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 59 times.

The development of the HMI flight instrument was subcontracted to the Lockheed Martin Space System Company at its Lockheed-Martin Solar and Astrophysics Laboratory (LMSAL) in Palo Alto California. This subcontract is nearly closed with final billing remaining. The monthly (or bi-monthly) report for E/PO activities is “attached” to this report. All periodic reports are available at http://hmi.stanford.edu/Status_Reports/. The quarterly reports from science Co-Investigators are also available 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 24 August 2012 to cover the activities at Stanford University in support of HMI and JSOC-SDP since June 2012. There was sufficient communication with the SDO project office at the SDO weekly telecons and at the various conferences so this report is primarily for documentation purposes. This report will continue in the style used during development until the LM subcontract for phase A-D is closed.
Status and Activities.

Administrative Issues:
We apparently can not convince LM to do as was contracted and give us the final bill shortly after the end of Phase-D, which passed by 21 months ago. It is our understanding that if LM rates change for the time of the contract that we will pass any increased costs on to NASA. (unchanged). LM has a no-cost extension on its Phase-E contract – and that will end soon. So shortly we will have only the not-finalized Phase B-D contract with LM to finish.

We also have not yet received all the documents needed to calibrate HMI in a form that are not marked ITAR. The information we need for calibration is not ITAR sensitive but LM has labeled the documents ITAR and while agreeing that the information we need is not ITAR sensitive, will not remove the labels. (unchanged, no progress)

HMI Instrument:

Overview:
HMI continues to operate very well. No changes to the operating sequence are planned.

Instrument Operations:
No issues to report.

Instrument Calibration:
The HMI Calibration team has plans for an in-orbit calibration and performance paper for the topics not yet in published form. These include the actual final observing sequence and a rundown of the known issues. These continue to be described on the jsocwiki and JSOC HMI Release Notes pages. Real work on this paper has begun.

HMI SDP:

HMI Level 1

Complete and no changes anticipated. Except we will add or change the name of one keyword to reflect new values for CROTA2 based on measurements made during the transit of Venus in June. The two HMI cameras have a roll difference between them of about 0.08 degrees. We arbitrarily chose the LOS camera, Camera 2, to be 0.0 and set CROTA2 for the other camera to 0.08 degrees. The transit data showed that Camera 1 was nearly correct so if we had chosen it as the reference we would have no change to make at this time. Both cameras will have about -0.07 degrees added as a delta for all hmi.lev1 records. The AIA team chose the HMI Camera 2 as a reference also so their roll angles also need to be adjusted.
HMI Level 2

Nearly complete.

Work is continuing on tasks for several standard product pipelines.

Work is proceeding on implementing the time-distance pipeline. All elements of the planned pipeline are functioning with the travel-time products published in hmi.tdVtimes_synopHC. The standard inversion code is not yet automatic but results are available to all interested parties at hmi.tdVinvrt_synopHC.

The “Rings” analysis pipeline is operating with tracked data cubes being generated and spectra computed, and analysis of flows generated. The Co-I provided 3-D inversions of this data are nearly operational. The inversions are available as described at http://jsoc.stanford.edu/doc/data/hmi/hmi.rdV*%20%28Ring%20Diagrams%29/

We now have 11 72-day intervals for global helioseismology analysis. Each completed interval is processed as soon as the level-1.5 data is available. The first 72-day interval began on 30 April 2010 (GONG month 153). The processing pipeline is complete. The zonal flow chart extending from the beginning of SOHO/MDI processing has been extended and shows the absence of the expected high latitude indicator of the next cycle. The student producing the fit frequencies for both a redo of 16 years of MDI and the first 2 years of HMI data will publish all of the frequencies any day now. The reprocessing with new CROTA2 values was delayed due to a Stanford power problem in mid August. Frequencies are available on request.

We developed and ran a Venus data tracking program which produced many thousands images of the recent transit of Venus. Data has been analysed and we have adopted new values for CROTA2 for both cameras. We will correct all products from level1 through observables. The change will effect measurements of meridional flows be removing an erroneous cross equator flow of about 2.4 m/s. We will not reprocess all local HS data in the Rings and TD pipelines but will retain the information about which products were made with the original and which with the revised roll angle. A new keyword, CALVERS, will contain a nibble field to identify which version of CROT2 was used. This same keyword will allow management of the planned incremental introduction of updated calibration methods to remove fringes, etc.

JSOC SDP:

In mid August the Stanford Cogen plant shutdown after a construction error breaking a 60kV line. For two days Stanford had no chilled water and was at the limit of backup power from PG&E. We were required to shutdown the JSOC computers during this time. Some hardware was damaged and some RAID disk
drives needed rebuilding. Stanford has asked for a cost estimate of the impact of the event. More details will be available in the August report.

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

DRMS and its ties to SUMS have been stable for a year. An update to SUMS code will prevent out of date versions of user software from requesting access to data on tapes. There was a bug that was introduced about six months ago which caused program failures for other users when another user accessed the tapes and had certain error conditions. This change will require all users to update to the next software release more promptly than usual.

**SUMS data Storage Unit Management System**

Disk volume growth and maintenance continues to be a challenge.

SUMS is managing the c. 5TB/day flow and archive functions with much less disruption than near the start of the mission. Final changes to the interface with the tape system have been in place for several months with greatly improved uptime.

The current status of SUMS online data can be found at http://jsoc.stanford.edu/~jsoc/SUM/sumlookgroup with a link from this page at the bottom of the first page of the jsocwiki.

**JSOC Database Development**

No new capability. System is stable. We are investigating methods to improve the speed of some heavily used queries

**JSOC Data Export**

Work is continuing on providing an easier to use user interface the main improvement planned is an interface for new or casual users that we refer to as a “visual catalog” which will provide sample images of the main data products and have a hierarchal graphical index to the datasets. Draft versions of these pages are now available for comment and continued development. Public versions should be available within the month.

**JSOC Hardware**

The JSOC-SDP hardware is in place and in regular use. We very near the end of the hardware procurement and configuration for the beginning of the mission.

We have placed orders for more cluster nodes to enable better coverage of vector field inversions and disambiguation. Also new nodes for science processing as long planned.
**HMI Science Team**

The Stanford SDO supported science team’s efforts to date are fully used to complete the initial characterization and calibration activities and making the data available to the broader community.

The science team led by Sami Solanki with Helioseismology group led by Laurent Gizon has been growing by attracting several key helioseismology scientists. Aaron Birch has recently moved from CORA to MPS. Jesper Schou will move from Stanford to MPS after the first of the year (2013). This is a good opportunity for Jesper but a significant hit to the Stanford HMI team. We anticipate other Stanford HMI team members will look for new homes as the NASA support for science trends downward.

That HMI broader science teams, as well as the local one, are supported by other grants/contracts and reports their progress via papers and conferences. Incremental support for porting available code into the JSOC is finished, the HMI Co-Is are now relying completely on grants to support their efforts. Their final reports are being gathered and placed in the online Status Reports section where this report is also found.

Summaries of recent accomplishments of the Stanford SDO team will be reported here as new science results develop after the initial push to get calibrated data is complete.

**Planned Activities for Summer**

Get the as-built, as-operated characteristics published.

Provide this report monthly.

**Near-term Milestones**

Publication of global HS frequencies and automated processing of time-distance inversions.

**Attachments**

This report, the final Co-I reports, and EPO reports which are considered attachments and available at [http://hmi.stanford.edu/Status_Reports](http://hmi.stanford.edu/Status_Reports) for convenience.