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| Investigation: FIELDS |
| Progress accomplished this period: | April 2014 Reporting Period |
| 1. | Project Management and Product Assurance |
|  | a. | Project Management* Provided additional information requested to support review at SwRi of the July 2013 FIELDS cost change proposal.
* Supported the following PERs and associated TRRs
	+ None
* Supported the following FRBs
	+ FM6 EDI GDU (LED current trends in TV)
	+ FM8 EDI Gun (low impedance 5V to ground)
* Supported the following Acceptance Reviews or PSRs
	+ None
* Received delivery of the following flight hardware items at UNH
	+ FM9 EDI Gun/GDE (from IWF)
* Delivery of the following flight hardware items from UNH to FIELDS partners
	+ FM4 EDI Gun and GDE for refurbishment and recalibration (to IWF)
* Prioritized and coordinated the efforts of the UNH team, subcontractors, foreign partners, outside vendors and in-house workshops to optimize schedule performance.
* Supported processing of NCRs
* Supported the FM6 GDU TV test
 |
|  | b. | Product Assurance |
|  |  | Turco / Salwen* TV test support of EDI FM6
* Integration support as needed for EDI FM9
* Procurement of EEE parts for spare EDI GUNs
* Acceptance of new PWBs and submission for coupon analysis (passed)
* Continued support of DEFL board testing
* NASA Audit
* EDI HVOC life test support.
* EDI Controller Kitting (EGSE for FSW development)
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| 2. | Systems Engineering and FIELDS I&T |
|  |  | Rau, Dors, Needell* Presented FIELDS Observatory level EMI/EMC test data
* Presented FIELDS Observatory status at OBS TV review
* Supported FSW updates and change requests
* Updated SDP EMI Test Procedure for FM2 (flight spare)
* Performed GDU SN06 EMI, Magnetics, and FIT
* Supported FIELDS eclipse operations development and OBS load shed priorities
* Supported GDU problem investigations and risk analysis (FM8 FRB)
* Continued submitting FIELDS verification material for closure
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| 3. | Post-Delivery Support (UNH) |
|  |  | * Supported pre-stack vibe VIF Observatory testing
* Supported the Observatory EMI Test Campaign Review
* Supported Observatory Stack Vibe as needed
* Continue supporting commissioning planning discussions
* Perform I&T planning for FIELDS at the OBS level
* Supported and reviewed OBS WOA and procedure development and closeout
* Reviewing all test data from previous OBS tests
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| 4. | Science and Science Data Processing  |
|  |  | SWT and SWG * Participation in all science planning discussions, including recently those related to coordinated observations with THEMIS.
* Continued preparation of the FIELDS instrumentation paper

Science data processing activities (Compiled by Chutter)* ALL
	+ Continued working through coordinate system definitions
	+ Continued working on software to run at SDC
	+ Continued working on revising MMS CDF Guide and providing input to SDC Developers Guide
	+ Continued populating FIELDS Processing documents
* UNH
	+ Improved products to be used for mag spin axis offset determination
	+ Working on “real time” plotting to be used during commissioning
	+ Updated some software to handle changes in flight software
	+ Continued review of science and engineering telemetry from observatory level testing
* LPP
	+ Test of new tplot version using TT2000. Will be replaced by own computation.
* UCLA
	+ Work continues on magnetic field data processing
	+ Work continues on inflight calibration and procedures
* GSFC
	+ Installed LANL GeoMag code and ran test cases
	+ Worked out a format for a ‘raw calibration’ file for flight software, wrote initial software to generate these files during routine operations in flight, provided initial set of calibrations
	+ Documented calibration parameters.
* IRFU
* LASP
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| 5. | Magnetometers |
|  | a. | DFG  |  |
|  |  |  | * Evaluation of observatory test data
* Continued activities in the frame of EDI/MAG data processing and in-flight calibration
 |
|  | b. | AFG |  |
|  |  |  | Science* Magnetometer paper submitted, reviews received, under revision.
* Submitted comments on FIELDS instrument paper.

Pre-launch Preparations* Work continues and code is being developed and documentation written for magnetic field data processing.
* Hannes Leinweber developing inflight calibration procedures, and generating code. Submitted summary calibration file for flight system software.
* Louise Lee converting analysis software to Python.
* Support SODAWG – emphasis on coordinate systems, which are now well defined. Coordinate systems to be used for different data products discussed at FIELDS meeting.

Post-launch Preparations* Assess effort requirements to develop and maintain calibration system.

Engineering: Post-delivery Activity* Watching over activities in assessing LM6142.
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|  | c. | SCM | * SCM FMS => SENSOR S/N FM4 + PREAMP S/N FM3
	+ - SCM FMS (sensor, preamp) fully packed and ready for delivery if needed.
		- ADP complete.
* Final review of the FMS ADP in progress.
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| 6. | EDI |
|  |  | Ship Set 4 – GDU SN 6 * TVAC Test, EMI, FIT, Magnetics

Ship Set 1 – GDU SN 9* GDU Assembly
* Baseline FFT; did not achieve required beam current at 500eV
* Held FRB
* Started testing of GDU in 145 chamber (with mu-metal shield)

Sensor* Ship Set 1 - SN 9
	+ Vacuum Test

Gun - IWF efforts* Ship Set 1 - SN9
	+ Shipped Gun and GDE to UNH for GDU Assembly

Flight Software* Continued implementation and testing of electric field mode
* Prepared plan for implementing and uploading EDI FSW changes (presented 2 May)
* Assembled and tested a new EM EDI Controller board to support EDI FSW development and testing.
	+ Delays in the flight HW development have held up release of the EDI GSE for EDI FSW development.

HV amplifier trend root cause investigations (UNH)* The Gun HV amplifier trending root cause investigation continues at UNH using two Gun DEFL boards removed from FM4. Two test setups are employed at UNH
	+ The unmodified DEFL2 board, in the room 105 thermal chamber, has been subject to constant operation at constant temperature for ~ 4weeks. The intent is to assess whether the rate of change of LED current will change with extended operation.
	+ The DEFL1 board is subject to studies to try to isolate and evaluate the factors in the circuit or construction that may be influencing the LED current trends. Recent testing has focused on current leakage paths.
* Board level tests to date show characteristics of gain and baseline LED current drift that are similar to those seen at Gun or GDU level, but are significantly lower (factor ~7) in magnitude.
* CTR measurements of the 12 UNH HVOCs in the life testing sequence indicate stable behavior after 1250 hours dynamic cycling. This testing will continue with the next CTR measurement planned after 1500 hours.
* HVOC LED luminosity testing was suspended at GSFC while we await a report of the test results to date. Of particular interest are the tests of two LEDs removed from a HVOC known to have exhibited LED current trends in one of the guns. This effort is intended to provide additional data for the Gun HV amplifier trend root cause analysis.

HVOCs* Life testing of 12 UNH HVOCs is continuing. More than 1400 hours have been logged.
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| 7. | SDP/BEB/LVPS  |

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|  | a. | SDP/BEB/LVPS (KTH/IRFU/Oulu)* All hardware efforts are complete.
 |
|  | b. | SDP (UNH)Flight Spare SDP (SN2):* Conducted LFT (successful)
* Prepared an EMI/EMC test procedure and distributed it for comment.
* FFT will be conducted after EMI testing. That activity is part of the investigation of deployment stoppage anomalies in TV (additional EMI/EMC testing)
 |
|  | c.  | SDP (LASP)* SDP work at LASP is complete
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| 8. | ADP |
|  | a. | LASP ADP Post-Delivery Support Activities * Obs #1 – No LASP activity
* Obs #2 – No LASP activity
* Obs #3 – No LASP activity
* Obs #4 – No LASP activity
* ADP WOA closure review
* Supported MMS IS I&T planning teleconferences
* Reviewed MMS stack vibration data for X, Y, and Z axes. Provided ADP approval to move forward to higher level tests. All ADP response data was nominal. No anomalous frequency shifts were observed.
* Provided supporting information for Obs-3 +Z ADP B-side thermistor PR investigation.
* Participated in IS load shed telecon and supported ADP thermal discussion. LASP thermal engineering will be evaluating the junction temperature of the ADP preamp during long eclipses – powered and unpowered.

Axial Electronics Box (AEB)* No activity
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| 9. | DSP, Thermal, Systems Engineering, Product Assurance and Management (LASP) |
|  |  | DSP, Thermal - No activities this month. Systems Engineering and Program Management* Supported project as needed

Quality Assurance, Parts, and Materials Engineering* No activity
 |
| 10. | CEB  |
|  | a. | Hardware |
|  |  |  | * No activity. CEB hardware activities are complete.
 |
|  | b. | CDPU Software  |
|  |  |  | * Completed implementation of FSW modifications for “Launch Release”
* Prepared for FSW Review conducted May 2,2014).
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| 11. | Commissioning and Mission Operations (Needell) |
|  |  | * Conducted weekly FIELDS Commissioning planning meetings
* Completed or made progress on Action Items from Iowa Commissioning TIM.
* Prepared for and participated in TVac debrief.
* Prepared for and participated in IS Eclipse/Load Shed discussion.
* Updated Commissioning activities on SOC WIKI and submitted updated Activity Plans to SOC.
* Supported ongoing planning activities with SOC.
* Supported PRe-Vibe VIF Functional Test.
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| 12. Problems encountered and updates this period |

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|  |  | EDI* [NEW] Low Beam Current at 500 eV (EDI GDU FM9) (PFR-10160.53-136-OP)
	+ During the first functional test in vacuum (room 105 chamber) of GDU SN9 we did not get enough beam current out at 500 eV. At 1keV things were just fine.
	+ The FRB recommended a repeat of the test in the room 145 vacuum chamber. This chamber has a magnetic shield. Disposition awaits this test.
* [UPDATE] Lower than expected impedance measurement during safe to mate (EDI GUN FM8) (PFR-10160.53-133-IP)
	+ During the safe to mate incoming receiving inspection test at UNH, a lower than usual impedance measurement was seen across the +5V line (P5V2) to ground: (800 Ohm versus ~4M Ohm for earlier units). IWF reported also that their incoming test at UNH showed a higher than previously measured and out of family supply current at the P5V2 line. The Gun performance is otherwise nominal
	+ UPDATE: Tests at UNH by UNH and IWF to investigate the cause of the anomaly, including tests in vacuum, have identified possible sources of the problem. Partial disassembly is required to further isolate the problem. An FRB recommended the Gun/GDE be returned to IWF for further investigation, rework and recalibration.
* [UPDATE] EDI GDU FM6 Red limit violation of Gun Anode HV amplifier LED current (PFR-10160.53-128-IP)
	+ When switching the gun energy from 250 eV to 500eV during the first (baseline) full functional test in vacuum, the GDU primary current increased to 156 mA which is out of family compared to other GDUs (expected current in that instrument state: ~121 mA). The next analog HK sample showed a red limit violation on the Gun Anode HV amplifier LED current (39mA). The red limit violation was not a transitional effect but stayed, as did the non-nominal primary current.
	+ Subsequent investigation and FRB discussion indicate that the problem is most likely related to the HVOC in the negative side of the anode amplifier. Analysis showed that the circuit would perform within requirements with this device disconnected. The recommended modification to the beam board was made. Subsequent tests in vacuum of the Gun were successful. The GDU6 was reintegrated and the FFT in air was successful.
	+ UPDATE: GDU6 has successfully completed environmental testing. Performance of the anode HV amplifier is as expected. Closure awaits Acceptance Review approval.
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| 14. Issues and concerns |
|  |  | From FIELDS PM* The EDI Gun continues to be the critical path for GDU and FIELDS. Commitments of the IWF team to the Solar Orbiter project have made the schedule issue more acute. UNH has provided support to IWF in efforts to help resolve technical issues and minimize schedule impacts.
* The risk record regarding GDU performance and schedule (PIMS ID 176, MMS Project) is being used as a tool to help coordinate mitigation efforts.

Science Data Processing Issues (Compiled by Chutter)* ALL
	+ Confusion about use of LANL attitude/ephemeris files and/or software at the SDC, reviewing needs to help SODAWG write statement of work for LANL
* UNH
* LPP
	+ [in progress] Conversion of TT2000 (64 bits long integers) to double precision floating point numbers introduces errors (tents of nanoseconds). This conversion is needed to correct for leap seconds and also for tplot variable timing => need to keep LONG64 all along the process => calibration software has to be modified.
* UCLA
	+
* GSFC
	+ Awaiting sensor orientation information of AFG and DFG
	+ Coordinate transformation software may need to be more portable to run at more than just SDC
* IRFU
* LASP
 |

NCR Summary: Provided separately (Excel file)

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| Activities planned for next reporting period |
|  |  | Management |
|  |  |  | * Update the Gun and GDE schedule.
* Continue to review and update the EDI GDU delivery and risk mitigation.
* Continue to push open NCRs to closure. Support FRBs as needed.
* Continue to prioritize and coordinate the work of the UNH team and its FIELDS partners.
* Support/staff T/V testing as needed
* Receive delivery of the following items at UNH
	+ EDI SN4 Gun and GDE (from IWF)
* Delivery of the following flight hardware items from UNH to FIELDS partners
	+ EDI Gun/GDE SN8 to IWF for rework and repeat of calibration
* Prepare and conduct the following PERs and associated TRRs
	+ EDI GDU SN9
* Prepare and conduct the following PSRs or Acceptance Reviews.
	+ EDI GDU SN6
* Make or coordinate delivery of the following to GSFC IS or S/C teams
	+ EDI GDU SN6
* CDRL and contract deliverable submissions:
	+ None planned
 |
|  |  | Product Assurance, Configuration Management, Parts, Materials, Facilities |
|  |  |  | Turco/Salwen* Continued DEFL board testing support as needed
* FM9 test support as needed
* EEE parts acceptance for EDI Spare GUNs
* Support population of EDI GUN Beam Board PWA for SM8 refurbishment
 |
|  |  | Systems Engineering & FIELDS I&T |
|  |  |  | Rau, Dors, Needell* Support CDPU FSW review and Acceptance Test
* Update the CDPU Software requirements Specification
* Support continued GDU problem investigations
* Perform GDU SN06 Acceptance Test
* Begin SDP FM2 EMI testing
* Continue submitting FIELDS verification material for closure
 |
|  |  | Post-Delivery Support (UNH) |
|  |  |  | IS and Observatory Support (FIELDS)* Update documentation in preparation for Post Stack testing including ADP RE deployment documents
* Support ADP canister thermistor anomaly investigation
* Support post stack vibe testing
* Support removal of SDP units for life testing
* Prepare for OBS-3 TV testing and personnel scheduling
* Prepare SDP door deployment procedures and receive training on FM2
* Continue I&T planning for FIELDS at the OBS level
 |
|  |  | Science |
|  |  |  | SWT and SWG* Support science telecons as needed
* Continue preparation FIELDS Instrumentation papers

Science data processing plans* ALL
	+ Work on INITIAL versions of software by end of November
	+ Continue populating FIELDS Processing document
	+ Use SPDF tools to verify CDF and skeleton files follow MMS CDF Guide
	+ Finalize errors and warning management
	+ Support SODAWG
* UNH
	+ Work on real time data display
	+ Continue work on scripting to control processing
	+ Continue L0 to L1 software updates as necessary – many new features added at Iowa meeting
	+ Work on error and warning management at SDC
* LPP
	+ Test further the SCM calibration software with the new SCM L1A CDF files provided by M. Chutter in Mag123 system.
	+ Digital filter response will be tested in the calibration software (may be postponed to later in 2014 depending on work load)
	+ [in progress] Convert time processing from double precision floating points (Epoch16) to long64 (TT2000)
	+ Include coordinate transformation from mechanical frame OMB to GSE in L1BtoL2 : interface with K. Bromund’s software as decided on the data processing group meeting, Iowa, March 2014
	+ Include CDF version number computation (vX.Y.Z)
* UCLA
	+ Continue developing in-flight calibration procedures
	+ Continue converting analysis software to python
	+ Generate test files using Cluster data
* GSFC
	+ Work on coordinate transformation software.
	+ Implement fully functional QL and L2pre software.
	+ Continue work with LANL and DSWG to define requirements for attitude/ephemeris data product and transformation software
	+ Implement metadata and proper versioning scheme in L1B, QL, and L2pre data product.
* IRFU
	+ Generate test files using Cluster data
* LASP
	+ Continue improving DCE software
 |
|  |  | AFG |
|  |  |  | * Continue work on data products guide.
* Continue developing inflight calibration procedures.
* Continue software analysis activities.
* Continue to support SODAWG.
* Generate magnetometer data test files using Cluster data.
* Develop milestones for prelaunch preparations. Milestones, based on activities conducted in association with Mission Readiness Tests.
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|  |  | DFG |
|  |  |  | * Continue support of observatory testing.
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|  |  | SCM |
|  |  |  | * FMS ADP: final review to be completed.
 |
|  |  | EDI |
|  |  |  | Ship Set 1 - SN9* Re-run Baseline FFT in 145 chamber
* Hold FRB and decide path forward

Gun - IWF efforts* Ship Set 2 - SN 4
	+ Re-integrate board stack; run functional test; start calibration

Flight Software* Continue implementation and testing of electric field mode

Investigation of HV amplifier trends* Continue board level testing at UNH.
* Report findings to Project

HVOCs (UNH)* Continue the HVOC life testing (12 devices).
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|  |  | SDP/LVPS/BEBs/Preamp/Probe (KTH/ Oulu/IRFU) |
|  |  |  | * Hardware work is complete. No hardware activity planned.
 |
|  |  | SDP/LVPS/BEBs/Preamp/Probe (UNH) |
|  |  |  | UNH SDP:* Conduct the EMI/EMC testing of the FM2 SDP at UNH and at Retlif Laboaratories

LVPS* No activity planned
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|  |  | ADP/SDP/DSP (LASP) |
|  |  |  | QA/Parts/Materials – No activities plannedDSP – No activity plannedADP* Support I&T at Goddard as needed

AEB, SDP– No activity plannedThermal* Perform thermal analysis of ADP preamp in deep eclipse

Systems and Program Management* Provide requested EIDP clarifications to UNH QA
* Support project as needed.
 |
|  |  | CEB Hardware and Software |
|  |  |  | * FSW review May 2,2014
* Complete Software Acceptance Test
* Prepare FSW and Tables for upload to OBS 3 in early June.
 |
|  |  |  |  |
|  |  | Commissioning and Mission Operations (Needell) |
|  |  |  | * Continue updating activity plans with SOC
* Conduct Weekly FIELDS Commissioning planning meetings
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