LAT Monthly Status Review

26 July 2005

Design Integration and Analysis

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Design Support Status

- Flight/fly-away hardware designs (all remaining hardware listed)
  - MLI blankets: draft drawings out for check
  - External fly-away instrumentation cables: in-work
  - TKR accel mount bracket: design complete; drafting waiting on designer priority
- Assembly drawings (all remaining assembly drawings listed)
  - LAT-DS-05210-50 Cable Installation Kit
    - Released this month
  - LAT-DS-06721 External Cable Installation Kit
    - Completing first draft (ECD: 29 July 2005)
  - LAT-DS-02563-01 LAT Instrument Assembly
    - Completing first draft (ECD: 5 August 2005)
  - LAT-DS-01624-01 LAT Top Assembly
    - Model up-to-date, but drawing not yet started
- Interface Drawings
  - All interface drawings released and up-to-date with no known liens

Integration Planning

- LAT Integration Sequence (LAT-MD-00676-03)
  - Draft of updated sequence is out for review
  - This includes contingency plan to install ACD and run system and FSW tests before integrating the final 8 towers
  - Expect close-out of this revision this week, then document will be sent out for release
- Configuration drawings
  - LAT Instrument Configuration Assembly
    - Includes LAT flight hardware and integration MGSE
    - Drawing being updated now to include last pieces of MGSE (ECD: 12 August 2005)
- Integration MGSE (all remaining integration MGSE listed)
  - ACD Lift Fixture
    - This is needed for integrating the ACD in late August
    - Drawings nearly complete (ECD: 29 July 2005)
  - EM-SIU Mount Plate
    - Added piece to support early system testing
    - Design not started yet, but will be a quick turn-around (ECD: 19 Aug 2005)

Environmental Test Planning

- Current focus is to complete all Plan-level documents by the end of August
  - Pushing hard to get Test Plans out
  - This is important to fully scope all tests and MGSE requirements
- Next step (Aug-Sep)
  - Develop procedure list
  - Complete MGSE designs
  - Start drafting procedures
  - Finalize NRL logistics plans
  - Develop Pathfinder plans for prototyping at NRL in November
- Pathfinder (Oct-Nov)
  - Complete all procedures that are needed for Pathfinder
  - Walk through procedures using real MGSE hardware at NRL
  - Update procedures based on Pathfinder experiences
  - Release procedures prior to TRR and LAT shipment

Environmental Test: Plan-Level Documents and Status

- The following documents (in total) form the technical bases for LAT environmental testing

Document	Title	Status	ECD
LAT-MD-02717-01	LAT Environmental Test Sequence	Defines the detailed test/handling sequence Released this month	Released
LAT-MD-01196-03	LAT Dynamics Test Plan	Out for general review	Rel: Aug 12
LAT-MD-00276-02	LAT EMI/EMC Test Plan	Draft out for comment Still needs work to complete	Draft: Aug 5
LAT-MD-01600-03	LAT Thermal-Vacuum Test Plan	Sent out for release this month	Rel: Aug 19
LAT-SS-06640-01	LAT Environmental Test MGSE/STE Requirements	Collects all MGSE req's from test plans First draft completed this month Out for comment	Rel: Aug 19
LAT-PS-06898-01	LAT Environmental Test Implementation Plan	Provides direction for test operations and work at NRL—QA, contamination control, handling requirements, MGSE operations Outline completed this month Document being drafted by I&T	Draft: Aug 12
LAT-MD-06560-01	Plan for Integrating and Testing the LAT on the Observatory	Collects all LAT req's and LAT-Spectrum-GSFC agreements on logistics of integrating the LAT and testing with LAT in place Outline completed this month Rough draft updated this month Plan to complete a clean draft and send to Spectrum for comment by mid-September	Draft: Aug 26

Environmental Test: Configuration Drawings and Status

- These show flight hardware and MGSE/STE in their test configuration
  - Includes all information needed to support test set-up procedures
  - Shows all mechanical test and handling equipment that is used for the test
    - Custom-built MGSE/STE
    - Lifting and handling hardware
    - Test facilities, including test chambers—used for verifying fit of LAT and access

Drawing	Title	Status	ECD
LAT-DS-06186	Handling Configuration Assembly	First draft complete	Aug 12
LAT-DS-06184	Transport Configuration Assembly	Waiting Transport Container final design	Late Sep
LAT-DS-06187	Horizontal Vibration Test Configuration Assembly	Modeling complete; drawing not started	Late Aug
LAT-DS-06190	Vertical Vibration Test Configuration Assembly	Modeling complete; drawing not started	Late Aug
LAT-DS-06189	EMI/EMC Test Configuration Assembly	Modeling underway; finalizing EGSE cable lengths	Mid Sep
LAT-DS-06188	Acoustic Test Configuration Assembly	Modeling not started	Mid Sep
LAT-DS-06185	Thermal-Vacuum Test Configuration Assembly	Modeling complete; EGSE cable length evaluation complete; starting sink plate design	Mid Oct

Environmental Test: NRL Facility Drawings and Status

- Drawings and models of NRL facilities are being used for modeling LAT orientation and clearances in the various test facilities
  - Models are based on measurements of the facility—little archival information since many of the facilities have been around for quite some time
- These will be used in the test Configuration Assembly drawings
  - The fits and orientation of the LAT and MGSE will be shown
  - All configurations in the facilities will be verified as part of the Pathfinder activities

Drawing	Title	Status	ECD
LAT-DS-5905-01	Sine vibration table	complete 4/20/2005	
LAT-DS-5903-01	Sine vibe slip table	complete 5/2/2005	
LAT-DS-5904-02	Sine vibe expander head	complete 4/25/2005	
LAT-DS-5899-01	High-bay tent	complete 4/20/2005	
LAT-DS-5902-01	Vibe facility	in release cycle now	July 26
LAT-DS-5906-01	Acoustic facility	in release cycle now	July 26
LAT-DS-5907-01	T-Vac facility	complete 4/20/2005 (rev in progress)	
LAT-DS-5908-01	EMI facility	in release cycle now	July 26
LAT-DS-xxxxx	A-59 west high-bay	started floor plan drawings	15 July 2005

Environmental Test MGSE/STE

- Transport Container
  - RFP came back high → too much, too late
  - NRL has started work on retrofitting a surplus container that they have
- Test Interface Plate
  - Parts due in this week
  - Working on details of mounting flexures—part of prep work for Grid static qual test
- Test Stand
  - Drawings in final draft
  - Assembly and proof test plans are nearly complete
  - Structural analysis nearly complete
  - Expect an RFP for this to be on the street by Aug 5—this is late, and we are pushing hard to get this done
- T-Vac Sink Plates and Cal-Rod Cage
  - Detailed thermal and electrical design started
  - Mechanical design waiting on designer availability
- Spreader Bars
  - Structural analysis complete
  - Drawing complete
  - This will go out for fabrication with the Test Stand

Structural Analysis: Accomplishments

- LAT System Level
  - (T) Continued LAT Static test plan development
    - Visit to NTS was successful
    - Completed two rounds of review with GSFC Mechanical Branch
    - GSFC buy-in on approach; some final pre-test analysis to be completed
  - (I)(T) Continued LAT Environmental test planning
    - Release third draft of Test Plan for review, so far, no major comments
    - Verified Instrumentation set currently in flight stores
    - Flexure Strain Gauge locations nearing completion
- LAT Subsystem Level
  - (I)(T) MGSE
    - Test Stand model complete – running load cases, making design iterations
    - Completed analysis/optimization of spreader bar used in LAT rotation operation
    - Support Observatory lift by the LAT as needed (stiffness calcs, analysis review)
    - New plan to test Flexures after assembly into TIP (saves time)
  - (T) TKR Subsystem
    - Supported TWR Tests remotely (by phone) with no major issues
    - Continued to review all TKR vibration test reports from INFN/Bari
  - (I)(T) Mechanical Subsystem
    - Supported NCR resolution on two issues
      - Liquid shim sub-standard hardness; resolution: remeasured hardness acceptable
      - Broken CAL shear stud on Grid #2; discovery: custom nut galled and destroyed threads on stud; resolution use non-locking nuts with lubrication and other applied locking feature such as Loc-tite
  - (T) EBOX Subsystem
    - Supported Special EBOX test readiness

(D) = Flight Design
(I) = Integration Prep
(T) = LAT/SS Test Prep

Structural Analysis: Near-term Milestones and Status

- **LAT System Level**
  - (T) **LAT Static Testing**
    - Complete Pre-test analysis: predictions, finalize instrumention locations, fixture evaluation
  - (I)(T) **LAT Dynamics Testing**
    - Finalize flexure strain gauge locations to facilitate load input calculation – ECD = 8/3/05
    - Release Dynamics Test plan Rev.3 – ECD = 8/5/05
    - Update LAT vibration test predictions – ECD = 9/1/05
    - Continue planning with I&T and NRL for LAT environmental testing – ECD=ongoing through test
  - (I) **MGSE for I&T: augment MGSE analysis with additional I&T needs, as required**
    - Write Analysis report for LAT Test Stand and Test Interface Plate MGSE for associated handling procedures and test environments – ECD = 8/5/05
- **LAT Subsystem Level**
  - (T) **TKR Subsystem**
    - Continue to support tower testing by phone – ECD = ongoing through last Tower test
  - (T) **Mechanical Subsystem**
    - Proof Test Spectrum provided flexures on TIP TRR – ECD = 8/5/05
    - Grid Static Load Test procedures, STE, TRR – ECD = 8/12/05
    - Support Grid Static Test – ECD = 8/26/05
    - Support radiator acoustic tests – ECD = 7/29/05
    - Support radiator static tests @ SLAC – ECD = TBD
  - (T) **EBOX Subsystem**
    - Complete TEM/TPS Vibration test report
    - Support GASU and PDU Protoflight tests

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Thermal Engineering Activities – Completed

- **Design Engineering and Support**
  - **Supported test to measure thermal conductance of HP bonded triple joint, but obtained limited useful data.**
- **LAT Level Thermal Analysis and Tests**
  - **LAT TVAC S/C bus simulation, ACD and radiator sink plates thermal design finished – heater circuit design postponed to August**
  - **Reviewed/modified detailed thermal sensor list for LAT TVAC**
- **Subsystem Support and Oversight**
  - **Supported TKR 6, 7 TVAC test at Alenia, 11 – 15 July**
- **LAT Thermal Control System**
  - **SLAC EGSE to run TCS software/hardware during radiator TVAC test is finished and delivered to Lockheed**
- **Lockheed Thermal Control System Hardware**
  - **Radiator Protoqual Test Plan and Test Procedure documents are finished.**
  - **X-LAT Plate shipped to and received at SLAC**

Thermal Engineering Activities – Current

- **Design Engineering and Support**
  - Environmental Specification – change Tracker Acceptance Level Tests (35C to 45C)
  - Reviewing electrical grounding scheme for MLI blankets with NASA/GSFC
  - Analyzed data from HP bonded triple joint test; test must be repeated.

- **LAT Level Thermal Analysis and Tests**
  - Thermal math model for LAT TVAC Test almost complete; LAT support stand GSE will be incorporated into model when time becomes available - after radiator/TCS protoqual tests – mid-August
  - Develop ground cooling thermal model to incorporate worst

- **Subsystem Support and Oversight**
  - Continued support for TKR TVAC Acceptance Testing; TKR 8, 9 week of 25 July and TKR 10, 11 week of 1 August.

- **LAT Thermal Control System**

- **Lockheed Thermal Control System Hardware**
  - Radiator/TCS Protoqual Test planned for mid-August 2005
    - TVAC Test Procedures completed
    - MGSE design finished; fabrication/assembly to begin late July
    - SLAC EGSE to run TCS software/hardware is finished and delivered to LM.

Thermal Engineering Activities - Planned

- Design Engineering and Support
  - Complete detailed MLI design
  - Review, then fabricate MLI blankets; two sets, one set for tests and other for flight
- LAT Level Thermal Analysis and Tests
  - Thermal Math Model, Ver. 6.1, reduced node
  - Thermal Math Model, Ver. 6.2, LAT TVAC test configuration
  - Document analysis of LAT transition from Survival to Operating Mode
  - 200 Node Launch Vehicle Thermal Math Model
  - Develop refined ground cooling scheme for LAT with light-tight shield
- Subsystem Support and Oversight
  - Support TVAC tests of all eboxes
  - Support TVAC tests of TKR 8 - 14
- LAT Thermal Control System
  - Preliminary verification during LM Radiator Protoqual Tests
  - TCS verified in LAT TVAC tests at NRL
- Lockheed Thermal Control System Hardware
  - Complete radiator TVAC test and deliver to SLAC