

LAT Monthly Status Review

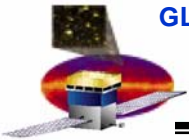
27 January 2005

Design Integration and Analysis

Martin Nordby

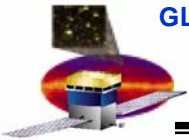
John Ku

Jack Goodman



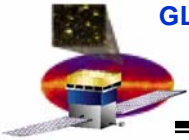
Subsystem Design Support Status

- **Mechanical systems**
 - Making final modifications to Connector Panels to reflect latest Instrumentation Plan release (ECD: 2/4)
 - Waiting final modifications to Grid assembly drawing to reflect heater change
- **DAQ**
 - Thermal Shunt: completed and released
 - Cable Ways: part drawings completed and released. Assembly held waiting stress analysis (ECD: 2/15)
 - Harness Interface Box (HIB): completed and released
 - Internal cables: all drawings completed and released over the past 2 months.
 - Internal fly-away instrumentation cabling: 3 cables had been released, but have since required revision, and are in-work now (ECD: 2/4)
 - External fly-away instrumentation cables: working cable routing now, with drawings to follow (ECD: 2/22)
- **I&T**
 - Just started LAT Configuration Assembly drawings to document flight hardware with M-GSE
 - Single-Bay drawing in the works (ECD: 2/5)
 - Developing list of other drawings needed (ECD: 2/2)
- **MLI**
 - Met with Spectrum and GSFC thermal, design, and system engineers to work through LAT, SC, and interface MLI design and stayclears
 - Arrived and consensus on integrated MLI design that met SC, LAT, and integration needs
 - Working MLI design details now. Spectrum working on stayclear growth with GBM



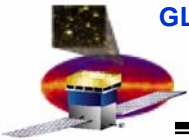
LAT Top Assembly Drawings Status

- **LAT-DS-02559-01 CAL-TEM-PS Module Assembly**
 - Complete and approved
 - No known leins on this assembly
- **LAT-DS-02560-01 LAT Tower Assembly**
 - Complete and approved
 - Known leins:
 - TKR flex cable mounting to Grid: method in-work by TKR (ECD:)
 - Grid Box Base Assembly drawing in revision for minor mod's (ECD:)
- **LAT-DS-02561-01 Cable Installation Kit**
 - This shows routing of all internal LAT cables
 - Modeling and bill of materials is nearly complete (ECD: 2/2)
 - First draft of drawing ECD: 2/11
- **LAT-DS-02561-01 LAT Tower and Electronics Assembly**
 - Model still in-work
 - Draft of drawing is underway in rough form (ECD: 2/25 for draft, late March for final)
 - Known issues still needing work:
 - Connector Panels in revision—expect incorporation of final design by 2/11
 - Fly-away accelerometer locations and mounting not quite final—plan to close this at a meeting this Friday, with model completion by 2/11
 - Assembly notes and detailed bill-of-material review still needed (ECD: 2/18)



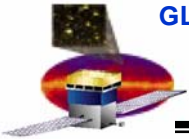
LAT Top Assembly Drawings Status (cont.)

- **LAT-DS-02563-01 LAT Instrument Assembly**
 - **Model is still in-work**
 - **Draft of drawing not started**
 - **Known issues still needing work:**
 - **Instrumentation and their cabling need finalization (ECD: 2/18)**
 - **MLI Blanket Bar design and analysis still in-work (ECD: 2/11, pending Spectrum, GSFC OK)**
 - **Heat Pipe mounting hardware design still in-work (ECD: 2/25)**
 - **Notes and detailed bill-of-material review still needed (ECD: 3/15)**
- **LAT-DS-01624-01 LAT Assembly**
 - **Model in-work**
 - **Known issues still needing work:**
 - **MLI blanket design still in conceptual stage (ECD: early March, pending GSFC, Spectrum OK)**
 - **Radiator as-built design needs to be incorporated (ECD:)**



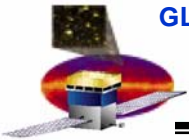
Interface Drawings

- **LAT-DS-00040-12 LAT Instrument Stayclear**
 - Revised to incorporate stayclear changes agreed-to at meeting in Phoenix on 1/12
 - Draft/model sent to GSFC and Spectrum for review
- **LAT-DS-00309-04 ACD-LAT IDD**
 - Remaining work
 - ACD-LAT cable hold-down points need to be added (as already agreed to by ACD and LAT)
 - Release of this is held pending release of LAT-DS-00040-12
- **LAT-DS-00233-07 CAL-LAT IDD**
 - Released 12/9/2004 with no known leins
- **LAT-DS-00851-03 TKR-LAT IDD**
 - Released 11/10/2004 with no known leins



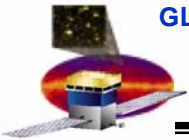
Integration and Test Planning

- **LAT Integration Sequence (LAT-MD-00676-03)**
 - The order in which bays are integrated has been modified and reviewed over the past month
 - Document revised and reviewed at LAT Engineering meetings
 - Ready for release
- **Environmental test planning**
 - Resurrecting Environmental Test Sequence document to clarify and codify test sequence and logistics
 - Working with I&T to identify long-lead issues and resolve them
 - Started working test planning strategy regarding:
 - Personnel interfaces between SLAC and NRL—with I&T and NRL involvement
 - MGSE, EGSE, and test definition lists for all tests—working with test engineers on this
 - Test configurations—identifying drawings needed and information that is lacking
 - Other logistics issues



Design Integrator: Issues and Concerns

- **Timely release of assembly drawings**
 - This is the only mechanism for catching hardware that drops through the cracks between subsystems
 - ECD for these drawings from I&T is for integration, not for hardware procurement for this “lost” hardware
 - Working with Systems Engineering and I&T to develop system for tracking parts needs and availability
- **Integration configuration drawings**
 - We just started working these, but behind on this
 - LAT has a mix of MGSE and flight hardware during integration, little of which has been well-documented
 - For the better-understood procedures, like integrating a CAL, there is little risk in not having these drawings
 - For more complex, cross-bay and LAT-wide procedures, these drawings will be more important



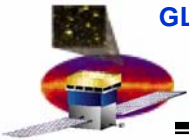
Structural Analysis: Accomplishments

- **LAT System Level**
 - Supported FMEA review of LAT and Subsystems
 - Ⓣ Continued LAT Static test plan development
 - New direction to streamline tests further
 - Informally presented to GSFC Mechanical Systems and deemed feasible, but official review in future needed
 - ⓓⓂⓉ LAT Instrumentation plan with accelerometer count completed
 - Final locations and routing pending one more design/analysis iteration
 - ⓓ Completed MLI support frame sizing analysis
 - Final design pending one more design/analysis iteration
- **LAT Subsystem Level**
 - ⓓⓉ **TKR Subsystem**
 - **TKR Flight Design**
 - Supported TWR A/B Vibration Testing
 - Supported resolution of various production questions and issues
 - **TKR Additional Studies**
 - Supported data review of bottom tray static testing
 - Supported tiger team with some pitch adapter analysis
 - » Cross-sectional differential CTE analysis – credible theory but collateral events are difficult to predict
 - » Moisture expansion survey – credible but not enough data
 - » MCM macro stress analysis – not credible, i.e. no correlation with observations
 - ⓓⓉ **Mechanical Subsystem**
 - Re-analyzed RMB for counterbored holes for MGSE access – margins all adequate
 - Evaluated RAD structural insert repair – LMCO's repair is acceptable
 - Radiator L4 Spec in release cycle
 - Supported RAD thermal isolator material selection
 - Ⓣ **EBOX Subsystem**
 - Supported TEM/TPS Qualification and Acceptance Testing
 - Supported TRR and action item closure
 - Supported dry run at Wyle Labs
 - Co-Authored Test Procedure with EBOX group
 - Supported EBOX shipping container evaluation

ⓓ = Flight Design

Ⓜ = Integration Prep

Ⓣ = LAT Test Prep



Structural Analysis: Near-term Milestones and Status

- **LAT System Level**

- **D** Complete MLI Support bracket analysis – one more design/analysis iteration anticipated – ECD = 1/28/05

- **T** Integrate correlated ACD model into LATv10.09 – ECD = 2/11/05

- **T** LAT Static Testing: develop detailed plans and predictions based on new direction given by SLAC mgmt (Streamlined testing of only required components; all else qualified by analysis, per GEVS-SE) – ECD = 2/18/05

- **I** **T** LAT Dynamics Testing

- Evaluate low freq acoustic loads into LAT in two configurations – ECD = 2/18/05

- Determine accelerometer locations for middle interface, i.e. to monitor the interface between TPS and Special Boxes – ECD = 2/18/05

- Release LAT Dynamics Test Plan – ECD = 3/4/05

- Finalize accelerometer locations and cable routing – one more design/analysis iteration anticipated – ECD = 3/16/05

- Update LAT vibration test predictions – ECD = 5/1/05

- Coordinate with I&T and NRL for LAT environmental testing – ECD = 7/05

- LAT Thermal Distortion Analysis

- Final analysis and reporting of results pending further discussion – ECD = 4/1/05

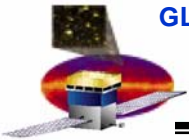
- **I** MGSE for Integration Analysis: augment MGSE analysis with additional I&T requests, as required – ECD = Continuing

- **I** Shipping Container Analysis report – ECD = 4/1/05

D = Flight Design

I = Integration Prep

T = LAT Test Prep



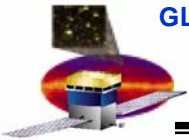
Structural Analysis: Near-term Milestones and Status and Summary of Issues and Concerns

- **LAT Subsystem Level**
 - **TKR Subsystem**
 - Work on plan to support Tracker Vibration acceptance tests in Italy – ECD = 2/4/05
 - Other analysis support – ECD = Ongoing
 - DT** **E-BOX Subsystem**
 - Complete TEM/TPS Vibration test support – ECD = 2/9/05
 - 1 Qual Units, 2 Acceptance Units, and test report
 - Support Special Box Vibration test analysis and planning (mesh with EBOX schedules)
 - Evaluate EBOX loads/accels when LAT is subjected to sine input – ECD = 2/18/05
 - Analyze cable support tray design – ECD = 2/18/05
 - T** **Grid Subsystem**
 - Finish helicoil and bare thread pull-out tests and derive B-basis allowables – ECD = 2/25/05
 - Grid Static Test procedures/STE – ECD = 3/18/05
 - Static Test Grid – ECD = 4/15/05
 - Shear plate qualification test report – ECD = 4/15/05
 - Proof Test Spectrum provided flexures – ECD = 5/6/05
 - Support RAD and X-LAT issues, as needed
- **Summary of Issues and Concerns**
 - Manpower to support testing (Integrated LAT, TKR, EBOX, Mechanical) in addition to “walk-in work” will require tight and creative planning

D = Flight Design

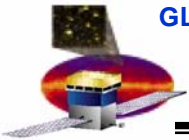
I = Integration Prep

T = LAT Test Prep



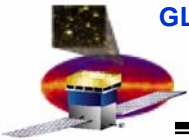
Thermal Engineering: Flight Hardware Design and Analysis

- **New TKR requirement to maintain coldest point of TKR above -15 degC**
 - **Assessed impact of this change to LAT thermal systems**
 - **Hardware impacted only during survival mode**
 - **New Grid thermostats (primary and redundant)—higher set-points needed to keep TKR above -15 degC**
 - **New Grid Make-Up heaters—larger heaters required to handle bigger heat leak**
 - **No change for radiator thermostats**
 - **Radiator anti-freeze heaters require less power—because of versatile design, no new heaters are required**
 - **New orbit-average and maximum total heater power are still within LAT IRD requirements**
 - **Procedural change required to limit Radiator Interface Temperature (RIT) low-temperature operation so no interference with survival heaters**
 - **Only remaining action is to update LAT Environmental Spec and TCS Spec**
- **MLI Blankets**
 - **Held interface meeting with GD Spectrum mechanical and thermal teams to arrive at consensus of LAT, SC, and interface MLI blanketing**
 - **Arrived at consensus on blanket design concepts to simplify all aspects of blanketing**
 - **Working LAT side of detailed design now**
 - **Expect completion of detailed blanket layouts by mid-February**
 - **Supporting Design Integration to resolve stayclear violations of Radiator MLI**



Thermal Engineering: LAT Test Planning

- **LAT Thermal Vacuum Test Plan**
 - Currently being revised—very rough draft sent out for limited preliminary review
 - Expect cleaner rough draft for general distribution by mid-February
 - ECD for release of this revision, late February
- **LAT Thermal Vacuum Test Math Model**
 - In preparation with bulk of work finished
 - ECD is end of February
- **LAT Test Thermal Requirements document**
 - In second revision, but delayed
 - This is required for planning M-GSE cooling for LAT integration tests
 - ECD is mid-February for clean draft out for review



Thermal Engineering: LAT Subsystem Support

- **Tracker**
 - **Acceptance Thermal Vacuum Test procedures have been reviewed and released**
 - **Tower B Acceptance Thermal Vacuum Testing**
 - **Alenia facility pathfinder test in progress**
 - **Starting one week late because of Alenia problems**
 - **Pathfinder test has shortened schedule to recover time for tower test**
 - **Expect to finish tower test first week in February**