

# GLAST Large Area Telescope

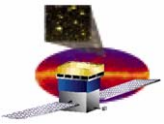
LAT Flight Software  
TRR



## Test Process

Sergio Maldonado  
FSW Test Team Lead

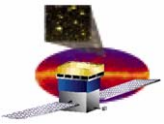
Stanford Linear Accelerator Center



# Test Process

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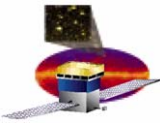
- **Test Approach**
- **Roles & Responsibilities**
- **Test Procedures**
- **Test Scripts**
- **Test Execution**
- **Test Execution Schedule**
- **Issue Resolution During FQT**
- **Post Test Review & Products**
- **Delivery to I&T**



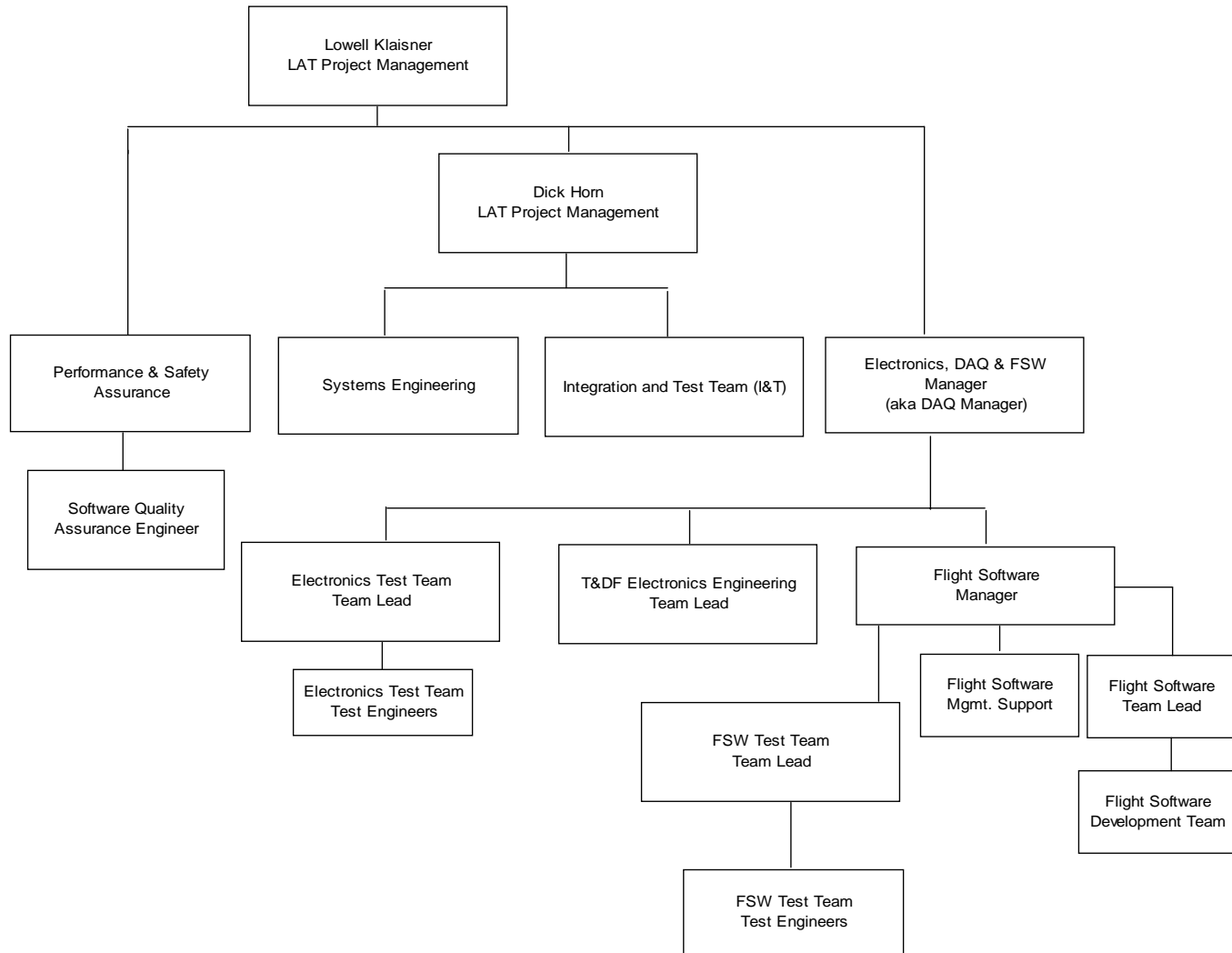
# Test Approach

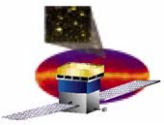
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- **Development testing**
  - Script development in step with FSW development
  - Scripts evolve as FSW functionality matures
- **Candidate testing**
  - Dry runs on integrated builds until run successfully, with FSW updated as needed
  - Formal dry run of scripts prior to initial delivery of FSW to I&T
  - Completion of formal dry runs is in sight
- **Qualification testing**
  - Begins after closure of open items specified at this TRR
  - Formal execution of test scripts over the course of multiple days



# Roles & Responsibilities

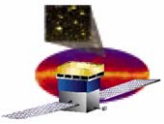




# Roles & Responsibilities (2)

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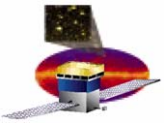
- **Test Team Lead**
  - Own, approve, implement the FSW Test Plan
  - Manage and coordinate test team members
  - Approve all test procedures and test execution products
  - Coordinate testing activities
  - Report results at post-test review
- **Test Team Engineer**
  - Develop assigned test procedures and scripts
  - Execute test scripts
- **SQE**
  - Review and approve FSW Test Plan and Procedures
  - Perform regular audits to ensure CM process is being followed
  - Validate test configuration(s) prior to test execution
  - Witness and approve test execution
  - Monitor issue resolution process
  - Approve final test results package to certify successful completion



# Roles & Responsibilities (3)

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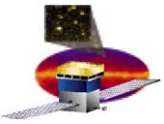
- **T&DF Electronics**
  - **FSW Testbed**
  - **VSC**
  - **Other EGSE**
- **Electronics Test Team Lead**
  - **Configuration control of test facilities**
  - **Scheduling of test facilities**
  - **Maintenance of test facilities**
- **FSW CCB**
  - **Approve specification, ICD, test plan, test procedure, and script changes**
  - **Disposition software problem/change reports**



# Test Procedures

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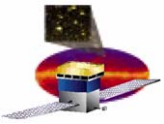
- **Related procedures organized into suites for assignment to test engineers**
- **All procedures have undergone peer review and have been CCB approved**



# Test Scripts

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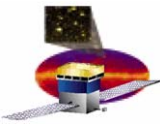
- **Validated by FSW Test Team Lead**
  - **Confirms correct execution**
  - **Confirms consistency with the test procedure**
  - **Checked into CMX as production versions**
- **Scripts brought under CCB control prior to FQT**
- **Once under CCB control, script changes tracked via JIRA**
  - **“FSW Test Scripts” project under “Glast Flight” category**
    - **See URL: <https://jira.slac.stanford.edu/browse/FSWTS>**



# Test Execution

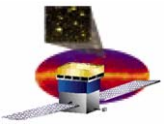
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- Test engineers execute test procedures on the Testbed over several days and analyze the results
- Witnessed by SQE
- Test procedure redlines and blacklines
  - Performed according to LAT-MD-03474
  - Redlines: record permanent change to test procedure
  - Blacklines: record “incidental”, one-time deviation from a procedure
- Defects documented via JIRA
- Test reports written to summarize results
- Post-test review verifies test reports and other test products



# Test Execution Schedule

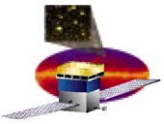
Day	Test Suites	(# tests) Test Suite Description
1	<ul style="list-style-type: none"> <li>• FSWINI</li> </ul>	<ul style="list-style-type: none"> <li>• (14) FSW Initialization</li> </ul>
2	<ul style="list-style-type: none"> <li>• FECALB</li> <li>• DCMODE</li> </ul>	<ul style="list-style-type: none"> <li>• (5) Front-End Calibration (i.e., charge injection calibration)</li> <li>• (1) Diagnostic functions</li> </ul>
3	<ul style="list-style-type: none"> <li>• CMDFNC</li> <li>• FILMGT</li> <li>• MEMMGT</li> <li>• NBTLMV</li> </ul>	<ul style="list-style-type: none"> <li>• (2) Command Functional</li> <li>• (1) File Management</li> <li>• (2) Memory Management</li> <li>• (3) Narrow-Band Telemetry Verification</li> </ul>
4	<ul style="list-style-type: none"> <li>• THRMCS</li> <li>• TIMPRC</li> <li>• VSGIFV</li> <li>• WBTLMV</li> <li>• EVTFIL</li> <li>• EVTPMO</li> <li>• OPMODE</li> <li>• SIUCFG</li> <li>• IPCFNC</li> </ul>	<ul style="list-style-type: none"> <li>• (2) Thermal Control System</li> <li>• (1) Time Processing</li> <li>• (1) Discrete Signals Interface Verification</li> <li>• (1) Wideband Telemetry Verification</li> <li>• (4) Event Filtering</li> <li>• (4) Event Performance Monitoring</li> <li>• (1) Operational Modes</li> <li>• (2) SIU Configuration</li> <li>• (1) Inter-Processor Communications</li> </ul>
5	<ul style="list-style-type: none"> <li>• Margin/retest</li> </ul>	



# Issue Resolution During FQT (1)

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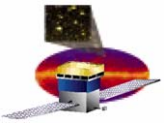
- **FSW & EGSE**
  - Issues reported in JIRA
  - Reviewed by FSW Test Team Lead
    - If valid, assigned to CCB
    - If not, closed with reason noted
  - For FSW issues
    - CCB rejects, approves, or identifies further action
    - If approved, CCB assigns to developer and specifies required level of regression testing
      - Changes unit tested prior to delivery to FSW Test Team
      - Test Team verifies changes, including regression testing
      - Test Team Lead marks issue “resolved”
      - “Resolved” issues reviewed and closed by CCB
  - For EGSE issues
    - CCB rejects or accepts
    - If accepts, NCR is created and JIRA item closed, referencing NCR



# Issue Resolution During FQT (2)

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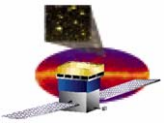
- **Test Scripts**
  - **Issues reported in JIRA**
  - **Reviewed by FSW Test Team Lead**
    - **If valid, assigned to CCB**
    - **If not, closed with reason noted**
  - **At CCB:**
    - **CCB rejects, approves, or identifies further action**
    - **If approved, CCB assigns to test engineer**
      - **Changes tested**
      - **Test Team Lead verifies changes**
      - **Test Team Lead marks issue “resolved”**
      - **“Resolved” issues reviewed and closed by CCB**



# Regression Testing

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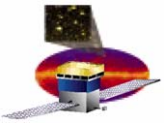
- **Regression testing prior to FQT:**
  - Re-run all test scripts that can be run in batch mode (expected to be >90 % of scripts). Analysis of most of these scripts will only be looking for “PASS” vs. any other detailed analysis. FSW CCB may recommend detailed analysis of results for tests of FSW likely to be directly impacted by the change.
  - Run other test scripts if FSW CCB determines that related functionality could be impacted
  - Reporting – Informal, via email to FSW Manager, SE, SQA. In test report, identify any tests that required updates in order to run with the changed software. Summarize the changes needed for each test.
- **Regression testing after FQT:**
  - Approve any test procedure and script updates via FSW CCB
  - Re-run all test scripts that can be run in batch mode. Analysis of these scripts will only be looking for “PASS” vs. any other detailed analysis. FSW CCB may recommend detailed analysis of results for tests of FSW likely to be directly impacted by the change.
  - Run test scripts that require manual intervention if FSW CCB determines that related functionality could be impacted
  - Run new or changed tests formally, with an SQA witness
  - Reporting – Formal, via test report document



# Post-Test Review

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- **Held within 10 working days after last test session**
- **Confirm tests successfully completed (or specify what is required for completion)**
- **Review test products**
  - **Test reports**
  - **JIRA issue reports**
- **Other deliverables**
  - **Version Description Document**
  - **Telecommand & Telemetry document & .dbx file**
  - **Test scripts**
  - **Test script results data**



# Delivery to I&T

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- FSW generates build with set of defined FSW packages
- FSW packages released to I&T as a .db file
  - Currently, deltas to currently loaded packages identified by hand
  - In future, enhanced FMX tool will provide this capability
- I&T loads delta packages onto LAT
- FSW development and test teams will provide support to I&T after delivery
- Incremental deliveries to I&T after acceptance of FQT release will be CCB controlled and formally regression tested