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 49 times. The contractual launch date is 31 December 2008 which is now in the past. SDO launch was on 11 February 2010.

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 (or bi-monthly) report for E/PO activities is also “attached” to this report. All periodic reports are available at http://hmi.stanford.edu/Status_Reports/. The quarterly reports from science Co-Investigators are also available 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 16 March 2010 and describes activities at Stanford University in support of HMI and JSOC-SDP development.
Status and Activities during February.

Administrative Issues:

The proposal for launch delay IV was submitted some time ago. We have submitted a proposal for LD-V. We have received a proposal from Lockheed for the first two years of Phase-E Co-I effort and are in the process of negotiating that contract.

HMI Instrument:

Overview:

HMI is in the sky and has been turned on to allow temperature control. Details are in the LM monthly report.

There are a few flight software issues that will be addressed during commissioning.

Instrument Calibration:

The HMI calibration team is working on completing the instrument description and performance papers to be published prior to end of commissioning. The goal for submission to “Solar Physics” is as soon as possible.

HMI SDP:

HMI Level 1

The base level 1.0 program is complete and is running with test data. We are still preparing a full test of the level 1.0 processing with re-tagged HMI sun light test data from 2007. All of level-1.0 is now ready. We have run the first test of the “observables” code from data produced by the level1.0 code.

HMI Level 2

Work is continuing on tasks for several standard product pipelines.

Work is proceeding on implementing the time-distance pipeline. Remaining work includes pipeline management scripts for this processing and code to merge the as-computed small regions into full scale heliographic maps. Present work in tuning the inversion kernel calculations is continuing.

Work is underway for other magnetic field modules needed for initial vector field products.

The set of standard products is documented via the jsocwiki. See e.g. http://jsoc.stanford.edu/jsocwiki/Processing

JSOC SDP:

Work is nearly complete on the “publish” part of the data distribution system. This code allows easy addition of more data series to the export and distribution
list as the need arises. We stopped local support of this development effort for the past few weeks to ensure that all code needed prior to commissioning was ready. Work on the remote distribution system will resume now with the expectation that it will be complete by 30 April.

**JSOC Capture System**

The Data Capture System (DCS) is complete. There was a final end-to-end verification exercise with the DDS in January. SDO data is expected to start on 19 March with HMI and AIA data starting on 20 March.

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

No new work. System is stable.

**JSOC Database Development**

No new work. System is stable.

**JSOC Data Export**

Work is continuing on providing an easier to use user interface. Work is continuing as part of the VSO (Virtual Solar Observatory) to allow “daisy-chaining” of exported storage units. This is part of work now underway to integrate SDO data access into the VSO. Work is proceeding on a browse-able data catalog vs. relying on the user to “know” what data is available.

The increasing number of requested remote distributions of JSOC data is a concern. We are at the bandwidth limit for our connection to the internet. We are proceeding to increase the system capability in conjunction with the Stanford networking services group. Final engineering decisions have been made on an upgrade to 10 gigabit/sec connection between the JSOC server and the world.

**JSOC Hardware**

The JSOC-SDP hardware is in place and in regular use. We very near the end of the hardware procurement and configuration for the beginning of the mission.

We have had several failures of the SUMS RAID system since a campus-wide power outage in mid January. We are in the initial procurement process for UPS support of the JSOC/SUMS disk array (960 1-TB drives). We now have a quote for electrician services and for the UPS hardware. We await approval from GSFC so we can place the order.

The increase in number of data streams we are being asked to support for remote distribution will saturate our network bandwidth from the computer room to the Stanford internet tie point. We are in the final stages of configuring the needed
equipment to support a larger bandwidth. We are at the top of “standard”
connections using 1-gigabit/sec Ethernet over fiber and are planning an upgrade
to 10gigabit/sec capability. This will require a new switch at the Stanford end as
well as a new switch on the JSOC end of an existing fiber. It will also require an
interface machine that will connect on one side to the 10gig switch and on the
other side to our infiniband “backplane” for access to the SUMS disks. This
machine will be called “jsocport” and will be the distribution point for remote
data access. We will proceed with this as quickly as possible with the goal of
having it in place by mid May when we expect to begin data distribution in
quantity.

Initial tests with observables code and vector field inversion code show that there
may be an important efficiency break with more processor cores having access to
shared memory and for more memory than present in the initial JSOC computing
array. We will investigate the benefits of adding four higher core-count with
larger memory per core nodes once we have real vs. simulated data flowing. The
class of machine that we are considering is similar to the “science analysis” node
set that we have explicitly delayed until newer processors are released and the
need is approaching critical. We have previously decided to postpone the
purchase of this machine to the beginning of Phase-E when more of the analysis
programs are better developed and we can determine the proper balance between
processor core count and memory.
Planned Activities for March

HMI first Light  
Develop image center measurement software  
Continue work on science product pipeline.

Near-term Milestones

24,25 March  HMI First Light
30 April 2010  JSOC Remote Distribution system complete.
4 May 2010  HMI running primary observing sequence for 6 month MDI cross-calibration overlap interval.

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.