GLAST Large Area Telescope:
LAT System Engineering

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Topics

- Performance and Operations Test Plan
- TRR Contents
Where it fits and what it defines

- It is responsive to the LAT Instrument Performance and Verification Plan (LAT-MD-00408), and thus the MAR (433-MAR-0001), and the SVAC Plan (LAT-MD-00446)
- It defines the electrical tests to be performed by I&T
- It starts with receiving tests and ends with final comprehensive test
- It is a companion document to the LAT Assembly Sequence (LAT-MD-00676) and LAT Environmental Test Sequence (LAT-MD-02717)
  - The sequence plans call out test suites (e.g. Comprehensive Performance Test) and the Performance and Operations Test Plan defines what makes up each test suite
- It is based on subsystem verification plans
Performance and Operations Test Plan
(Continued)

• Structure
  – Has a section defining tests (in general based on subsystem level tests)
  – Defines test suites (such as receiving tests, CPT and LPT)
  – Has a matrix that defines which tests are run for each test suite

• Phased development
  – First stage defines risk mitigation testing during LAT electrical integration
    • Covers incoming inspections through multiple tower testing without ELX boxes installed
  – Second stage covers the remainder of the electrical test program
    • ELX box integration and checkout
    • ACD integration and checkout
    • Heater control box integration and checkout
    • Environmental Test Sequence
What is Needed from Subsystems

• Tracker and Cal have provided lists of tests for the first phase (based on subsystem test plan), and are currently refining them

• ACD, Mech and ELX
  – Need to start discussions for the second phase of test plan development

• All subsystems
  – Requirements trace from Level III to Level IV specs
  – Verification Plans and matrices for those requirements
  – Help in determining which tests are applicable at the LAT level, and defining which of those tests are run in the LPT (Limited Performance Test), the CPT (Comprehensive Performance Test), or the Aliveness tests
TRR Contents

- Changes since CDR
  - Changes that affect form, fit or function or that affect the structural, thermal, or electrical design of the instrument. For example, the hard mounting of the X-LAT plate to the DAQ boxes.

- Test Requirements
  - Summary information to ensure that the proposed testing complies with LAT-408 (And by inference MAR) and the environmental spec
  - List of environmental tests, with levels.
  - e.g. TV profile to be used, with a list of the temperature limits to use

- Planned tests
  - Verification matrix showing which test verifies which performance requirement

- Test Entry / Exit Criteria
  - Entry is closure of required action items from the TRR
  - Exit is meeting the requirements of the preship review.

- Test facilities
  - List the test facilities (e.g. thermal chamber, vib facility) and the readiness of each facility
TRR Contents (continued)

- Equipment calibration
  - Describe plan to verify that all test equipment is calibrated.
- Test configurations
  - Block diagrams of hardware under test in the facility with connections to EGSE shown
- Test procedure status
  - List of required procedures and release status of each
- Staffing plans
  - High level statement of staffing for
    - Techs to run the tests
    - Engineering support to handle problems
    - Quality
    - EGSE/MGSE support
- System performance review
  - List of Level III parameters and predicted performance of each vs the level III spec.
  - The subsystem performance prediction should allow us to understand where we think we have margin going into the qual program and where we should really worry
TRR Contents (continued)

• Quality program review
  – Subsystem QA group should concur that they are ready and tell how they will ensure that the test process will meet all requirements to result in certified flight H/W. Eg witness tests, sign off on changes, cleanliness requirements, etc

• Problem / failure reports
  – List of open problem/failure reports on the qual hardware build
  – List of “use as is” problem/failure reports.

• Risk assessment
  – Subsystem Manager’s assessment of risks (possibly top 3 or 5) covering performance, staffing, facilities, schedule, …

• Test schedule
  – One page schedule

• List of reference documents and revs
  – Specifications, Verification Plans, …
TRR Contents (continued)

• System safety
  – EGSE- statements of what has been done to ensure safety (safe to mate, using flight design hardware as EGSE…)
  – MGSE – Statements that safety has been reviewed and that (for example) load margins have been verified, the equipment has been bolted down for earthquakes,…)
  – Env- List of environmental controls required and statement of how each is addressed
  – Training- Verification that the team has required training, such as ESD, cleanroom, …
  – Again, the local safety person should sign off that hazards have been identified and addresses.

• Configuration Management
  – Statement of how test procedures, scripts, … are configuration controlled.

• Issues and concerns