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| --- |
| Investigation: FIELDS |
| Progress accomplished this period: | December 2013 Reporting Period |
| 1. | Project Management and Product Assurance |
|  | a. | Project Management* Supported review of cost change proposal submitted to SwRI 31 July.
* Continued discussion of science data processing topics as part of the weekly FIELDS team meeting agenda.
* Supported the following PERs and associated TRRs
	+ EDI GDU SN7
* Supported the following FRBs
	+ EDI GDU SN5 comm locks during Obs TV test
* Supported the following Acceptance Reviews or PSRs
	+ None
* Received delivery of the following flight hardware items at UNH
	+ 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
	+ None
* 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* Refurb DEFL PWA in process inspections
* EDI Preamp FM9 resistor trim
* EDI FM7 PER support
* HVOC screening support
* SDP FM2 Probe assembly support.
* SDP FM2 assembly inspections.
* EDI BGS parts inspections.
 |
| 2. | Systems Engineering and FIELDS I&T |
|  |  | Rau, Dors, Needell* Supported EDI GDU SN07 PER
 |
| 3. | Post-Delivery Support (UNH) |
|  |  | * Supported OBS-1 pre-TV post ship Functional
* Supported OBS-1 TV preparation including GDU Maheu hat installation
* Supported OBS-1 pre-TV SDP Motor and HOP test and ADP Sim Test
* Supported OBS-2 TV testing including end to end HV testing on EDI GDU
* Supported OBS-2 post TV including removing GDU Maheu hats
* Supported OBS-3 Baseline Mag boom 2nd/3rd motion and mag functional
* Installed SDP 15-18 on OBS-3 and performed electrical integration/functional
* Supported OBS-4 Acoustics pre and post aliveness testing
* 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

Science data processing activities (Compiled by Chutter)* ALL
	+ Continue working through coordinate system definitions
	+ Continue populating FIELDS Processing document
* UNH
	+ Updated sample CDF v3.5 L1A and L1B files (except EDI) available at UNH and SDC using MRT9B L0 data as input
* LPP
	+ New “SCM Cal” version delivered on the Sandbox :
		- [partially done] software to write output CDF file, OK with data but more has to be done on metadata.
	+ Work on calibration analysis started (needed for the “Make SCM Cal” software)
* UCLA
	+ Worked 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).
* GSFC
	+ Finalized and delivered the ‘prototype’ L1A to L1B processing software in the SDC sandbox
	+ Began work on ‘L1B to Quicklook’ processing software and Quicklook CDF skeleton files.
	+ Coordinated with FDOA to receive attitude/ephemeris to support SIT5B
* IRFU
	+ Started to implement the SITL/QuickLook pipeline.
* LASP
	+ Quicklook data product code working on LASP system
 |
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| 5. | Magnetometers |
|  | a. | DFG  |  |
|  |  |  | * No activity this month
 |
|  | b. | AFG |  |
|  |  |  | Science* Magnetometer paper now submitted.
* .

Prelaunch Preparations* Hannes Leinweber met with Ken Bromund at UCLA (Dec. 16 – 18) to work on development of magnetic field processing formats and procedures, to finalize deliveries to SDC, and continue development on Level 2 processing code
* Hannes Leinweber developing inflight calibration and inflight calibration procedures.
* Louise Lee converting analysis software to modern languages like Python.
* Support SODAWG – with emphasis on coordinate systems.
* Submitted software and calibration files to test interfaces at the SDC.

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 still in progress (MMS-SCM-NC-TRI-623-LPP and MMS-SCM-PR-TRI-622).
* 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. Yet, time tags for the start of each SCM segment (which are transmitted in a separate packet) would make easier and more accurate the analysis. The way to transmit these parameters to SCM team will be investigated by J. Needell.
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| 6. | EDI |
|  |  | Ship Set 3 - GDU SN 7* Completed GDU Assembly
* Baseline Functional Test in Vacuum
* PER
* Vibration
* Returned Lower Optics SN7 to UIowa for anomaly investigation and repair
* Detector Characterization

Sensor* Ship Set 1 - SN 9
	+ Preamplifier Trimming

Gun - IWF efforts* Ship Set 4 - SN 6
	+ Completed Gun Calibration
* Ship Set 4 - SN 8
	+ Completed board level testing
	+ Integrated lower board stack

Gun – UNH efforts* Continued assembly of DEFL boards (2 sets) in preparation for GDU refurbishment efforts

Optics* Ship Set 3 - SN 7
* Shipped GDU bulkhead to UNH for mounting & return of SN7 optics;
* Investigated anomalous resistance (30 MOhms) in SN7 extractor electrode connection; resistance was caused by assembly error

Software* Continued impementation and testing of electric field mode

HVOCs (UNH)* Completed screening of the 4th and final planned batch of UNH HVOCs (45 devices) at UNH.
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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:* Continued assembly of the flight spare unit (SN 2).
 |
|  | c.  | SDP (LASP)* Done
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| 8. | ADP |
|  | a. | LASP ADP Post-Delivery Support Activities at Goddard* No LASP I&T activity in December
* Reviewed and approved WOAs and SCoRes for upcoming Obs 3 and Obs 4 ADP I&T

Axial Electronics Box (AEB)* No activity
 |
|  |  |  |
| 9. | DSP, Thermal, Systems Engineering, Product Assurance and Management (LASP) |
|  |  | DSP - No activities this month.Thermal – No activities this month.Systems Engineering and Program Management* Supported program as necessary.
* Provided inputs to ADP instrument paper – figures, text, and performance specs. Review of ADP instrument paper.

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

FIELDS Simulator* No activity

GSEOS & GSE Software* Update Telemetry screens as needed to support testing.
* Update TLM & CMD spreadsheets.
* Add ANNIE & 1Wire TLM feeds for TV testing.
* Updated GSEOS to latest released version.
* Support FIELDS IS & TV testing
 |
| 12. | Commissioning and Mission Operations (Needell) |
|  |  | * Supported OBS2 TVAC. This was the major focus of all activity for the month.
* Supported OBS1 Acoustics and TVAC preparations
* Worked on plans for SDP “diagnostic” testing during commissioning.
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| 13. Problems encountered and updates this period |

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|  |  | EDI* Zero counts observed during SN7 EDI Sensor characterization in vacuum (PFR-10160.53-119-IP)
	+ The initial ring around with the test pulser verified that all preamp channels were active. Following the ring around, there is a test to perform a dark counts scan. This normally would show 0-4 counts, however, there were 0 counts in all pads. After looking at the housekeeping data, the current on the MCP supply appeared to be slightly lower than expected. This suggests a connection to the HV Connector board is missing.
	+ Inspection confirmed the observation. The rework and retest of the SN7 Sensor testing completed normally. NCR to be closed.
* Beam current for 500eV calibration (Gun FM7) (PFR-10160.53-122-IP)
	+ Insufficient beam at 500eV. Change in operating characteristics observed at 1 keV.
	+ FRB approved plan to replace the BGS.
	+ Gun 7 calibration, I&T with GDU and FFTs proceeded normally following the rework.
* GDE Converter Shutdowns during TV (GDU SN FM4) (PFR-10160.53-118-IP)
	+ GDE converter shut down during continuous operations startup at first hot plateau in TV while switching gun energy to 1keV.
	+
	+ Another converter shutdown and two FPGA communication locks occurred after 101 hours of error free operation during instrument configuration for continuous operations.
	+ Subsequent instrument operation (23 hours) at HV on was nominal.
	+ PSR for GDU4 postponed pending planning for rework.
* Off-resonance HV supply operation (Gun SN7) (PFR-10160.53-116-IP)
	+ During a test of the partially assembled board stack (lower three boards and HV stacks) the HV supply input current was 95 mA instead of the typically nominal 9.6 mA.
	+ Caused by test setup (HV probe capacitance causing off-resonance operation with high power consumption) resulting in possible overstress of two resistors (R20 and R46) on HV-FIL board SN8;
	+ The HV-FIL board SN8 was removed and replaced with SN9; Gun testing resumed.
	+ HV-FIL board will be repaired (R20 and R46)
	+ Gun 7 calibration, GDU integration and FFTs have proceeded normally.
* Red Limit Violation of MCP supply current housekeeping monitor (EDI GDU FM4) (PFR-10160.53-117-IP)
	+ During detector characterization tests, the MCP current monitor had a single-sample red limit violation. This type of violation has occurred on other units referenced in NCRs 53-83, 53-88, and 53-105.
	+ Another single-sample red limit violation of the MCP current monitor was registered during the LFT conducted during the third hot cycle in the TV test.
	+ PSR for GDU4 postponed pending planning for rework.
* Failure of HV supply (Gun SN6) (PFR-10160.53-113-OP)
	+ During final integration test of the FM6 gun electronics, in two cases a failure of the HV supply has been observed. The high voltage output of the stack reaches only 60% of the nominal value.
	+ As of 8 Oct 2013:
		- Diagnosed problem with insufficient HV stack output; R20 has increased resistance (700 Ohms instead of 20 Ohms); Very likely caused by test setup (HV probe capacitance causing off-resonance operation with high power consumption) resulting in overstress of two resistors (R20 and R46) on HV-FIL board.;
		- The HV-FIL board will be repaired
	+ The cause was identified with a similar problem was observed with Gun 7. See PFR-10160.53-116-IP. Rework is complete. Calibration of Gun/GDE SN6 was completed nominally.
* Board-level test failure SN6 Gun Beam Board - damaged LVDS chip (PFR-10160.53-110-OP)
	+ The LVDS driver chip was damaged during board-level test on the SN6 Beam board due to a missing ground between the EGSE and the +/-5.2V power supply of the test board.
	+ Proposed Actions/Corrections:
		- Replace the part and inspect. DONE.
		- Correct the test setup and confirm. DONE.
		- Resume board level testing of the Beam Board. DONE.
		- Provide analysis assessing risk, if any, to other components on the board.
	+ UPDATE:
		- SN6 Gun has been placed back in cleanroom environment. Testing will resume when time is available.
		- Awaiting NCR details and analysis from IWF. Meanwhile, the calibration of Gun SN6 has proceeded normally.
* EDI GDU SN2 open work (PFR-10160.53-101-IP)
	+ GDU SN2 exhibited problems during the Gun calibration and component level TV test. See PFR-10160.53-56 [Thermal Vacuum Com Locks and Fold-Backs (EDI GDU SN2)] and PFR-10160.53-47 [GDE fold-back during SN2 Gun Calibration]. The unit was delivered to GSFC to participate in I&T, but needs to be returned to UNH and IWF for rework.
	+ Rework plan:
		- -Install new UNH-built optocouplers on DEFL1 and DEFL2 board and in any other gun HV amplifiers that have exhibited LED current trends.
		- -Remove 27 Ohm resistor from GUN25V supply line in GDE/Gun harness
		- -Install 20 Ohm resistor on HV-FIL board in Gun
	+ Retest plan:
		- -Gun calibration at IWF
		- Sensor stand-alone vacuum testing at UNH
		- GDU integration and environmental testing
* EDI GDU SN3 open work (PFR-10160.53-103-IP)
	+ GDU SN3 exhibited problems during the component level TV and vacuum tests. See PFR-10160.53-81 [GDE Converter Fold Back and Comm Locks observed during TV test (GDU SN FM3)] and PFR-10160.53-83 [Sensor FPGA reset (EDI GDU FM3)]. The unit was delivered to GSFC to participate in I&T, but needs to be returned to UNH and IWF for rework.
	+ Rework plan: Install new UNH-built optocouplers on DEFL1 and DEFL2 board and in any other gun HV amplifiers that have exhibited LED current trends.
	+ Retest plan:
		- Gun calibration at IWF
		- Sensor stand-alone vacuum testing at UNH
		- GDU integration and environmental testing
* EDI GDU SN5 open work (PFR-10160.53-106-IP)
	+ GDU SN5 exhibited problems during the component level TV and vacuum tests. PFR-10160.53-105 [Red Limit Violations on GDU SN5] and PFR-10160.53-96 [Converter Foldbacks (GDU FM5)]. The unit was delivered to GSFC to participate in I&T, but needs to be returned to UNH and IWF for rework.
	+ Rework plan: Install new UNH-built optocouplers on DEFL1 and DEFL2 board and in any other gun HV amplifiers that have exibited LED current trends.
	+ Retest plan:
		- Gun calibration at IWF
		- Sensor stand-alone vacuum testing at UNH
		- GDU integration and environmental testing
* [UPDATE] Negative Current spikes seen on Plate 7 Optocoupler during calibration (GUN SN4) (PFR-10160.53-85-AP)
	+ Three opto-couplers (HVOC 204, 210, 229) and one transistor (Q5, 2N2222) were replaced and submitted to GSFC for DPA. DPA results for HVOC 229 still pending.
	+ Successful Gun re-calibration performed.
	+ Waiting for successful GDU T/V test before closing. Risk of latent damage unknown. Opened risk on GDU SN4 (ID: 121)
	+ Update following GDU TV test:
		- 1) The affected Gun deflection channels – D5, D6 and D7 – performed without error during the GDU SN4 T/V test. Channel D6 exhibited a 7% trend (5 LSBs) in LED current between the first and last hot plateau of the T/V test. This is much less than the trends found on channels D3 (25%) and D8 (20%). Channel D5 showed no trend at all, channel D7 merely 2.2% (one LSB)
		- 2) The DPA report for HVOC 229 is still pending.
	+ UPDATE: PSR for GDU4 postponed pending planning for rework.
* Failure to set the Wehnelt voltage (EDI Gun SN4, Q4 on HV-FIL board SN4) (PFR-10160.53-78-IP)
	+ Damage of transistor Q4 on HV-FIL board.
	+ Suspected cause: arc or ESD.
	+ Successful BLT of board SN4 after replacement of Q4, but board SN4 was not used for Gun SN4. Board SN5 was used with Gun SN4.
	+ No impact on other Gun boards seen, but risk of latent damage unknown. Opened risk on GDU SN4 (ID: 121)
	+ Converter shutdowns and communication locks were observed during GDU SN4 TV testing
	+ PSR for GDU4 postponed pending planning for rework.
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| 14. Issues and concerns |
|  |  | From FIELDS PM* The Gun/GDE continues to be the critical path for GDU and FIELDS. UNH will continue to coordinate support with IWF via weekly telephone calls. UNH will provide support of testing and assembly activities on site at IWF as needed. In addition, UNH is assembling the Gun boards to be used in the refurbishment of GDUs. That work is underway. The intent is to have assembled and tested boards to be used as replacements and avoid rework of the boards currently in these Guns. These boards will employ UNH-built HVOCs.
* A risk record regarding GDU performance and schedule was initiated and discussed on several occasions in November with with SwRI and GSFC project leaders. The intent is to use this as a tool going forward to help coordinate mitigation efforts.

Science Data Processing (Compiled by Chutter)* UNH
* LPP
	+ [Still pending] 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
	+ Several coordinate system issues being discussed
* IRFU
	+ New TT2000 time format not supported in Matlab – as workaround, will write CDF output routine in C
* LASP
 |

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.
* 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
	+ Macor brackets for 3R and 5R Gun boards (from IWF)
* Delivery of the following flight hardware items from UNH to FIELDS partners
	+ EDI Gun/GDE SN4 to IWF for rework
* Prepare and conduct the following PERs and associated TRRs
	+ GDU SN6
* Prepare and conduct the following PSRs or Acceptance Reviews.
	+ GDU SN7
* Make or coordinate delivery of the following to GSFC IS or S/C teams
	+ GDU SN7
* CDRL and contract deliverable submissions:
	+ None planned
 |
|  |  | Product Assurance, Configuration Management, Parts, Materials, Facilities |
|  |  |  | Turco/Salwen* EDI TV Support
* EDI FM9 PWA staking and coating
* EDI integration support
* Inspections of EDI Gun DEFL boards
 |
|  |  | Systems Engineering & FIELDS I&T |
|  |  |  | Rau, Dors, Needell* Support GDU SN07 TV testing as needed
* Perform FIELDS testing on GDU SN07 (EMI, Magnetics, FIT, AT)
* Support GDU SN07 PSR
* Continue submitting FIELDS verification material for closure
 |
|  |  | Post-Delivery Support (UNH) |
|  |  |  | IS and Observatory Support (FIELDS)* Deliver GDU SN07 to GSFC
* Update documentation in preparation for OBS-1 TV test
* Support OBS-1 TV Test
* Support removal of GDU SN05 from OBS2
* Support OBS-2 EMI test
* Integrate GDU SN05 and SN07 onto OBS3
* Support OBS-3 ADP -Z RE installation, deployment and functional test
* Support OBS-4 Post Acoustic ADP +/-Z RE deployment and functional test
* Prepare for OBS-4 TV test
* Support run for score of MRT8 (SDP deployment) with SOC at LASP
* Pass damaged SCM harness to FIELDS technicians and QA for repair
 |
|  |  | Science |
|  |  |  | SWT and SWG* Support science telecons as needed
* Continue preparation FIELDS Instrumentation papers

Science data processing activities* ALL
	+ Continue working through coordinate system definitions
	+ Continue populating FIELDS Processing document
* UNH
	+ Continue work on scripting to control processing
	+ Continue L0 to L1 software updates as necessary
* LPP
	+ Finalizing SCM Cal interface with SDC :
	+ include software to calibrate data.
	+ Complete software to write output CDF file
	+ 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 skeleton SITL/Quicklook, L2pre data files, and ‘glitch’ files.
	+ Write routines to read FDOA definitive and predictive ephemeris and attitude data files
	+ Finish the prototype versions of the ‘L1B to Quicklook’ and ‘L1A to L2pre’ software modules, and deliver to the SDC sandbox
	+ Begin work on coordinate transformation library and a full implementation of the ‘L1A to L1B’ software module
* IRFU
	+ Write a routine for CDF output in C and make a Matlab-MEX interface to it
	+ Supply initial version of the software to the SDC
* LASP
	+ Transfer quicklook data product code over to the SDC sandbox and make it work there
 |
|  |  | AFG |
|  |  |  | * Work on data products guide.
* Continue developing inflight calibration procedures.
* Continue software analysis activities.
* Continue to support SODAWG.
* Develop milestones for prelaunch preparations.
* Deliver calibration files for Observatory 2.
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|  |  | DFG |
|  |  |  | * Continue with our models for the combined SCM/FG data product
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|  |  | SCM |
|  |  |  | * FMS ADP
* NCR alignment measurements final report (MMS-SCM-NC-TRI-623-LPP and MMS-SCM-PR-TRI-622).
* Checking of “in flight” calibration signal sequences (four segments, APID 17d) on OBS2 and OBS4.
 |
|  |  | EDI |
|  |  |  | Ship Set 3 - SN 7* T/V Test, EMC Test, Magnetics, FIT Test
* Pre-ship inspections
* Shipment to GSFC

Ship Set 4 - SN 6* GDU Integration
* Baseline FFT, PER, EMC Test, Vibration

Sensor* Ship Set 1 - SN 9
* Preamplifier Delay Test, Thermal Test, send out boards for parylening

Gun - IWF Efforts* Ship Set 4 - SN 6
	+ Deliver Gun & GDE to UNH for GDU SN6 integration
* Ship Set 4 - SN 8
	+ Board stack integration and testing; gun calibration

Gun – UNH Efforts* Complete assembly of the DEFL boards (2 sets) for Gun refurbishment.
* Deliver to IWF

Optics * Deliver repaired lower optics SN 7 and optics SN 9 to UNH

Software* Continue impementation 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) |
|  |  |  | SDP:* No activity planned

S-BEB’s & Preamp & Probe:* No activity planned

A-BEBs and LVPS:* Done
 |
|  |  | SDP/LVPS/BEBs/Preamp/Probe (UNH) |
|  |  |  | UNH SDP:* Continue assembly of flight spare SDP (SN2)
* Revise plan for additional EMI testing as requested by SwRI.

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 planned

Thermal – No activity plannedSystems and Program Management* Close out EIDP and verification items
 |
|  |  | CEB Hardware and Software |
|  |  |  | * All flight hardware is delivered. Flight spare kits are complete. No further activity is planned.
* CEB flight software is stable.
 |
|  |  |  |  |
|  |  | GSE (Mello) |
|  |  |  | GSE hardware* No planned activity

GSEOS & GSE Software* Update Telemetry screens as needed to support testing.
* Update TLM & CMD spreadsheets.
* Support FIELDS IS & TV testing

FIELDS Simulator (FS)* No planned activity
 |
|  |  | Commissioning and Mission Operations (Needell) |
|  |  |  | * Submit plans for SDP “diagnostic” tests during commissioning
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