability	RMRB 6 Oct 2005 Decreased likelihood to medium. We are constructing a Lyot with existing elements for the sun test. In parallel, we are polishing new calcite for element 1 and element 2. The new calcite is expected mid October. Three weeks are added to	Open
RMHMI007	Mechanism Life	RMRB 6 Oct 2005 No change. Life test at 138M moves.	Open
RMHMI013	FY2006 Funding	RMRB 6 Oct 2005 No change in ranking.	Open
RMHMI016	FPP Tunable Filter Rework	RMRB 6 Oct 2005 Reduced likelihood to very low. TF is scheduled to return to Japan in November.	Open

RMHMI017	Flight Filter Oven Production	RMRB 6 Oct 2005 Risk closed. All parts are in house.	Closed
RMHMI018	Front Window Charging	RMRB 6 Oct 2005 No change. Awaiting test to qualify front window design.	Open
RMHMI019	Electronic Parts Deliveries	RMRB 6 Oct 2005 Increased consequence to high. Electronics box is on the HMI critical path.	Open
RMHMI020	Camera Interface Board Design	RMRB 6 Oct 2005 No change in rankings. To this point, CIF rework has been proceeding according to schedule. Implemented use of camera EGSE for sun test.	Open
RMHMI021	Front Window Delivery	RMRB 6 Oct 2005 New risk.	Open

9.0 Change Control Board

No changes to report.