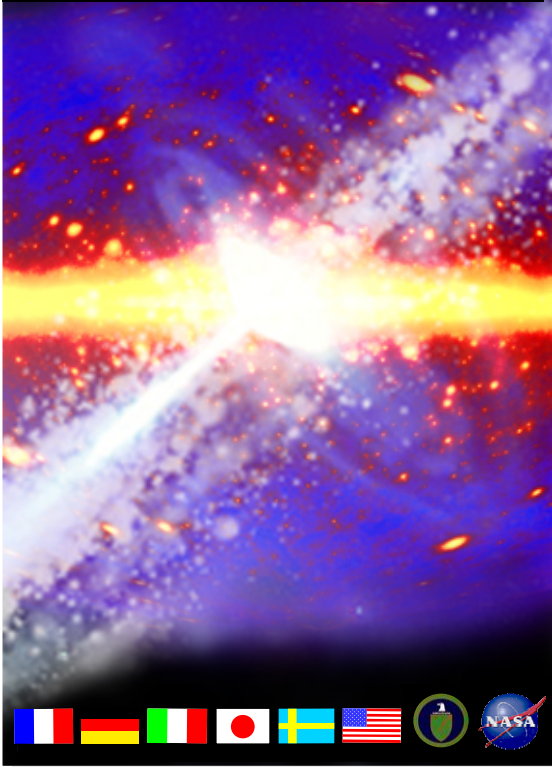




Gamma-ray Large
Area Space
Telescope



GLAST Large Area Telescope

LAT Flight Software
System Checkout TRR

Test Process

Sergio Maldonado
FSW Test Team Lead

Stanford Linear Accelerator Center



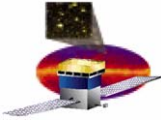
Test Process

- **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**

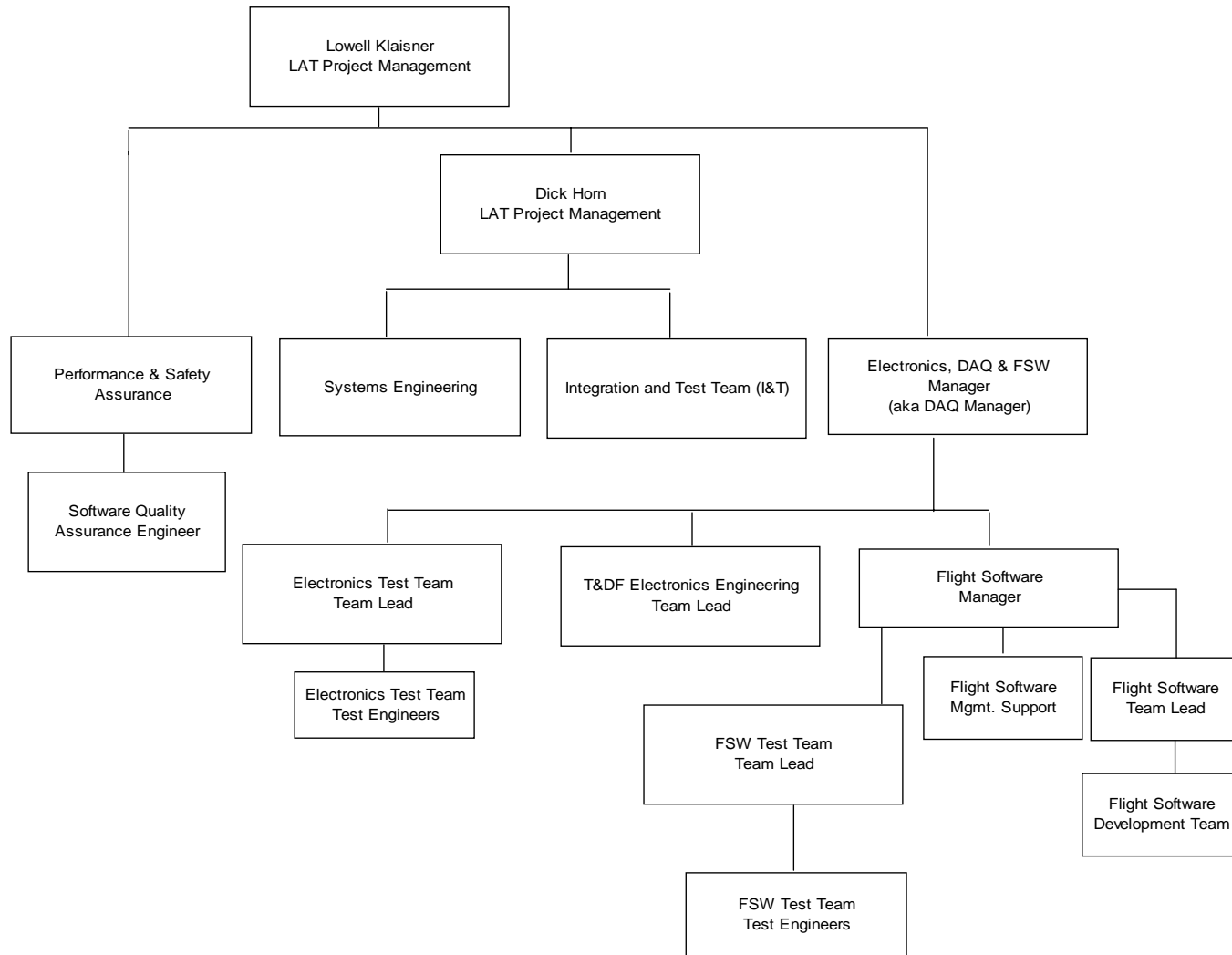


Test Approach

- **Development testing**
 - Script development in step with FSW development
 - Scripts evolve as FSW functionality matures
- **Candidate testing**
 - Dry runs on candidate builds until run successfully, with FSW updated as needed
 - Completion of candidate testing 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)

- **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 Engineers**
 - 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



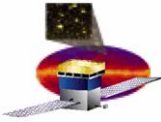
Roles & Responsibilities (3)

- **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**



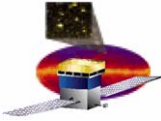
Test Procedures

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



Test Scripts

- **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**



Test Execution

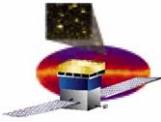
- Test engineers execute test procedures on the Testbed over several days and analyze the results
- Witnessed by SQE
- Test procedure redlines and blacklines
 - Performed according to LAT-MD-03474
 - Redlines: record permanent change to test procedure
 - Blacklines: record “incidental”, one-time deviation 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

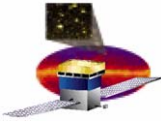
- Prioritized based on goals of LAT System Checkout

Day	Functional Area	Specific Tests
1	<ul style="list-style-type: none"> • SIU and EPU “nominal” primary and secondary boot • Housekeeping and low-rate science telemetry • FSW and instrument “nominal” configuration control • Mode control • Charge injection calibration 	<ul style="list-style-type: none"> • FSWINI_001, FSWINI_009, FSWINI_005, CMDFNC_001, FSWINI_010 • NBTLMV_001 • SIUCFG_001, SIUCFG_002, FILMGT_001 • OPMODE_001 • FECALB_001 through 005
2	<ul style="list-style-type: none"> • Instrument diagnostic functions • Event filter and science data output 	<ul style="list-style-type: none"> • DCMODE_001, DCMODE_002, DCMODE_003, EVTPMO_001, EVTPMO_002, EVTPMO_003, EVTPMO_004 • EVTFIL_001, EVTFIL_002, EVTFIL_003, EVTFIL_004, WBTLMV_001
3	<ul style="list-style-type: none"> • SIU and EPU “non-nominal” boot 	<ul style="list-style-type: none"> • FSWINI_002, FSWINI_003, FSWINI_004, FSWINI_007, FSWINI_006, FSWINI_008, FSWINI_012, FSWINI_013, FSWINI_014, FSWIN_011, CMDFNC_003
4	<ul style="list-style-type: none"> • FSW and instrument “non-nominal” configuration control • ACD HSK anomaly response • Time services • Thermal control system • Interface formats: diagnostic telemetry, inter-processor comm., discrete signals 	<ul style="list-style-type: none"> • MEMMGT_001, MEMGT_002 • NBTLMV_003 • TIMPRC_001 • THRMCS_001 • NBTLMV_002, IPCFNC_001, VSGIFV_001



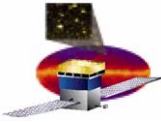
Issue Resolution During FQT

- **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
- **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



Post-Test Review

- **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**
 - **Software Design Document**
 - **Version Description Document**
 - **Telecommand & Telemetry document & .dbx file**
 - **Test scripts**
 - **Test script results data**



Delivery to I&T

- **I&T will have access to qualified FSW directly from the FSW repository**
- **FSW development and test teams will provide support to I&T after delivery**
- **Incremental deliveries to I&T after acceptance of System Checkout release, if any, will be CCB controlled and formally regression tested**