

Helioseismic and Magnetic Imager

Stanford University

Contract NAS5-02139

Progress Report for October/November 2004

Introduction

The Helioseismic and Magnetic Imager (HMI) investigation 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 proposed by NASA on 15 August 2002. The contract (NAS5-02139) between NASA and Stanford University was in place as of 27 September 2002. That contract has 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. Modification #20 to provide funding through 15 January 2005 was signed on 1 December. We have submitted a proposal for the additional effort needed to extend the launch date to 30 April 2008. We expect the launch delay modification to be negotiated in the next few months possibly with an additional two months effort just after launch to bring our contract into alignment with the 90-day checkout time planned for the mission. We are expecting instructions from NASA for a proposal to support the HMI-AIA Joint Science Operations Center enhancements of the original HMI SOC tasks.

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 October and November 2004 monthly reports from Stanford are combined in this report.

Status and Activities during October and November.

The primary activity in October and early November was preparation for the HMI CDR which was held in Palo Alto on 16-17 November. We feel that the CDR was well presented and that the HMI instrument development has now proceeded beyond the CDR level of development. We received several RFAs which are being studied and acted upon. These will be responded to primarily by the LMSAL HMI team with only one of them requiring action by Jesper Schou at Stanford.

Part of the preparation for the CDR involved completing work on some deliverable documentation. The HMI Science Plan was revised with the addition of explanatory material and editing of the science observing requirements. CDRL SD-301 is chapter 5

of this document. The Instrument Performance Specification was revised and delivered as CDRL SD-302. An update of the Calibration plan and a terse outline of the in-flight checkout plan were delivered as SD-306 and SD-309 respectively. The overview of the SOC was revised to reflect plans for the JSOC and delivered as CDRL 326a. The beginning of a much more detailed description of the JSOC in all of its aspects was prepared as CDRL SD-326b. The list of standard data products was made with only a few details included so far as SD-326c. These documents are available at http://hmi.stanford.edu/doc/CDRL/SU_HMI_CDR_CDRLs.html

Both Stanford and Lockheed personnel have participated in weekly SDO instrument interface, ground system, and individual instrument team teleconferences.

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 (R. Bush and J. Schou) continued work on understanding the optical, thermal, and filter performance for the HMI filter oven and front window and blocking filters to assist LMSAL. J. Schou has completed extensive modeling with Zemax to study the effect of the IR light which is not blocked by the front window. 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. Additional work continued in the form of discussions and management activities on the CCD camera systems for both the development and flight camera systems for both HMI and AIA in support of the LMSAL activities. R. Bush attended a working meeting to examine progress on the Michelson's in Canada.

The Stanford personnel responsible for the design and development of the HMI-AIA Joint Science Operations Center (JSOC) and science data processing participated in several SDO ground data system teleconferences. We supported the Operations Working Group (SOWG) meeting on 21-22 October.

The data EGSE unit HMI-1 has been delivered to Lockheed and the unit called AIA-1 can be moved to Lockheed when it is needed. We had a second disk failure in HMI-0, the first version and development system for the data-EGSE. We are concerned about two disk failures in a short span in one 1-U box. We believe they may have suffered during the episode last fall when the air conditioning in our computer room failed and HMI-0 was mounted in the hottest corner of the room. Nevertheless we will evaluate the choice of vendor for HMI-2 and AIA-2 which will be the units eventually shipped with the flight instruments. Work is continuing on the level-0 image display and quick analysis functions that will be done in an analysis workstation. We have also found a problem with performance on HMI-0 using Red Hat Enterprise version of Linux. It has been identified as a disk cache management problem. We are examining performance using Red Hat FC2 and SUSE linux.

Work on the top level design of the keyword database for image and dataset headers continued with many discussions. The designs for the analysis program environment

have also been discussed with the details of what needs to be changed from the MDI system being clarified. Prototype code for these functions is nearly complete. We placed orders for the disk and tape systems needed to develop the prototype processing system. The a new SGI SMP linux system (funded by non-HMI sources) was delivered to support data analysis for the SOHO/MDI and LWS/TR&T grants that support most of the Stanford group. This will make the prior machine available for use in the prototype system for software development and testing.

The JSOC Peer review is now scheduled for 17 March in the afternoon.

Stanford University planning for the new Varian-II Physics building is progressing and we have initial space allocations sufficient for almost 40% of our needs. A construction trailer is onsite and ground breaking will take place in December. Work is continuing on identifying the additional space we need. The Dean of Research has identified Stanford funds to ensure the necessary on-campus facilities can be provided. Full approval from the Provost office is anticipated soon. This effort will move to a high priority since Stanford has removed a year from the planned demolition schedule for our present building with the new date set for fall 2006.

Planned Activities for December

We expect to begin use of the prototype hardware system in December or early January. The first tests will be to verify throughput necessary for level-1 processing. We anticipate having a prototype keyword database and data storage database operating before the end of February.

Many members of the Stanford team will participate in the AGU fall meeting in San Francisco in the third week of December. Stanford University will close for the last two weeks in December – from 18 December to 2 January. Support for HMI during this time will be minimal with telecom participation from home. Rock Bush will be available until the 23rd.

We will complete the agenda development for the HMI Science Team meeting scheduled for the last week of January.

We expect to have the IT security plan complete and delivered to SDO by the end of February. Some details will need to be modified after the referenced documents are available.

Near-term Milestones

- | | |
|----------------|---|
| 1 January 2005 | Decision on space location within Stanford for the JSOC and Stanford HMI team facilities. |
| January 2005 | HMI Science Team meeting at Stanford. |

1 March 2005 JSOC Prototype system basic functions operating

17 March 2005 HMI-AIA JSOC Peer Review

Attachments

Lockheed Martin Solar and Astrophysics Laboratory HMI progress reports for October and November 2004 are attached by reference. They are forwarded to GSFC separately by LMSAL and is also available at http://hmi.stanford.edu/Status_Reports for convenience. Also the HMI EPO progress reports for October and November are attached and available online.