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 selected 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. As of 1 May 2006 the contract has been modified 29 times.

In late November we submitted a complex proposal in response to an RFP for the merged program changes which include the original launch date to April 2008, the addition of 2-months to Phase-D after launch, the merging of HMI and AIA SOC and EPO activities to form the JSOC and merged EPO, and the funding driven launch delay to August 2008. We are proceeding with development of the JSOC and support of AIA development under the verbal assurance that NASA approves of the plan.

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/. 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 9 May.

Status and Activities during April.

Administrative Issues:

The Co-I subcontracts are in place.

We are updating the development plan to be consistent with the new definitions of WBS elements used in the new JSOC schedule.

We anticipate negotiations for the JSOC et al. proposal in the coming month.
**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 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) are working intensively supporting the calibration activities.

**Instrument Calibration:**

Following the initial “Sun Tests” which were completed in the first week of March we have continued development of analysis programs and are preparing for the resumption of calibration activities. A number of important issues/anomalies were found and most have been resolved. There is remaining uncertainty about the source of some of the optical “distortions” and the discrepancy in focus between tests with the Sun and stimulus telescope. Notes and descriptions of the results can be found at [http://sun.stanford.edu/~schou/hmi/suntest](http://sun.stanford.edu/~schou/hmi/suntest). The regular weekly calibration planning meetings continue as a forum to discuss continuing analysis of the first sun tests and to prepare for “calibration in air” now expected to be resume in mid May. We are evaluating which of the calibration activities can proceed without the benefit of the flight camera and data handling systems which will not be available until June at best. The May calibration activities will begin with a repeat of some of the Feb-March tests to insure that the “features” found then have been resolved. This first week of tests will be followed with a more comprehensive set of calibration measurements in air. For some aspects of the instrument these will be the definitive calibrations while for most aspects the definitive tests will await in vacuum calibration in June/July.

**Data EGSE:**

We are working on including more complete image crop and image modes into the EGSE as well as handling the instrument image status housekeeping packets in the eGSE as well as in the Capture System level-0 processing.

**HMI SDP**

**HMI Level 1**

A new semiweekly development meeting has begun to discuss refinements to the plans for HMI level-1 observable computation algorithms. This topic will be addressed in the coming months with initial implementations to be used for test data obtained in the in-air calibrations. Jesper Schou will lead this effort.

**JSOC SDP:**
**JSOC Capture System**

Work on the capture system has begun with several meetings to clarify detailed requirements and design decisions. The goal is to have the capture system software essentially complete by November when we can finally order the hardware. Jim Aloise has completed a detailed draft Data Capture System Specification for review.

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

The SUMS system development is nearing an end. File checksums have been included and a method of specifying near-line tape retention times has been designed and implemented. Work has begun on the remaining functional changes to SUMS including migration of the system to Postgress DBMS. This move should be complete before the end of May. There will also be some work to improve scheduling of tape activity if the simple queue system in place becomes an issue – which is not expected.

The emphasis in April continued to be on testing and stress testing.

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

The DRMS development to handle multi-record data blocks is nearly complete and will be finished well before the end of May.

Karen Tian has begun testing the replication feature of the database system. This will used for the outside user access. The replication system is functioning on a borrowed spare single processor server and a workstation. Two levels of replication are in use.

Rasmus Larsen, the lead developer of the DRMS has decided to take a new job in a nearby company starting in June. His move from Stanford will significantly slow the development of the DRMS and the development of the JSOC processing pipeline.

**JSOC Science Module Development**

No work planned for April. No work expected in May.

**Science Team:**

The joint HMI and AIA science team meeting was held in the week of 13 February 2006. The web site at [http://hmi.stanford.edu/TeamMeetings/Feb_2006](http://hmi.stanford.edu/TeamMeetings/Feb_2006) contains detailed information. The presentations from the meeting are now present on the web site.

The absence of sufficient apparent support for the science team is the primary risk to the success of the HMI investigation and the SDO mission goals.

**HMI Home and JSOC-SDP Site:**
The construction of the new Varian-II Physics building (now called the Physics and Astrophysics Building) is progressing with a schedule for occupancy on 2 August 2006. We have now confirmed that the JSOC data center will be built in the basement room in the NE corner of this building. In terms of office space, there has been little positive progress in the past month. We are still working the problem. We have a deadline of about May 2007 for a move date to new quarters.

**Planned Activities for May**

We expect to conclude intensive throughput testing of the SUMS/DRMS system.

We will continue analysis of the Sun Test data begin in-air calibration activities.

We will complete the job description for a JSOC scientific programmer and for a JSOC development programmer.

**Near-term Milestones**

1 January 2005  Decision on space location within Stanford for the JSOC and Stanford HMI team facilities. *This is finally beginning to happen! again*

1 June 2006  First interviews for scientific programmer staff addition.

15 June 2006  SUMS and DRMS data saved from this point forward.

**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.