

LAT Monthly Status Review

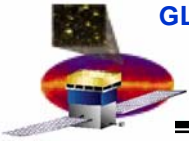
26 July 2005

Design Integration and Analysis

Martin Nordby

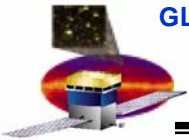
John Ku

Jack Goodman



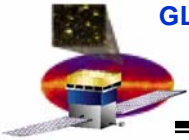
Design Support Status

- **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**



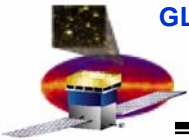
Integration Planning

- **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

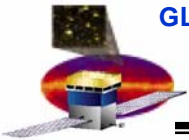
- **Current focus is to complete all Plan-level documents by the end of August**
 - Pushing hard to get Test Plans out
 - This is important to fully scope all tests and MGSE requirements
- **Next step (Aug-Sep)**
 - Develop procedure list
 - Complete MGSE designs
 - Start drafting procedures
 - Finalize 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

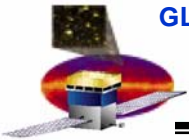
Document	Title	Status	ECD
LAT-MD-02717-01	LAT Environmental Test Sequence	Defines the detailed test/handling sequence Released this month	Released
LAT-MD-01196-03	LAT Dynamics Test Plan	Out for general review	Rel: Aug 12
LAT-MD-00276-02	LAT EMI/EMC Test Plan	Draft out for comment Still needs work to 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

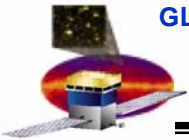
Drawing	Title	Status	ECD
LAT-DS-06186	Handling Configuration Assembly	First draft complete	Aug 12
LAT-DS-06184	Transport Configuration Assembly	Waiting Transport Container final design	Late Sep
LAT-DS-06187	Horizontal Vibration Test Configuration Assembly	Modeling complete; drawing not started	Late Aug
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

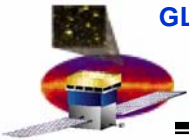
- Drawings and models of NRL facilities are being used for modeling LAT orientation and clearances in the various test facilities
 - Models are based on measurements of the facility—little archival information since many of the facilities have been around for quite some time
- These will be used in the 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

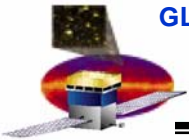
- **T** **EBOX Subsystem**

- 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 instrumentation 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

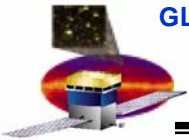
- **T** **Mechanical Subsystem**

- 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**

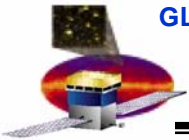
- Complete TEM/TPS Vibration test report
 - Support GASU and PDU Protoflight tests

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



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

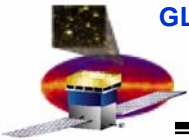
- **Design Engineering and Support**
 - Environmental Specification – change Tracker Acceptance Level Tests (35C to 45C)
 - Reviewing electrical grounding scheme for MLI blankets with NASA/GSFC
 - Analyzed data from HP bonded triple joint test; test must be repeated.

- **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