

Helioseismic and Magnetic Imager

Stanford University

Contract NAS5-02139

Progress Report for January 2007

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 14 February 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. With the expectation that this proposal will not be reviewed and a resulting contract modified negotiated before the end of February, we are working with GSFC and Stanford OSR to develop a path to increase Lockheed's authorization enough on an interim basis to allow work to continue past their current contract value.

Our search will resume shortly for the remaining scientific programmer position. We are beginning work on final job description for a computer system administrator to assist with the development and support of the JSOC production system. Our Administrative Assistant, Millie Chethik has announced her plans to retire in February. That position has been advertised and applications have been reviewed. We are as of this date almost ready to make an offer.

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:

After several small setbacks we are now expecting to begin vacuum calibration first-cut on 16 Feb. During this run planned for about 10 days we expect to obtain final calibration information for several parameters and to exercise and complete verification of readiness for the remaining parameters. The vacuum cal first-run is being done with the original front window which does not allow sufficient image quality for flight. Because the present window was selected as the one with best filter characteristics it may be that the final window will have different filter characteristics. Therefore we will need to repeat the detailed filter characterization after the window is replaced. Because the reason we are changing the window is that it causes a blurred image, all calibration activities that measure image quality will need to be repeated. Many of the cal sequences will be OK. These include such topics as image motion induced by moving internal mechanisms, Michelson and Lyot phase (zero point) maps, etc.

The vignetting that was detected at the mounting of the beam control lens continues to be studied. The replacement parts for the inner sleeve of the Lyot housing are ready. We will make detailed measurements of the nearness of the vignetting edge to the light path and search for possible scattered light from that

edge during the coming vacuum cal. If the image can be kept in the unvignetted path for most of the year and there is no detectable scattered light during the vignetted intervals we will not correct this problem unless we need to remove the Lyot for other reasons+. If necessary we will change the part during EMI/EMC testing. The blocking filter fringes will be further evaluated during vacuum calibration. Changes in amplitude, phase, or spacing of these fringes with time or temperature will require corrective action. As measured last fall they would introduce non-correctable errors in the Doppler signal if they are not static.

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 completed a thorough review of the HMI processing pipeline module requirements last fall. The results of this assessment have been provided to Dean Pesnell. After discussions with the SDO project we are prioritizing these tasks but do not see the needed funding arriving in time to fully support these activities.

We are beginning to port some of the MDI pipeline modules into the DRMS system. We are beginning work on the port of the MDI v2helio program which is the first step in the global helioseismology processing pipeline. The first step has been to make planned updates to that program within the DSDS framework first (completed) then to move it to DRMS using existing MDI data as test data.

JSOC SDP:

JSOC Capture System

Work on the capture system has continued. The capture system hardware components have arrived and been mounted into the rack. Our plan had been to use the same version of RedHat Linux for the capture system that we have been using on the data EGSE. Unfortunately there appears to be an inconsistency with the SGI version that supports the RAID disk array. We will switch to SUSE Linux for the capture system. Initial throughput tests showed 1/3 the expected data write bandwidth and SGI is examining the installation. Work on the system is delayed by one week to support the SDO/HMI high speed bus test at GSFC. We will delay purchasing two of the three tape systems until spring when the higher density versions are expected to be available.

JSOC Storage Unit Management System (SUMS)

The SUMS system development is complete. Residual testing and minor bug corrections continue as increased usage exposes problems. About one day of work was needed for this activity in the past month.

JSOC Data Record Management System (DRMS)

Work in December continued to focus on getting more personnel familiar with the DRMS implementation building simple utility modules, finding bugs, and improving the documentation. The documentation “wiki” on the <http://jsoc.stanford.edu> web site continues to be improved. Programs to ingest the ground test ancillary data are complete. The HMI ground level 0 ingest program has now been used for many thousands of images. It has been provided to LMSAL as a prototype for the similar functionality that will be needed by AIA when AIA begins to use the DCHRI/CIF vs the RAL EGSE for image capture.

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. The ingest program for the ground test data has highlighted several issues that will simplify some of the level-0 code.

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. The results of this survey have been forwarded to the SDO Project Scientist, Dean Pesnell.

We are planning a local-helioseismology workshop in early March to develop detailed specifications for the local-HS pipeline components. Several team members are planning to attend.

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 university has apparently made its best offer of a solution. This, if adopted, will result in the solar group being split into 4 buildings separated from each other by one to five minute walks. We have been directed by the university to not make direct contacts with commercial realtors to identify off-campus space. The Stanford people (both in DoR office and Planning office) are focusing on the on-campus option. We are looking for an acceptable way to at least explore viable near campus solutions where the AIA team could co-locate at least their non-US visitors. Such an off-campus solution would be a benefit to the SDO program but would be a significant disadvantage to interactions with the other astrophysics groups on campus as

well as providing difficulties for student involvement in the program. We have not identified a good solution and are looking for the least bad solution.

Planned Activities for February

Capture system hardware and OS integration with acceptable performance.

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

We will begin vacuum calibration activities.

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 begin implementation of the detailed plan to move our existing computer systems into the new Physics and Astrophysics building. The building modifications are due to be completed in early March

Near-term Milestones

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| 1 January 2005 | Decision on space location within Stanford for the JSOC and Stanford HMI team facilities. |
| 28 February 2007 | Capture system components in house and integrated. |
| 30 March 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.