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 16 January 2007 the contract has been modified 34 times to extend through Phase-E at launch plus 90 days with launch expected by 31 August 2008. Mod 33 included launch delays and the formation of the HMI/AIA Joint Science Operations Center (JSOC).

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 report is written on 19 March 2007.
Status and Activities during December.

Administrative Issues:

The 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. After receipt of specific authorization from NASA we increased Lockheed’s authorization enough on an interim basis to allow work to continue. We hope to have the negotiated contract mod in place by the end of May. A response to some clarification questions from LMSAL is pending.

We have interviewed one candidate for the software position and we have added Jeff Wade to the group to help with system administration. Jeff Wade is already in the HEPL lab and has served in a similar position for the GP-B program. Kim Ross has joined the group as Administrative Assistant to replace Millie Chethik who retired.

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 optics, thermal, electrical, software, CCD cameras, and others as needed.

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, and Tom Duvall are participating in analysis of calibration data.

Instrument Calibration:

The vacuum calibration first-cut was completed on March 2. During this run plan which lasted a day less than the planned 10 days we verified performance and demonstrated readiness for determining the remaining parameters once the instrument is in its final configuration. The original front window has optical errors that prevent a full resolution image. A replacement will be available before the final calibration. The focus gradient which was characterized in January can not be adequately corrected by tipping the CCD focal plane assemblies without introducing large distortions. The correct place to fix this issue is where it is likely originating, by inserting an 0.4mm wedge in the mount of the reimaging lens assembly. This will be done before EMI testing. The focal planes will also be finalized at that time. The vignetting that was detected at the mounting of the beam control lens was studied during vacuum calibration. It was found that there is a small margin of at least 10 pixels between the edge of the image and the vignetting region when SDO will be closest to the Sun in January. Therefore no correction will be made to the part which was incorrectly built. The blocking filter fringes were also further evaluated during vacuum calibration and found to be correctable by calibration since they were of less amplitude than measured in October and did not change with varying oven temperature.
HMI SDP:

HMI Level 1

Work on Level-1 will start in earnest after calibration activities are complete. Work is however progressing on definition of the keywords that will be used to describe the images in level-0.5 which is input to level-1.

HMI Level 2

We held a workshop for the local helioseismology pipeline development in early March. Individuals have accepted development roles for each of the major modules to be developed or ported from heritage systems. It is clear that a key will be to provide bindings to the JSOC DRMS system for several languages in addition to C. At least FORTRAN and IDL are needed and will be provided. This will enable existing code to be brought into the JSOC environment with less effort.

We are beginning to port some of the MDI pipeline modules into the DRMS system. Work on the port of the MDI v2helio program is continuing. Since the workshop work on several other key modules such as fastrack is beginning.

JSOC SDP:

JSOC Capture System

Work on the capture system has continued. The base system hardware, OS, support 3rd party packages, etc are all installed. Work on configuring the “T-50” tape system is proceeding. We will review the capture system status in detail on Tues 27 March. Detailed capture system specs and design description will be available for review a day or so before that.

JSOC Storage Unit Management System (SUMS)

The SUMS system development is complete. Residual testing and minor bug corrections continue as increased usage exposes problems. Again, about one day of work was needed for this activity in the past month. Part of the tape scheduling function in the present system is a prototype version that will be replaced to saving some tape rewinds when multiple files are retrieved from one tape. This will be a short task sometime on March or April.

JSOC Data Record Management System (DRMS)

The base DRMS system is stable. Code to allow adding or removing keywords from existing series has been developed and will be released in March. That
addition completes the functionality needed in DRMS. We are beginning to detail the binding to other languages.

The [http://jsoc.stanford.edu](http://jsoc.stanford.edu) web site continues to be improved.

**JSOC Level-0 Processing**

Work is continuing on moving the level-0 code developed for the mission version in the DRMS/SUMS environment. A fully documented level-0 processing specification is being reviewed (this was postponed to allow full support to the HMI calibration activities). The ingest program for the ground test data has highlighted several issues that will simplify some of the level-0 code. The HMI level-0 ground code is being modified (by LMSAL) to support AIA ground testing with the DCHRI/CIF boards when they become available shortly.

**Science Team:**

As mentioned above, we have 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. We are presently reviewing the status after updates from the team at the workshop in early March. Three team members received Guest Investigator grants for work in the local helioseismology area for analysis of MDI or Hinode data. While this does not help HMI directly (in fact it takes attention away from HMI), it does support those members of the team so they are not lost to the discipline.

We are planning another local-helioseismology workshop for August to continue detailed work for the local-HS pipeline components.

**HMI Home and JSOC-SDP Site:**

“There is some movement on the part of Stanford administration to identify space for the solar group. We may know in a few weeks. We have however been advised that we should also resume exploration of the off-campus alternative. Unfortunately the above words continue to be unchanged from last month(s). A decision of on or off campus must be made by end of January.” The on-campus solution still has some uncertainties. It looks like the best plan is to place people in buildings known as Poplar, Cypress North, Cypress Annex, Astrophysics, and Astrophysics Basement. We would be able to leave the basement in January after the GP-B program shrinks again after November. At that time we would have some space in Cedar South, near to Cypress North. We do not view this as a good solution. We are in continuing discussions with the University and have suggested a temporary move to a single location off campus for c. 2 years until we could have a single location on campus. The concern is lack of definitive answers about when that might actually occur.
Planned Activities for March

Capture system tape subsystem operational.

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

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

We will continue the search for another scientific programmer to support science module development.

We will implement the splitting of our workstations from our servers via a single high speed link to simulate the system after the move. The present date for a move of the data center is late April when the building modifications are now scheduled to be complete.

Near-term Milestones

1 January 2005 Decision on space location within Stanford for the JSOC and Stanford HMI team facilities.

30 April 2007 Capture system operational.

30 April 2007 Move computer systems into new data center room.

31 July 2007 Be completely out of our existing office space.

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.