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| Investigation: FIELDS |
| Progress accomplished this period: | September 2014 Reporting Period |
| 1. | Project Management and Product Assurance |
|  | a. | Project Management* Still awaiting feedback from SwRI subcontracts group regarding the review of the July 2013 FIELDS cost change proposal.
* Supported the following PERs and associated TRRs
	+ None
* Supported the following FRBs
	+ None
* Supported the following Acceptance Reviews or PSRs
	+ PSR: SDP FM2
	+ AR: EDI GDUs 4&8
* Received delivery of the following flight hardware items at UNH
	+ None
* Delivery of the following flight hardware items from UNH to GSFC
	+ GDU SNs 4 & 8
* Supported processing of NCRs and risks
* Supported EDI GDU TV testing
 |
|  | b. | Product Assurance |
|  |  | Turco / Salwen* EDI HVOC root cause investigation support.
* SDP motor stall root cause investigation support.
* DI HVOC root cause support
* EDI SN4 & 8 delivery support
* EDI SN4 & 8 acceptance review support
* EIDP uploading
 |
| 2. | Systems Engineering and FIELDS I&T |
|  |  | Rau, Dors, Needell* Performed refurbished GDU SN04 EMI, Magnetics, and Acceptance Test
* Performed GDU SN08 EMI, Magnetics, FIT and Acceptance Test
* Released GDU SN04/08 EMI reports
* Compiled and reviewed all FIELDS operating hours
* Supported SDP SN02 PSR
* Prepared draft SE slides for Mission PSR
* Continued supporting commissioning planning discussions with SOC
* Continued I&T planning for FIELDS at the OBS level
* Continued submitting verification material for EDI GDU and SDP SN02
 |
| 3. | Post-Delivery Support (UNH) |
|  |  | Observatory Support (FIELDS)* Supported OBS-2 ADP deployments and flight close outs
* Supported OBS-2 and OBS-3 Mag boom deployments and functional tests
* Installed SDP termination resistors for OBS-2, OBS-3 and OBS-4 CPT
* Supported OBS-1, OBS-2, OBS-3 and OBS-4 CPT's
* Performed magnetometer boom inspections on OBS-2 and OBS-3
* Executed SDP door deployment procedures on OBS-2 and OBS-3
* Supported MRT17 SOC led BDM runs on OBS
* Supported EDI FSW loads on OBS3 and OBS2
* Delivered, integrated and tested GDU SN04/08 on OBS-4
* Continued development of OBS SDP Sensor Safety Removal procedure
* Supported OBS WOA and procedure development and PFR/PR resolution
* Continued 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.

Science data processing activities (Compiled by Chutter)* ALL
	+ Continued working through coordinate system requirements
	+ Continued working on software to run at SDC
* UNH
	+ Continued work on EDI E Field interfaces
	+ Continued review of science and engineering telemetry from observatory level testing – final observatory CPTs
	+ Worked on scripting to control batch science processing
	+ Continued development of FIELDS real time displays
	+ Worked on combined B product software (with Cluster data)
	+ Worked on combined E product software (with Cluster data)
* LPP
	+ Data products guide has been updated.
	+ Analysis of SCM test data from MRT9 is underway.
	+ Automatic increment of CDF data file version number now includes calibration file version number.
	+ Log messages extended.
	+ Minor bug fixes.
* UCLA
	+ Continued bi-weekly mag team telecons to develop calibration data flow, and magnetic conference procedures
	+ Work continues on magnetic field data processing - emphasis on timing
	+ Developing inflight calibration procedures
	+ Work continues on inflight calibration and procedures
* GSFC
	+ Timing:
		- Wrote up a summary of pre-processing steps before application of calibrations.
		- Researched possible interpolation methods and documented effects interpolation will have on the phase/amplitude response.
		- Invented a possible scheme for adding timing adjustments to the mag cal files.
	+ Worked with getting LANL up to speed on coordinate system/ephemeris task, now that they have funding to start working
	+ Prepared mms\_fg\_rawcal code for delivery to UNH (this is the code that converts the calibration file parameters into a format that is close to what needs to be uploaded to the observatory)
* IRFU
	+ Continued implementation of functional version of DCV and DCE processes
	+ Had 3 day data processing meeting with Roy concerning E field calibration and SDP/ADP/EDI cross calibration (E conference)
* LASP
	+ Working on ADP software
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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 |  |
|  |  |  | Pre-launch Preparations* Louise Lee converting analysis software to Python.
* Continued bi-weekly mag team telecons to develop calibration data flow, and magnetic conference procedures
* Continued to evaluate data processing activities - with emphasis on timing corrections.
* Preparation for the October SWT, including the Mag team meeting on October 19th.

Post-launch Preparations* Continuing to 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 | * Completed the EIDP for the flight spare SCM=
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| 6. | EDI |
|  |  | Ship Set 4 - GDU SN4 (was SN9)* Finished TVAC test
* Performed EMC, Magnetics, Fields Acceptance Test, Cleaning/Bagging
* Shipped to GSFC

Ship Set 4 - GDU SN 8* Finished TVAC test
* Performed Detector Characterization, FIT, EMC, Magnetics
* Installed GeBk tape
* Performed Fields Acceptance Test, Cleaning/Bagging
* Shipped to GSFC

Gun - IWF efforts* Gun - SN4
	+ Solved offset problem on OPT\_DEFL board (missing ground connection)
	+ Assembled board mini-stack (3 boards); re-test successful
	+ Completed assembly of 5-board electronics stack, functional testing successful

Flight Software* Completed generation of tables for all four observatories
* Testing of FSW Build 06 (including tables)
* Software Acceptance test for FSW build 06
* Generated load scripts for Observatories 3 and 2
* Loaded FSW build 06 and associated tables on Observatories 3 and 2

HV amplifier trend root cause investigations (UNH)* Performed CTR measurements on one HVOC removed from a Gun DEFL board. CTR is stable.
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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)Deployment stoppages investigation* Continued effort to isolate the source and path of disturbances that cause these stoppages.
 |
|  | c.  | SDP (LASP)* No activity.
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| 8. | ADP |
|  | a. | LASP ADP Post-Delivery Support Activities * Supported OBS-2 ADP deployments and flight close outs
* ADP WOA closure review
* Supported MMS IS I&T planning teleconferences
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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 LASP activities |
| 10. | CEB  |
|  | a. | Hardware |
|  |  |  | * No activity. CEB hardware activities are complete.
 |
|  | b. | CDPU Software and FIELDS test support (Needell) |
|  |  |  | * Supported CPTs on all 4 Observatories!
* Supported SOC Burst Data management tests
* Updating FIELDS Users Manual
* Supported EDI FSW loads on OBS2 and OBS3
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| 11. | Commissioning and Mission Operations (Needell) |
|  |  | * SOC Review of Mag tests and ADP deployment
* FlatSAT test of Mag tests and ADP
* MRT17 ADP Boom Deployment
* MRT17 CDPU FSW load
* MRT17 EDI FSW load
* MRT17 Mag Cal Load
* Submitted Autonomous turn on /off scripts to SOC for MRT11
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| 12. Problems encountered and updates this period |

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|  |  | EDI* All NCRs for delivered GDUs (MMs 1-8) are closed, some with residual risk. These have been reviewed with the Project and will be formally presented at the GDU and MMS PSRs in October
* [UPDATE] 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.
	+ UPDATE
		- FFT retest in room 145 chamber, per FRB recommendation, showed situation at 500 eV was unchanged, and that we now had the same problem at 1keV.
		- Corrective action: FRB recommended replacement of the BGS with the available spare (BGS SN13) and conduct of measurements to assess the impact on calibration.
		- Test of the Gun/GDE SN9 with the new BGS showed adequate beams but a discrepancy of ~3 degrees in the pointing. Subsequent checks of the alignment in the test setup and beam tracing calculations provided evidence that MGSE alignment and the effect of magnetic field could account for the discrepancy. The decision was made to proceed with GDU reintegration and retest.
		- The GDU 9 FFT in vacuum (room 105 TV chamber) showed nominal results except that the azimuthal scan across the hole in the Maheu hat revealed a change of about 2 degrees in azimuth from the test performed with the previous BGS. Approximately 1.5 degree of this change remains after accounting the effects of the magnetic field differences in the 2 chambers.
		- The GDU9 PER recommended proceed at risk. Accept this amount of deviation from IWF calibration and develop an algorithm for in-flight corrections. A separate NCR (PFR-10160.53-139) was initiated and a residual risk (PIMS ID 125) defined.
		- [UPDATE] Cause/Status: Awaits inspection of the removed BGS. Retest found higher than expected beam current. Inspection is pending. NCR to remain open pending this investigation
* [UPDATE] Upper Injector +140V offset (EDI Gun FM4) (PFR-10160.53-137-OP)
	+ During the functional test of the reintegrated FM4 Gun, IWF measured a+140V offset in Upper Injector. The+140V offset is linear over the full range from 0...2000V. This appears to be a fixed offset, not a gain error. This voltage is provided by a channel in the Gun Optics board (the half board). The test was performed on 12 May and repeated on 13 May with the same result.
	+ The SN 4 EDI Gun was disassembled at IWF to investigate the voltage offset on the Optics board UI channel found during Gun stack testing. The offset was not observed in subsequent board level testing.
	+ [UPDATE, 9 Oct 2014]:
		- IWF identified and corrected the problem. A missing screw in the assembly prevented proper grounding.
		- Gun 4 assembly and testing has resumed.
* 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
	+ 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. The Gun/GDE were returned to IWF for further investigation, rework and recalibration.
	+ IWF has isolated the problem to the Beam Board. IWF will replace the beam board with a new one assembled at UNH.
	+ [UPDATE, 8 Sep 2014]: Gun 8 has been reassembled and tested using the new beam board. The FM8 Gun/GDE calibration and the subsequent integration with GDU8 are complete. Closure awaits completion of the GDU 8 environmental testing and detector characterization.
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| 14. Issues and concerns |
|  |  | From FIELDS PM* Eight EDI GDUs are now delivered and integrated on the Observatories, some with residual risk. The EDI team is now preparing a flight spare (FM9) in an effort to have it ready in time for a swap out with one GDU on Obs 4 in January.
	+ The wild card in this plan is that the replacement of a HVOC in the GDE (SN9) for GDU FM9 is in itself a risky process. It has not been done before. IWF has agreed to send the EM GDE to UNH for rework practice.

From FIELDS SE* OBS-3 ADP +Z Boom Canister B-side thermistor is not operational and may be left that way for flight

Science Data Processing Issues (Compiled by Chutter)* GSFC
	+ GSFC is requiring that there be a Software Management Plan (SMP) for my task (yes, they know this is Class D software). GSFC is providing help to create the actual document (essentially documenting the informality of our processes in a formal-looking document). There are issues that might be worth considering, such as an agreed-upon process for documenting software requirements/decisions from team meetings for future reference.
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| Activities planned for next reporting period |
|  |  | Management |
|  |  |  | * Prepare contract modifications for U of Iowa, UCLA and LASP based on modification expected from SwRI for FIELDS July 2013 proposal.
* 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 facilitate, prioritize and coordinate the work of the UNH team and its FIELDS partners.
* Receive delivery of the following items at UNH
	+ DFG flight spare Sensor and board from IWF to UNH
	+ EM GDE from IWF to UNH
	+ SN4 Gun and SN9 GDE from IWF to UNH
* Make or coordinate delivery of the following to GSFC IS or S/C teams
	+ None
* Prepare and conduct the following PERs and associated TRRs
	+ None
* Prepare and conduct the following PSRs.
	+ PSR: EDI GDU FMs 2-8
* Prepare for and participate at the review requested by Linda Pacini
* Prepare for and participate at the MMS PSR.
* CDRL and contract deliverable submissions:
	+ None planned
 |
|  |  | Product Assurance, Configuration Management, Parts, Materials, Facilities |
|  |  |  | Turco/Salwen* EDI GDU PSR support
* EDI GDU SN9 integration support
 |
|  |  | Systems Engineering & FIELDS I&T |
|  |  |  | Rau, Dors, Needell* Support GDU SN09 (flight spare) test program
* Support EDI GDU Super PSR
* Prepare for and support Mission PSR
* Prepare for and support SWG/SWT/Commissioning and FIELDS team mtg
* Finish submitting FIELDS verification material for closure
 |
|  |  | Post-Delivery Support (UNH) |
|  |  |  | Observatory Support (FIELDS)* Perform final ADP RE inspections for OBS1 +Z, OBS2 -Z
* Finish development of SDP Sensor Safety Removal procedure for OBS level
* Supported EDI FSW loads on OBS4 and OBS1
* Continue I&T planning for FIELDS at the OBS level with focus on Cape
* Prepare WOA for FIELDS work at Cape
 |
|  |  | Science |
|  |  |  | SWT and SWG* Prepare for and participate in the October SWT and SWG meetings
* Support science telecons as needed

Science data processing plans* ALL
	+ Work on INITIAL versions of software by end of November
	+ Use SPDF tools to verify CDF and skeleton files follow MMS CDF Guide
	+ Work on error and warning management
	+ Support SODAWG
	+ Prepare for and participate in the October FIELDS data processing meetings at GSFC.
* UNH
	+ Work on real time data display for EDI and DFG/AFG
	+ Use real time data display at LASP for FIELDS MRT17 activities
	+ Continue working on EDI E Field interfaces
	+ Work on RunEst software (for E Field and mag spin axis calibration)
	+ Continue work on scripting to control processing
	+ Continue L0 to L1 software updates as necessary
	+ Continue working on combined E and B products
* LPP
	+ [in progress] Analyze the results of the MRT9 data test and correct the software where needed.
	+ [in progress]Test further the SCM calibration software with the new SCM L1A
	+ [in progress] Include CDF version number computation (vX.Y.Z)
	+ L1B data will be delivered in both SCM123 and OMB reference frames as decided on the data processing group meeting, Iowa, March 2014
	+ Include coordinate transformation from mechanical frame OMB to GSE in L1BtoL2
	+ [new] Produce and check CDF skeleton files fully ISTP/MMS standard compliant.
* UCLA
	+ Continue developing in-flight calibration procedures
	+ Continue converting analysis activities
	+ Continue working on timing corrections
	+ Work on MMS Products Guide
* GSFC
	+ Demonstrate the calibration process (Orthogonalization) as input to Mag Conference and next level of Mag calibration
	+ Continue work with LANL and DSWG to create attitude/ephemeris data product and transformation software.
	+ Work on fully functional L2pre software: finish DMPA-GSE transformation.
	+ Modify L1B and L2pre software to handle data overlap, fine timing corrections.
	+ Create MMS-style attitude/ephemeris from Cluster attitude/ephemeris.
	+ Work on coordinate transformation software required for L2 data production.
	+ Work out and implement a reasonable versioning scheme for the L1B, QL, and L2pre data products.
	+ Work on calibration document: timing corrections; plans to modify calibration file: add uncertainties and temperature correction coefficients
* IRFU
	+ Implement initial version of SDP offset files
* LASP
	+ Continue improving DCE software
 |
|  |  | AFG |
|  |  |  | * Continue work on data products guide (Leinweber)
* Continue developing inflight calibration procedures (Leinweber).
* Continue software analysis activities (Lee).
* Continue discussion of time-tag corrections for different data rates (Strangeway).
* Most of the AFG/DFG Mag team will attend the October SWT and associated meetings.
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|  |  | DFG |
|  |  |  | * Participate at SWT and FIELDS data processing meetings.
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|  |  | SCM |
|  |  |  | * Participate at SWT and associated meetings.
 |
|  |  | EDI |
|  |  |  | Top Level* GDU Super-PSR
* Participation in Observatory PSR, Commissioning TIM

GDE - UNH efforts* Practise optocoupler replacement on EQM GDE
* Start replacement of optocoupler in GDE SN9

GDE - IWF efforts* Ship EQM GDE to UNH to allow practicing of optocoupler replacement

Gun - IWF efforts* Gun SN4
	+ Complete assembly, calibrate
	+ Ship to UNH, together with GDE SN9

Flight Software* Generate load scripts for Observatories 1 and 4
* Load FSW build 06 and associated tables on Observatories 1 and 4
* Start implementation of Gun HV ramping

Investigation of HV amplifier trends* Report findings to Project
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|  |  | SDP/LVPS/BEBs/Preamp/Probe (KTH/ Oulu/IRFU) |
|  |  |  | * Support commissioning planning activities
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|  |  | SDP/LVPS/BEBs/Preamp/Probe (UNH) |
|  |  |  | UNH SDP:* Prepare report of deployment stoppage root cause investigation

LVPS* No activity planned
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|  |  | ADP/SDP/DSP (LASP) |
|  |  |  | ADP* Support observatory I&T at Goddard as needed.

Thermal* Perform thermal analysis of ADP preamp in deep eclipse

Systems and Program Management* Support project as needed.
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|  |  | CEB Software and FIELDS test support (Needell) |
|  |  |  | * Support project as needed
 |
|  |  |  |  |
|  |  | Commissioning and Mission Operations (Needell) |
|  |  |  | * Support MRT17 Testing
* Support remaining EDI FSW loads
* Submit updated FIELDS Users Manual before PSR
* Continued support of Commissioning Planning
* Prepare for and Attend SET/PSR/Commissioning TIM
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