

# Helioseismic and Magnetic Imager

## Stanford University

Contract NAS5-02139

Progress Report for July 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 this date the contract has been modified 38 times. Launch is expected by 31 August 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. 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/](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 section of the monthly report is written on 20 August 2007 and describes activities at Stanford University in support of HMI and JSOC-SDP development.

## **Status and Activities during July.**

### **Administrative Issues:**

A 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 2006. A response from LMSAL to some clarification questions was forwarded to NASA after some delay. After receipt of specific authorization from NASA we twice increased Lockheed's authorization enough on an interim basis to allow work to continue. We have provided further information from LMSAL in early August and hope to have the negotiated contract mod in place by the end of August. Future contract issues will include a second cost-to delivery proposal for LMSAL work (rfp already sent to LMSAL for this), a Phase-E increased effort in years 3-5 proposal, and likely a proposal to support extended Phase-D activities.

### **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, and others as needed. This list should get smaller very soon.

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 re-polish with correction of one of the spare front windows has produced the flight window! The other spare (SN/2) has been sent back to Zygo for similar treatment to become a flyable spare. Some light leaks were detected in the vicinity of the CCD cameras in tests done just prior to the HOP vibration testing. The source of these leaks has been found and preliminary corrections have been made. Final corrections will be made before the MLI is attached for the final time. The front door chattered against the sun shield that it closes against during the vibration. Corrections are being made to that assembly also. When these items are finished we will have a final flight HOP. The EMI/EMC testing has been completed and the DCHRI, CIF, and power boards are being conformal coated. Then we will have a completed HEB also. The bulk of in-air calibration was finally accomplished in the past few days. The vacuum calibration will be done in conjunction with thermal balance in the next two weeks.

### **HMI SDP:**

#### **HMI Level 1**

Work on Level-1 will start in earnest after calibration activities are complete.

#### **HMI Level 2**

Work is proceeding on tasks for the time-distance pipeline. Existing programs for all parts of the pipeline have been identified and tested. Work is proceeding to convert them to run in the DRMS environment.

We now have access to MDI data via the DRMS interface so we can develop and test the global seismology pipeline and synoptic magnetic pipelines testing with real data. This work should be complete by the end of September.

## **JSOC SDP:**

### **JSOC Capture System**

The Data Capture System (DCS) is complete. The GSFC provided router/switch has arrived and has been installed. We are waiting for the connection of the first OC3 line and testing with the DDS.

### **JSOC Storage Unit Management System (SUMS)**

The SUMS system code development is complete. Several minor issues are being addressed while waiting for the DDS testing.

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

The base DRMS system is stable. Work is continuing to provide bindings to the JSOC DRMS system for several languages in addition to C. The version 1.0 of the FORTRAN work is complete with support from the NSO Co-I team. The IDL work has begun. This will enable existing code to be brought into the JSOC environment with less effort.

### **JSOC Level-0 Processing**

Work is continuing on moving the level-0 code developed for the mission version in the DRMS/SUMS environment. The work includes housekeeping data processing, image extraction and decompression, and merging these streams with FDS data and SDO HK data as needed. The level-0 code is a revision of the code in the data EGSE.

## **Science Team:**

As mentioned before, we 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. Several members received LWS TR&T grants for work in the local helioseismology area. Work is proceeding to get the Co-Is more closely involved with the use of the DRMS capability.

We held a local-helioseismology workshop in August to continue detailed work for the local-HS pipeline components. This meeting was quite successful with useful discussions on key unresolved issues in time-distance processing and methods.

We will participate in a one-day HMI/AIA/EVE meeting after the conclusion of the LWS workshop in September.

## Planned Activities for August

Install and test connection between DDS and Capture system.

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

We are reviewing the primary JSOC hardware plan with a goal of being ready for procurement in the fall.

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

## Near-term Milestones

31 July 2007	Capture system ready for DDS testing. Done but OC3 line not ready.
30 September	Level-0 processing should be ready.
30 September	Goal for level-2 global seismology pipeline.
TBD Fall	Internal review of JSOC design and implementation prior to initiating primary hardware purchases. Also review of JSOC SDP software implementation and HMI science pipeline development status.
TBD Winter	Joint HMI, AIA, EVE? science teams meeting.

## 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](http://hmi.stanford.edu/Status_Reports) for convenience.