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| Investigation: FIELDS |
| Progress accomplished this period: | January 2014 Reporting Period |
| 1. | Project Management and Product Assurance |
|  | a. | Project Management* Supported review of cost change proposal submitted to SwRI 31 July.
* Began preparation of the PPBE due in February.
* Continued discussion of science data processing topics as part of the weekly FIELDS team meeting agenda.
* Supported the following PERs and associated TRRs
	+ TRR for GDU7 TV test
* Supported the following FRBs
	+ GDU 7 red limit violation in TV
	+ GDU SN6 – Red limit on LED current in anode amplifier channel
* Supported the following Acceptance Reviews or PSRs
	+ GDU SN7 (Acceptance Review)
* Received delivery of the following flight hardware items at UNH
	+ EDI Optics SN7 (from U of Iowa)
	+ EDI Optics SN9 (from U of Iowa)
	+ EDI Gun/GDE SN6 (from IWF)
	+ Balance of Macor brackets for Gun DEFL board assembly (from IWF)
* Delivery of the following flight hardware items from UNH to FIELDS partners
	+ None
* Delivery of the following flight hardware items from UNH or LASP to the IS and Observatories
	+ EDI GDU SN7
* CDRL and contract deliverable submissions this month:
	+ None
* 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
 |
|  | b. | Product Assurance |
|  |  | Turco / Salwen* Preamp PWA FM9 resitor trimming
* Spare DEFL PWA assembly support
* EDI optics FM8 integration support
* EDI GDU FM6 integration support
* EDI GUN FM4 disassembly support
* EDI GDU FM7 Outgassing Certification
* EDI Sensor PWA FM9 staking
* ADP RE EIDP delivery to SWRI
* EDI fab inspections
* EDI TVAC testing support
* EDI assembly support
* SDP #2 assembly support
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| 2. | Systems Engineering and FIELDS I&T |
|  |  | Rau, Dors, Needell* Performed FIELDS testing on GDU SN07 (S2M, EMI, Magnetics, FIT, AT)
* Released GDU SN07 EMI and FIT test reports
* Submitted GDU SN07 magnetics report to B.Andersen
* Supported GDU SN07 AR
* Passed damaged SCM harness to FIELDS QA for repair
* Released DSP timing delay memo for flight data processing
* Implemented/tested SCM in-flight calibration analysis method
* Continue submitting FIELDS verification material for closure
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| 3. | Post-Delivery Support (UNH) |
|  |  | * Supported removal of GDU SN05 from OBS2
* Delivered GDU SN07 to GSFC
* Integrated GDU SN05 and SN07 onto OBS3
* Updated documentation in preparation for OBS-1 TV test
* Supported OBS-1 TV testing including MRT9a and EDI ETE and HV testing
* Supported OBS-3 ADP -Z RE installation, deployment and functional test
* Supported OBS-4 Post Acoustic ADP +/-Z RE deployment and functional test
* Supported OBS-4 pre-TV post ship Functional
* Supported OBS-4 pre-TV SDP Motor and HOP test and ADP Sim Test
* Supported run for score of MRT8 (SDP deployment) with SOC at LASP
* Performed OBS1 and OBS2 AFG and DFG sensor temperature calibrations
* Supported and reviewed WOA and procedure development at IS/OBS levels
* Reviewed test data from OBS2 TV
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| 4. | Science and Science Data Processing  |
|  |  | SWT and SWG * Continued work on drafts of FIELDS Instrumentation papers
* Began preparation for March SWT, SWG and FIELDS data processing meetings

Science data processing activities (Compiled by Chutter)* ALL
	+ Continued working through coordinate system definitions
	+ Continued working on software to run at SDC – initial interface version delivered
	+ Continued working on revising MMS CDF Guide and providing input to SDC Developers Guide
	+ Continued populating FIELDS Processing documents
* UNH
	+ All FIELDS L0 v0 software tested at SDC
	+ Some initial scripts to manage FIELDS processing at SDC written – no bells, no whistles
	+ Released DSP timing delay memo for flight data processing
	+ Implemented and tested SCM inflight calibration analysis method
	+ Continued review of science and engineering telemetry from observatory level testing
* LPP
	+ L1A to L1B v.0 software delivered
	+ L1B to L2 v.0 software delivered
* UCLA
	+ Work continues on Level 2 processing software (UCLA software that will be based on GSFC code) and calibration software (GSFC software that will be based on UCLA algorithms).
	+ Working on converting analysis software to python – working interface
* GSFC
	+ Wrote interace to FDOA products
	+ Finalized and delivered the ‘prototype’ L1B to SITL/Quicklook processing software in the SDC sandbox
	+ Created cal files for OBS2
	+ Developed and delivered the ‘prototype’ L2Pre software to SDC sandbox
* IRFU
	+ Initial SITL and Quicklook SDP DCE and DCV code working on SDC sandbox
	+ Write a routine for CDF output in C and make a Matlab-MEX interface to it
* LASP
	+ Initial quicklook and SITL ADP DCE and DCV code working on SDC sandbox
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| 5. | Magnetometers |
|  | a. | DFG  |  |
|  |  |  | * Processed DFG data from the observatory tests
 |
|  | b. | AFG |  |
|  |  |  | Science* FIELDS paper reviewed and comments made.

Prelaunch Preparations* Work continues and code is being developed and documentation written for magnetic field data processing.
* Hannes Leinweber developing inflight calibration and inflight calibration procedures, and generating code.
* Louise Lee converting analysis software to Python. Has a working interactive module
* Support SODAWG – emphasis on coordinate systems, which are now well defined. Preferred sensor-level spinning and despun coordinates still to be reconciled for comparing Level 2/Level 2Pre data across instruments.

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.
		- ADP still in progress.
* NCR and alignment measurements report (zip package) delivered to UNH for reviewing on January 22nd (MMS-SCM-NC-TRI-623-LPP and MMS-SCM-PR-TRI-622). Approved by UNH on Jan. 23rd during weekly Fields telecom.
* Checking of “in flight” calibration signal sequences (four segments, APID 17d) on OBS1 and OBS3. Estimated transfer functions of the SCM calibration circuit agree with transfer functions measured at Chambon. Time tags for the start of each SCM segment (which are transmitted in a separate packet) have been now included in the header of APID 17d cdf file by M. Chutter and J. Needell. The assessment of the SCM calibration signal analysis with these new time tags are in progress.
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| 6. | EDI |
|  |  | Ship Set 3 - SN 7* T/V Test, EMC Test, Magnetics, FIT Test
* Pre-ship inspections
* Acceptance Review
* Shipment to GSFC

Ship Set 4 - SN 6* GDU Integration
* Baseline FFT in Vacuum exhibited problem with Gun anode amplifier (PIMS NCR PFR-10160.53-128); Diagnostic testing underway

 Sensor* Ship Set 1 - SN 9
	+ Thermal Test, Preamplifier Delay Test, sent out boards for parylening
	+ MCP module assembly

Gun - UNH efforts* Received VESPEL retainer parts for building spare beam generation systems

Gun - IWF Efforts* Ship Set 4 - SN 6
	+ Delivered Gun & GDE to UNH for GDU SN6 integration
* Ship Set 4 - SN 8
	+ Board stack integration and testing
* Ship Set 1 - SN 9
	+ Board level testing problems:
		- Offset trimming problems on DEFL1 board, channel D3
		- Elevated LED current on DEFL2 board, channel D1
	+ HV stack parylened

Optics * Delivered repaired lower optics SN 7 for integration in GDU SN6
* Delivered optics SN 9 to UNH
* The above mark the completion of the U of Iowa hardware deliveries

Tracking Simulator* Worked on software to convert Cluster beam reference tables to MMS

Flight Software* Continued implementation and testing of electric field mode

HV amplifier trend root cause investigations (UNH)* Wrote up and submitted EDI Board Level test plan to SwRI.
* Began collecting hardware for the EDI Board Level test by removing Deflection board 1 and 2 from GUN #4,
* Began set-up and consolidation of test hardware for this test.
* Initiated LED luminosity test at GSFC by providing them with LEDs and test plan.

HVOCs* Completed screening of 4 lot of opto-couplers plus extended 24 hour static CTR test and review.
* Compiled and submitted test report for the screening test of lot 4.
* Selected and released optos for Gun refurbishment.
* Selected optos for life testing and began setting up for this testing (1000 plus hours)
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| 7. | SDP/BEB/LVPS  |

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|  | a. | SDP/BEB/LVPS (KTH/IRFU/Oulu)KTH/IRFU: LVPS, SDP BEB’s, ADP BEB’s and SDP Preamp/Boom Cable Assemblies:* Done.

KTH/Oulu/IRFU: Sphere / Yo-Yo Mechanism:* Done.
 |
|  | b. | SDP/BEB/LVPS (UNH)LVPS, * No activity

AEB, S-BEB’s, Preamp/Cable Assemblies, GSE:* Done for all flight units

FS SDP (SN2):* Continued assembly of the flight spare unit (SN 2).
	+ Installed thermal hardware onto FM2 adapter plate.
	+ Bonded thermal strap to Motor #30 for FM2.
	+ Assembled 90% of FM2 deployer.

Investigation of deployment stoppage anomalies in TV (additional EMI/EMC testing)* Prepared and submitted SDP EMC test plan to SwRI.
* EMC test preparation,
	+ Completed setup of CEB and SDP per thermal vacuum configuration.
	+ Reviewed hardware. Found CIDP board to have a marginal LVDS receiver, replaced , re-establishing communication with the BEBs.
	+ Reworked motor on FM1 and QM deployers to meet flight established manufacturing standards as seen on FM3-FM18 via thermal strap impedance and installation of met glass.
 |
|  | c.  | SDP (LASP)* Done
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| 8. | ADP |
|  | a. | LASP ADP Post-Delivery Support Activities at Goddard* Obs #1 – No LASP activity
* Obs #2 – No LASP activity
* Obs #3
	+ Installed –Z ADP RE on Obs #3 (RE SN08).
	+ Performed safe-to-mate and ADP RE LPT on –Z ADP RE on Obs #3.
	+ Performed post-integration first motion test of –Z ADP RE Launch Latches on Obs #3.
	+ Performed post-acoustic FIELDS ADP Functional Test on –Z ADP RE on Obs #3.
* Obs #4
	+ Performed post-acoustic deployment test of +Z ADP RE on Obs #4.
	+ Performed post-acoustic first motion test of –Z ADP RE Launch Latches on Obs #4.
	+ Performed post-acoustic FIELDS ADP Functional test on +Z and –Z ADP RE’s on Obs #4.
* ADP WOA closure review

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* Submitted completed ADP SS3 EIDP to UNH
* Submitted completed ADP SS4 EIDP to UNH

Quality Assurance, Parts, and Materials Engineering* Supported program as needed
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| 10. | CEB  |
|  | a. | Hardware |
|  |  |  | * No activity. CEB hardware activities are complete.
 |
|  | b. | CDPU Software,  |
|  |  |  | * Software is stable
 |
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| 11. | GSE (Mello) |
|  |  | GSE Hardware* No activity

FIELDS Simulator* No activity

GSEOS & GSE Software* Updated telemetry screens as needed to support TV
* Updated CMD & TLM spreadsheets
* Support IS & TV testing
 |
| 12. | Commissioning and Mission Operations (Needell) |
|  |  | * Supported MRT8 SDP Boom Deployment Test at LASP
* Met with Bob Ergun to review ADP Commissioning plans
* Met with SOC to review Commissioning plans
* Supported SOC commissioning planning
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| 13. Problems encountered and updates this period |

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|  |  | EDI* 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.
	+ Following FRB, the investigation continues with the GDU partially disassembled and with the Gun isolated. From all the measurements taken so far, the best fitting root cause is a leaky HVOC in the negative side of the anode amplifier.
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| 14. Issues and concerns |
|  |  | From FIELDS PM* The EDI Gun continues to be the critical path for GDU and FIELDS. UNH has provided support to IWF in efforts to help resolve technical issues and minimize schedule impacts. That said, continued technical problems have made the schedule issue more acute.
	+ New efforts to understand root cause of trends observed in Gun HV amplifier channels:
		- UNH is assembling a test setup to investigate HV amplifier trends using boards removed from Gun SN4.
		- UNH has provided LED samples and a test plan for conduct at GSFC of LED luminosity measurements as part of the investigation into trends in EDI Gun HV amplifiers.
* A risk record regarding GDU performance and schedule was initiated and discussed on several occasions with SwRI and GSFC project leaders. The intent is to use this as a tool going forward to help coordinate mitigation efforts. Recent activity in this regard involves a waiver request – currently in the PIMS approval cycle –  to reduce unnecessary testing stress on GDUs. Some provisions of the waiver were applied to testing of GDU SN7. The EDI team will meet again to discuss current status and options and revise the risk mitigation strategy, if warranted. We will continue to work closely with SwRI ad GSFC.

LASP* Now that Phase D science support activities at LASP are ramping up, LASP’s cumulative spending is forecasted to exceed the current spend plan in April 2014. LASP has performed and is performing out of scope ADP post-delivery support, SITL, and science algorithm development tasks with only informal direction from the UNH PM. The delay at SwRI in reviewing the FIELDS cost to complete proposal and subsequently modifying UNH’s FIELDS contract is a concern.

Science Data Processing (Compiled by Chutter)* UNH
	+ Working through violations and misunderstanding about conforming to MMS CDF Guide and SDC Developers Guide with SDC and FIELDS members
* LPP
	+ [still pending] Conversion of TT2000 (64 bits long integers) to double precision floating point numbers introduces errors (tenths 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
	+ No issues reported
* GSFC
	+ Awaiting mounting orientation information of AFG and DFG on mag booms
	+ Delivery data for LANL GdoMag coordinate transformation software
	+ Coordinate system issues (to be discussed at March meeting)
* IRFU
	+ No issues reported
* LASP
	+ No issues reported
*
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NCR Summary: Provided separately (Excel file)

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| Activities planned for next reporting period |
|  |  | Management |
|  |  |  | * Continue to support SwRI review of the FIELDS cost change proposal submitted 31 July.
* Submit PPBE
* 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.
* Closely monitor status and schedule performance of team members. Identify schedule risks and provide assistance for mitigation if warranted. Work to minimize schedule slippage.
* Support/staff T/V testing as needed
* Update the Gun and GDE schedule.
* Receive delivery of the following items at UNH
	+ Gun/GDE SN8 (from IWF)
* Delivery of the following flight hardware items from UNH to FIELDS partners
	+ EDI Gun/GDE SN4 to IWF for rework
	+ Gun DEFL1 and 2 boards (2 sets) to IWF to be used for Gun refurbishment efforts
* Prepare and conduct the following PERs and associated TRRs
	+ GDU SN6
* Prepare and conduct the following PSRs or Acceptance Reviews.
	+ None planned
* Make or coordinate delivery of the following to GSFC IS or S/C teams
	+ None planned
* CDRL and contract deliverable submissions:
	+ None planned
 |
|  |  | Product Assurance, Configuration Management, Parts, Materials, Facilities |
|  |  |  | Turco/Salwen* Continued spare DEFL PWA assembly support
* EDI GDU continued support
* SDP FM2 assembly support
 |
|  |  | Systems Engineering & FIELDS I&T |
|  |  |  | Rau, Dors, Needell* Support continued GDU problem investigations
* Continue submitting FIELDS verification material for closure
 |
|  |  | Post-Delivery Support (UNH) |
|  |  |  | IS and Observatory Support (FIELDS)* Update documentation in preparation for OBS-4 TV test
* Support OBS-2 EMI test
* Support OBS-4 TV test
* Support OBS3 Baseline Functional
* Support removal of GDU SN03 and SN02 from OBS1.
 |
|  |  | Science |
|  |  |  | SWT and SWG* Support science telecons as needed
* Continue preparation FIELDS Instrumentation papers
* Prepare for SWT, SWG and FIELDS data processing meetings in March

Science data processing activities* ALL
	+ Develop plans for completing INITIAL versions of software by end of August
	+ Continue populating FIELDS Processing document
	+ Use SPDF tools to verify CDF and skeleton files follow MMS CDF Guide
	+ Support SODAWG
* UNH
	+ Continue work on scripting to control processing – significant task

Must have initial versions of all scripts* + Continue L0 to L1 software updates as necessary
	+ Work on error and warning management at SDC
* LPP
	+ ISTP full compliance for output CDF
	+ Finalize errors and warning management
	+ Include full calibration process in L1AtoL1B
	+ 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)
* UCLA
	+ Continue developing in-flight calibration procedures
	+ Continue converting analysis software to python
* GSFC
	+ Produce ‘flag’ files for L2Pre processing.
	+ Work on full implementation of L1A to L1B module
	+ Continue evaluation of orthogonalization code
* IRFU
	+ Start implementing functional parts of software
* LASP
	+ No reported plans
 |
|  |  | AFG |
|  |  |  | * Continue work on data products guide.
* Continue developing inflight calibration procedures.
* Continue software analysis activities.
* Continue to support SODAWG.
* Develop milestones for prelaunch preparations.
* Prepare for upcoming MMS SWT and associated meetings (Mag and FIELDS) in March.
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|  |  |  |  |
|  |  | DFG |
|  |  |  | * Prepare for the MMS SWT and Fields data processing meetings in March
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|  |  | SCM |
|  |  |  | * FMS ADP
* Checking of “in flight” calibration signal sequences (four segments, APID 17d) on OBS2 and OBS4.
 |
|  |  | EDI |
|  |  |  | GDU Ship Set 4 - SN6* Continue diagnostic testing of gun anode amplifier anomaly

GDU Ship Set 4 - SN8* Start GDU assembly

Sensor* Ship Set 1 - SN 9
	+ Final assembly
	+ Electrical Test and Vacuum Test

Gun - UNH efforts* Start assembly of spare beam generation systems

Gun - IWF Efforts* Ship Set 4 - SN 8
	+ Install grid; calibrate gun; deliver Gun and GDE to UNH
* Ship Set 1 - SN9
	+ Complete board level testing; start board stack assembly

Tracking Simulator* Finish conversion software for beam reference tables

Flight Software* Continue implementation and testing of electric field mode

 HVOCs (UNH)* Begin the HVOC life testing (12 devices).
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|  |  | SDP/LVPS/BEBs/Preamp/Probe (KTH/ Oulu/IRFU) |
|  |  |  | * Hardware work complete. No hardware activity planned.
 |
|  |  | SDP/LVPS/BEBs/Preamp/Probe (UNH) |
|  |  |  | UNH SDP:* Complete the assembly and conduct the FFT of flight spare SDP (SN2)
* Investigation of deployment stoppage anomalies in TV (additional EMI/EMC testing)
	+ Continue to work the EMC study for SDP

LVPS* No activity planned
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|  |  | ADP/SDP/DSP (LASP) |
|  |  |  | QA/Parts/Materials* Support the project as necessary.

DSP – No activity plannedADP* Support I&T at Goddard as needed

AEB – No activity plannedSDP – No activity plannedThermal – No activity plannedSystems and Program Management* ADP requirement closeout review.
* Perform Phase E budgeting in support of March 2014 FIELDS meeting
 |
|  |  | CEB Hardware and Software |
|  |  |  | * All flight hardware is delivered. Flight spare kits are complete. No further activity is planned.
* Implement FSW modifications/enhancements for final CDPU FSW load.
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|  |  | GSE (Mello) |
|  |  |  | GSE hardware* No planned activity

GSEOS & GSE Software* Updated telemtry screens as needed to support TV
* Improve monitoring features for testing.
* Updated CMD & TLM spreadsheets
* Support FIELDS testing

FIELDS Simulator (FS)* No planned activity
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|  |  | Commissioning and Mission Operations (Needell) |
|  |  |  | * Continue to support SOC Commissioning planning
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