Introduction
The Helioseismic and Magnetic Imager (HMI) investigation contract (NAS5-02139) between NASA and Stanford University has been in place since 27 September 2002. As of this date the contract has been modified 39 times. The contractual launch date is 31 August 2008 however the official “launch readiness date” is now 1 December 2008.

The development of the HMI flight instrument is subcontracted to the Lockheed Martin Space System Company at its Lockheed-Martin Solar and Astrophysics Laboratory (LMSAL) in Palo Alto California. The monthly progress of the LMSAL subcontract is reported in parallel with this report and is considered to be an attachment to this report. The monthly report for E/PO activities is also attached to this report. All monthly reports are available at http://hmi.stanford.edu/Status_Reports/. The quarterly reports from science Co-Investigators are also available online and are considered to be attachments to this report. These monthly reports are written a week or two into the following month and include some status as of the date written. This section of the monthly report is written on 22 October 2007 and describes activities at Stanford University in support of HMI and JSOC-SDP development.
Status and Activities during September.

Administrative Issues:

A LMSAL cost proposal for costs to complete Phase-D work was received just before the Stanford holiday closure and was forwarded to NASA in mid December 2006. A response from LMSAL to some clarification questions was forwarded to NASA after some delay. After receipt of specific authorization from NASA we twice increased Lockheed’s authorization enough on an interim basis to allow work to continue. We have provided further information from LMSAL in early August and hope to have the negotiated contract mod in place by the end of some month. Lockheed is now proceeding on internal funds. Future contract issues will include a second cost-to delivery proposal for LMSAL work (still expected within the week), a Phase-E increased effort in years 3-5 proposal, and a now not likely a proposal to support extended Phase-D activities.

Instrument Development:

Overview:

The SU team supported regular Weekly HMI meetings at the LMSAL facilities including the regular weekly status meeting and topical development and I&T meetings in areas including software, calibration activities, and others as needed. This list should get smaller very soon.

The Stanford personnel responsible for the HMI instrument performance (R. Bush and J. Schou) are working intensively supporting the calibration activities. Sebastien Couvidat, Cristina Soares, Richard Wachter, Tom Duvall and Todd Hoeksema are participating in analysis of calibration data.

We supported the Thermal Vac testing with several team members taking full shifts in support of the tests during the two weeks of testing. This slowed work in other areas.

Instrument Calibration:

Except for the final correction of the light leak the HOP is now complete. We obtained almost all remaining calibration data during the final cycles of Thermal Vacuum (TV) testing in early October. A few final calibration activities are planned as part of the pre-ship CPT. The focus tilt issue turned out to be due to variations in the test setup. An effect of heater cycling in the HOP has been detected – with image motions of 0.2 pixels occurring due to box bending after the ISS. Since this exceeds the stability requirements it must be resolved. We are convinced that we can alter the control parameters to reduce the amplitude and/or increase the period sufficiently to reduce the variations or reduce the rate of change outside the critical range. This may require a minor software change. It can not be really tested until commissioning in orbit. During TV we obtained both better filter characteristic measurements by using a borrowed wavemeter (from another group at Stanford, the LMSAL instrument was not properly calibrated) so we can now properly model the end-to-end filter performance sufficiently well to obtain well calibrated Dopplergrams. We also obtained enough sunlight observations to verify end-to-end performance and provide data
that can be used to develop level-1 processing code. Continued analyses of the calibration data show that HMI can meet its science goals.

**HMI SDP:**

**HMI Level 1**

Work on Level-1 will start in earnest after calibration activities are complete, which means in early November.

**HMI Level 2**

Work is proceeding on tasks for the time-distance pipeline. Existing programs for all parts of the pipeline have been identified and tested. Work is proceeding to convert them to run in the DRMS environment.

**JSOC SDP:**

**JSOC Capture System**

The Data Capture System (DCS) is complete. The connection of the first OC3 line to the DDS is complete and has been tested. We have begun to test data flow with the DDS.

**JSOC Storage Unit Management System (SUMS)**

The SUMS system code development is complete. We resolved some of the tape issues reported earlier. Since we will not use SAIT-1 tapes later we have decided not to pursue the other issues at this time. We will use LTO-4 tapes for the primary JSOC archive. We have modified the tape read process to minimize unnecessary tape positioning.

**JSOC Data Record Management System (DRMS)**

The base DRMS system is stable. Further testing with mission-size database tables has revealed some further query performance issues. We have examined these issues and modified our indexing scheme with satisfactory results. Work is continuing to provide bindings to the JSOC DRMS system for several languages in addition to C. The version 1.0 of the FORTRAN work is complete with support from the NSO Co-I team. The IDL work has begun. This will enable existing code to be brought into the JSOC environment with less effort. We have decided to use the standard cfitsio library within DRMS so we can generate compressed FITS files using the now (almost) standard processing method. This will enhance portability of raw DRMS data files.

**JSOC Level-0 Processing**
Work is continuing on moving the level-0 code developed for the mission version in the DRMS/SUMS environment. The work includes housekeeping data processing, image extraction and decompression, and merging these streams with FDS data and SDO HK data as needed. The level-0 code is a revision of the code in the data EGSE.

**SDO MOR** – We participated in the SDO Missions Operations Review in mid October. The presentation for that review is on the HMI web page presentations link.

**Science Team:**

As mentioned before, we completed a detailed review of the Phase-D plans for the Co-I team provided data product computation code, status and risks of insufficient funding. Several members received LWS TR&T grants for work in the local helioseismology area. Work is proceeding to get the Co-Is more closely involved with the use of the DRMS capability. The two prime areas that are not presently supported at a level that we can be sure of code by launch include the “solar subsurface weather” work and vector field non linear force free modeling method (found in our trials to be the best way to convert observed quantities into estimates of coronal field values). A third area is near surface seismology for structure determinations where work will stop without additional support.

We participated in the second first LWS Workshop in Boulder in September. The final day was an “SDO Teams Day” with an overview of the JSOC and development status of the science investigation. Discussions were held with SDO and LWS and Heliophysics Division personnel concerning the Co-I funding issues.
Planned Activities for October

Continue testing data flow through connection between DDS and Capture system.

We expect to continue documentation updates and code development of the DRMS system.

We are reviewing the primary JSOC hardware plan with a goal of being ready for procurement in the fall.

We will continue level-2 pipeline module porting from the MDI system.

Near-term Milestones

5 November Level-0 processing should be ready.

30 September Goal for level-2 global seismology pipeline. Will be a bit late.

3 November Deliver HMI to GSFC

5 November Internal review of JSOC design and implementation prior to initiating primary hardware purchases. Also review of JSOC SDP software implementation and HMI science pipeline development status.

TBD late Winter Joint HMI, AIA, EVE science teams meeting.

Attachments

Lockheed Martin Solar and Astrophysics Laboratory HMI progress report and the HMI/AIA EPO progress report for the month are attached. This report, the LMSAL report, and EPO reports are also available at http://hmi.stanford.edu/Status_Reports for convenience.