

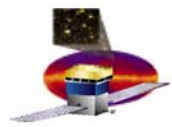
GLAST Large Area Telescope: I & T Peer Review

Performance & Safety Assurance

**Darren S. Marsh
SU-SLAC**

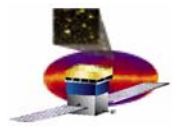
Performance & Safety Assurance Manager

**Marsh@SLAC.Stanford.Edu
(650) 926-4577**



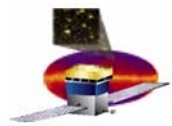
Outline

- **Introduction**
- **Requirements**
- **Performance Assurance System**
- **Contamination Control**
- **Workmanship and Inspection**
- **Nonconformance Reporting**
- **Systems Safety**

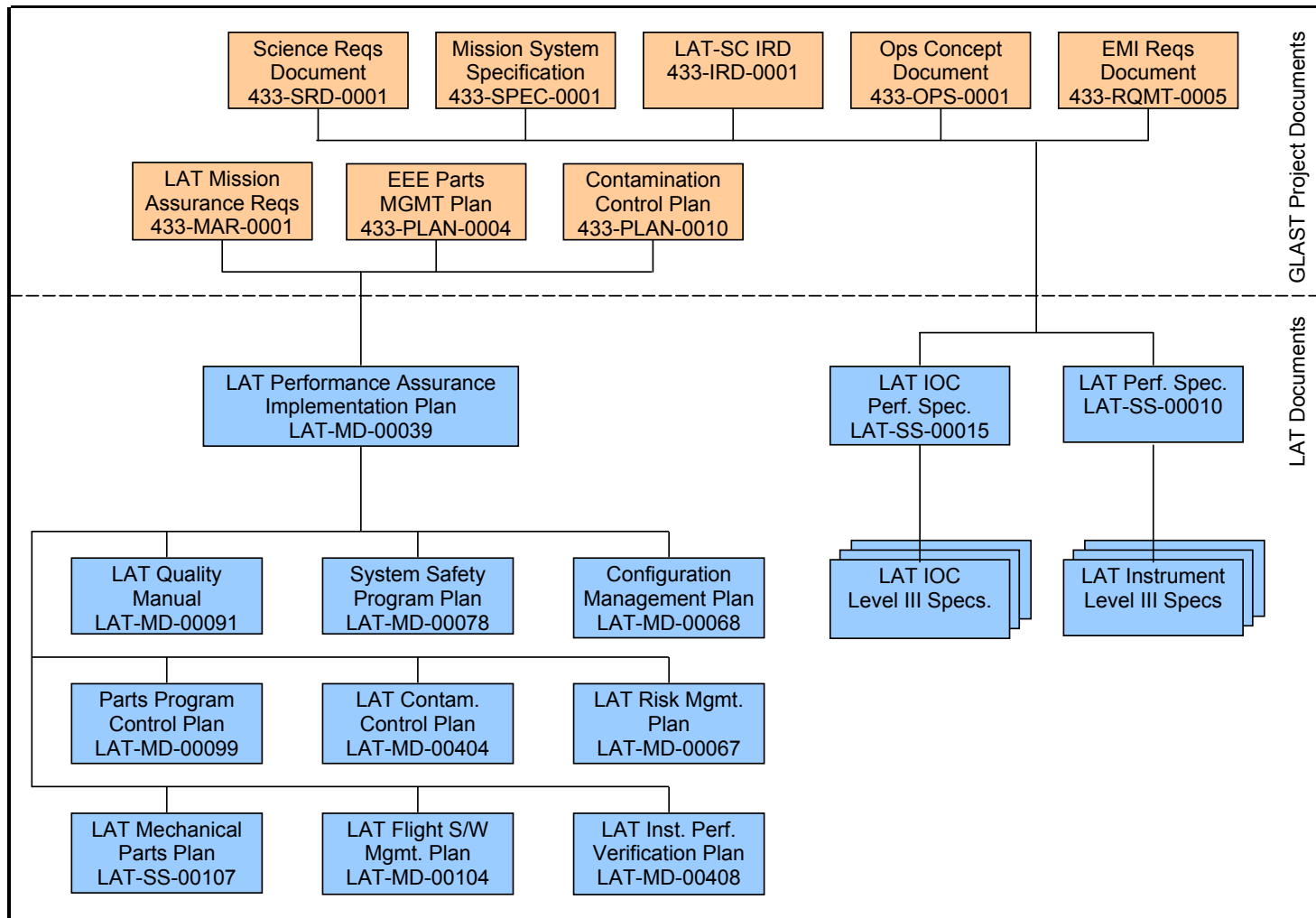


Introduction

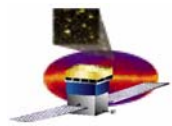
- **Performance & Safety Assurance is a program consisting of:**
 - **Quality Assurance**
 - **Hardware**
 - **Software**
 - **Systems Safety**
 - **EEE Parts Program**
 - **Materials & Processes Program**
 - **Contamination Control**
 - **Reliability & Risk Management Program**
 - **Design Verification**
 - **Technical Reviews**



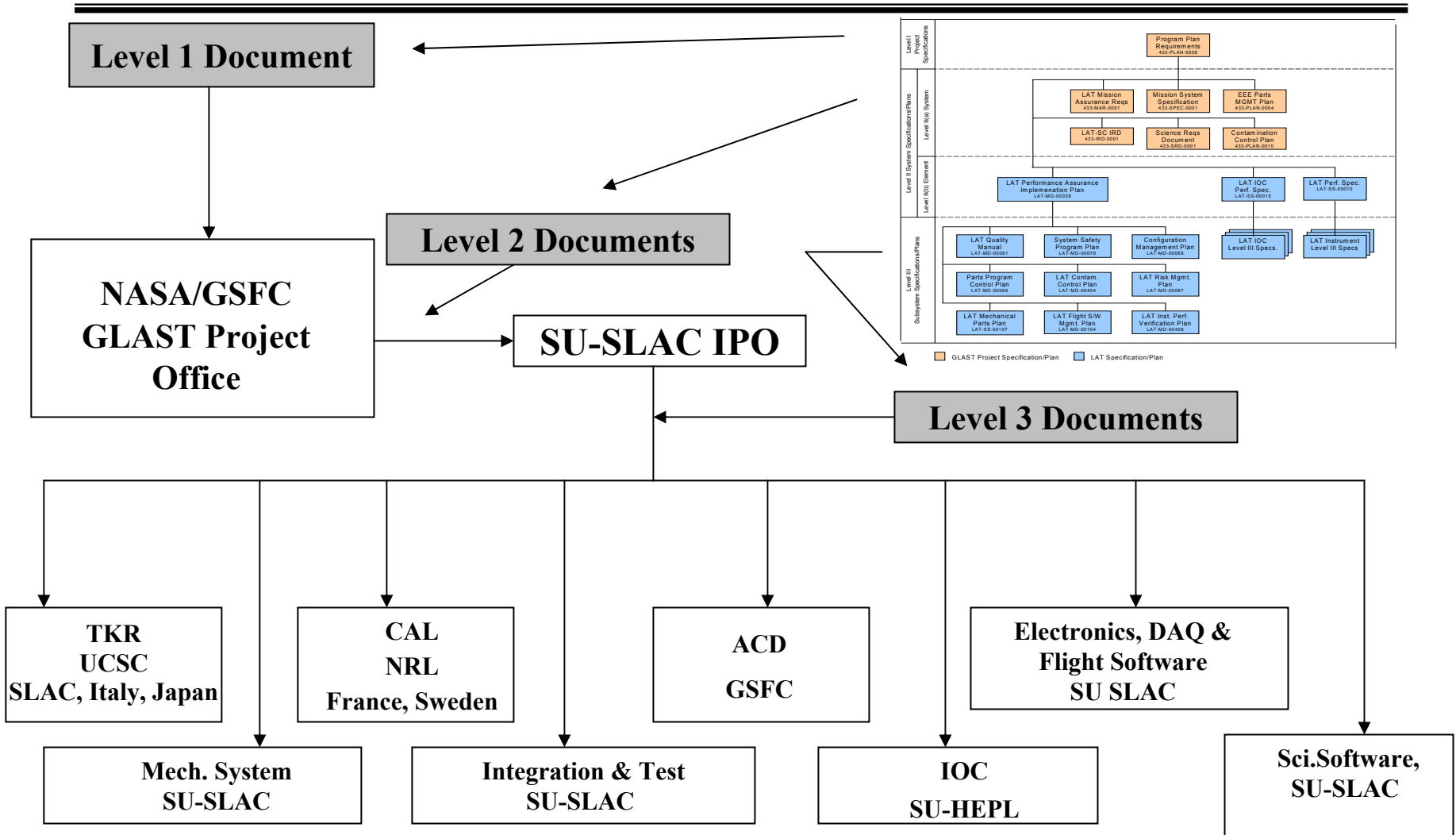
Performance & Safety Assurance Requirements



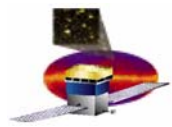
GLAST Project Documents
LAT Documents



Requirements Flow-Down

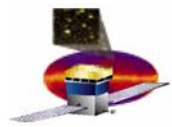


Level 4 Documents: controlled by each subsystem manager



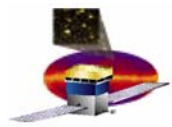
LAT Performance Assurance System

- **LAT Performance Assurance Implementation Plan (PAIP), LAT-MD-00039, Released and Approved by GSFC**
 - Requirements for performance assurance elements are defined
- **LAT Quality Manual, LAT-MD-00091, Completed and Released**
 - Procedures and work instructions established which provide for the identification, handling, packaging, storage and transportation of flight hardware
- **Configuration Management Plan, LAT-MD-00068, Implemented**
 - All project documentation stored in central database, with individual controlled access via:
 - <http://www-glast.slac.stanford.edu>
 - Single Document Change Notice (DCN) Form for initial release to configuration control, and to record changes



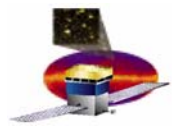
Other Performance Assurance System (Con't.)

- **Design Verification**
 - **Instrument Performance Verification Plan, LAT-MD-00408, issued and released**
 - **LAT Environmental Specification, LAT-SS-00778, completed, in review cycle**
 - **Requirements traceability/verification matrix development efforts underway**
- **Test Facility Activities**
 - **On-going preparation of SLAC I&T facility for flight hardware receipt**
 - **Cleanroom procedures and personnel training planned**
 - **ESD equipment and facility environmental monitoring equipment in place**
 - **SLAC End Station “A” facility/equipment requirements identified and planned**
 - **Survey of NRL Payload Checkout Facility performed**
 - **Capabilities, personnel qualifications, and equipment specifications reviewed**



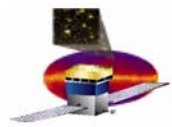
Other Performance Assurance Systems (Con't.)

- **Calibration Program Implemented, LAT-MD-00470**
 - **Equipment and tools used for flight hardware inspection, test and measuring are calibrated to ensure their accuracy**
- **QA support of integration and test activities:**
 - **Test readiness reviews**
 - **Verify test set-ups**
 - **Monitor thermal testing**
 - **Witness vibration testing**



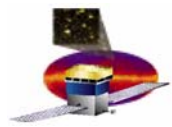
Contamination Control

- **The LAT Contamination Control Program will be governed by the LAT Contamination Control Plan, LAT-MD-00404**
 - **LAT Integration & test activities will be performed in class 100,000 environment**
 - **Surface cleanliness verification of flight hardware by particle fallout plates, tape lifts, particle fallout samples and/or NVR solvent rinses/swabs**
 - **Materials used in flight hardware shall meet outgassing requirements as specified in the LAT Contamination Control Plan**
 - **Required thermal vacuum testing of flight hardware shall be performed and outgassing rates shall be monitored to achieve required maximum outgassing levels**



Work Authorization

- **All integration & test activities will be performed on approved Assembly and Inspection Data Sheets (work orders)**
 - **Responsible Engineer, Manufacturing Engineer and Quality Engineer review and sign**
 - **Assembly, integration or test instructions**
 - **Step-by-step procedures**
 - **Provisions for operator and inspector sign-off**
 - **May reference other documents, such as test procedures, criteria for workmanship, etc.**
- **Work order remains with specific activity until final acceptance**
- **Completed work orders are archived by LAT Quality Assurance**



Assembly and Inspection Data Sheet

Stanford Linear Accelerator Center
2575 Sand Hill Road
Menlo Park, CA 95025

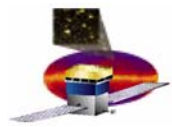
ASSEMBLY AND INSPECTION DATA SHEET

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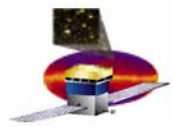
Project LAT	Equipment Title	Drawing/Part No.	Rev.	Serial No.
Reference Designator	Subsystem	Equipment Class	Prepared By	
Approvals				
Responsible Engineer	Date	Manufacturing Engineer	Date	
Quality Engineer	Date			

Step	Instructions	Oper. ID	Date	Stamp



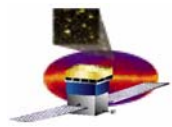
Workmanship & Inspection Requirements

- **Where applicable, all I&T personnel working on flight hardware will be trained and certified to the following standards:**
 - **NASA-STD-8739.1, Workmanship Standard for Staking and Conformal Coating of Printed Wiring Boards and Electronic Assemblies**
 - **NASA-STD-8739.2, Workmanship Standard for Surface Mount Technology**
 - **NASA-STD-8739.3, Requirements for Soldered Electrical Connections**
 - **NASA-STD-8739.4, Requirements for Crimping, Interconnecting Cables, Harness, and Wiring**
 - **NASA-STD-8739.7, Electrostatic Discharge Control.**



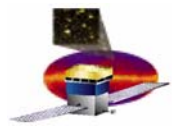
Workmanship & Inspection Requirements (Con't.)

- **The Assembly and Inspection Data Sheet will define the steps for QA inspection**
 - **Quality records will be maintained and reviewed**
- **Mandatory inspections points (MIP) will be performed for integration & test at predefined inspection points**
 - **To screen out defects caused by workmanship, design, assembly, etc.**
 - **To prevent unacceptable products from entering the next stage of production**
 - **A final inspection verified that the hardware/software deliverables meet requirements and are properly documented**



Nonconformance Reporting

- **During integration and test, all nonconformances will be reported through the LAT nonconformance & corrective action (NCR/CA) system**
 - **All major nonconformances will be reported to the GSFC Project Office within 24 hours**
 - **Close-out of all nonconformance reports shall be verified by the Performance Assurance Manager**
- **The LAT I&T Material Review Board (MRB) shall determine the disposition of all flight hardware that does not conform to drawings, specifications or requirements**
 - **MRB is chaired by the PSAM with participation from design engineering, system engineering and effected subsystem personnel**
 - **A waiver request will be process for any “use as is” MRB disposition**



Systems Safety

- **Established and implemented System Safety Program Plan (SSPP), LAT-MD-00078**
 - **Comply EWR 127-1, Eastern and Western Range Safety Requirements**
 - **LAT Preliminary Hazard Analysis, LAT-MD-00366, identifies safety critical areas, assesses risk, and establishes requisite hazard controls**
 - **LAT Operating and Support Hazard Analysis, (in progress), evaluates activities for hazards or risks introduced into the system by operational and support procedures and evaluates the adequacy of operational and support procedures used to eliminate, control, or abate identified hazards or risks.**
- **Identified hazards include:**
 - **Collision**
 - **EMI/EMC**
 - **Structural Failure**