Introduction
The Helioseismic and Magnetic Imager (HMI) proposal was submitted to NASA on 24 April 2002 in response to the Solar Dynamics Observatory Announcement of Opportunity AO 02-OSS-01, and this investigation was accepted by NASA on 15 August 2002. The contract to NAS5-02139 between NASA and Stanford University was in place as of 27 September 2002. That contract has now been modified (via Modification #13) to extend through Phase-E at launch plus 30 days plus six years with the launch expected in 31 August 2007. We have submitted a proposal for the additional effort needed to extend the launch date to 30 April 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. For months in Phases A and B where the Stanford component is not separately reported the LMSAL Monthly Status Report is the HMI Monthly Status Report.

Status and Activities during March.
Both Stanford and Lockheed personnel have participated in weekly SDO instrument interface, ground system, and individual instrument team telecons.

The SU team supported regular Weekly HMI meetings at the LMSAL facilities including the regular weekly status meeting and topical design meetings in areas including mechanical, optics, thermal, electrical, software, CCD cameras, and others as needed.

The Stanford personnel responsible for the HMI instrument performance continued work on understanding the thermal and filter performance specifications for the HMI filter oven and front window and blocking filters to assist LMSAL. Additional work continued in the form of technical discussions of the Michelson Interferometer development with LMSAL personnel to support the subcontract (from LMSAL) with Light Machinery in Canada.

Phil Scherrer and Rock Bush visited GSFC from 9 to 12 March to support the SDO PDR. We supported the HMI instrument, the JSOC, and the programmatic portions of the SDO PDR.

Phil Scherrer, Rock Bush, Sasha Kosovichev, and Jesper Schou attended the SDO Science Working Group meeting on Monday 22 March and Living With a Star Workshop
in Boulder Co. from 23 to 26 March. We had discussions with our HAO and UK Co-Is in Boulder.

The Stanford personnel responsible for the design and development of the HMI Science Operations Center (SOC) and science data processing participated in several SDO ground data system telecons. The efforts of this SU team were focused on development of the EGSE system that will handle the science data flow from the SDO Spacecraft Simulator, work on verifying estimates of computer I/O bandwidth requirements and performance for the HMI Science Operations Center (SOC) data capture component, and work on testing performance of algorithms for level-1 calibrations and spatial remapping.

Work on the Data EGSE continued with testing the porting of the full heritage MDI data system to a stand-alone workstation. Nearly all functions are now working with only a few Oracle 10 problems persisting. Testing was done with MySQL to ascertain if a relational database system could manage the storage and access to the image metadata at a cadence sufficient to support the pipeline processing. The first results were very encouraging and a more detailed prototype is in development. Timing tests on the EGSE data system showed that it can handle the full bandwidth of camera data with a file per minute per virtual channel – but at a processor utilization level very close to the maximum. We will examine options of more disk partitions or more processors to obtain sufficient margin. The system at present is a dual processor 3.2GHz 32-bit P4 family processor with a single RAID-0 file system consisting of three drives connected via a gigabit Ethernet. The data simulator code is progressing so that we should soon be able to generate realistic data streams for testing of the data EGSE.

When the NASA-Stanford contract was finalized in February the LMSAL subcontract period of performance was extended to give enough time to extend the full terms of the Mod 13 contract changes. We are presently negotiating the final terms of the Lockheed Phase C-D contract and should have it in place by mid April.

Stanford University planning for the new Varian-II Physics building is progressing and we have initial space allocations sufficient for about 40% of our needs. Work is continuing on this issue. At present we have an allocation sufficient for the JSOC data center and 1/3 of our needed office space. If we have not obtained a firm commitment for sufficient space on campus by January 2005 we will need to begin the process of leasing off-campus office and data center space. There should be no increase in cost to the project for this since the off campus effort will be “taxed” sufficiently at a lower rate to pay the lease and related costs.

**Planned Activities during April**

We will support the development of the AIA Concept Study Report proposal with an unofficial proposal for the Stanford efforts to add AIA processing to the HMIK SOC to turn it into the data part of the HMI-AIA JSOC.

We will continue work on the LMSAL subcontract terms and conditions.

The initial data EGSE system arrived in late February and initial configuration has been completed with the installation of the core DSDS software. Work should be nearly complete on the prototype data simulator that will be used to test the data unpacking in
the data EGSE and the modules to do that unpacking will be integrated into the prototype raw to Level-0 program. Work will continue to develop specifications for handling the housekeeping data that will also flow into the data EGSE via the high speed bus and the data portion of the spacecraft simulator. The performance testing on the data EGSE will be completed and recommendations will be made for the four deliverable data EGSE systems (assuming AIA as well as HMI systems to be provided to LMSAL). The bread boarding of the SQL system for meta-data will be completed and a decision on the meta-data server may be accomplished.

The HMI SOC Ground Data System Development Plan will be further revised to reflect the planned joint activities with the SDO-AIA SOC.

A job description will be completed and advertised for a software system engineer to support the JSOC development.

**Near-term Milestones**

30 April 2004  Basic data EGSE functioning to Level-0 with simulated data.

31 August 2004  Data EGSE ready to accept data from spacecraft simulator and make it available for analysis.

Attachments

Lockheed Martin Solar and Astrophysics Laboratory HMI progress report for March 2004 is attached by reference. It is forwarded to GSFC separately by LMSAL and is also available at [http://hmi.stanford.edu/Status_Reports](http://hmi.stanford.edu/Status_Reports) for convenience. Also the HMI EPO progress report for March is attached and available online.