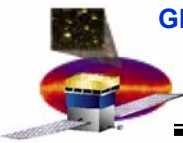


## **GLAST Large Area Telescope:**

# Mechanical Systems' EM Test Plans

**Marc Campell**



# Engineering Modeling Tests

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- Grid has thermal & mechanical interfaces with the Tracker, Calorimeter, ACD, Radiators & Spacecraft
- EM test plans developed for:
  - Mechanical interfaces
  - Thermal interfaces
  - Critical fabrication & assembly processes
- EM testing is underway now

The logo for the GLAST LAT Project, featuring a stylized satellite or space station component with a blue and white base and a yellow and red top section, set against a dark background with a starburst effect.

# Engineering Modeling Tests - Mechanical

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4 Mechanical tests planned:

- CAL-Grid Joint coupon test
- CAL-Grid 1 bay test
- CAL-Grid Cantilever Beam test (TBR)
- 1 x 4, 4-bay Grid unit test

The logo for the GLAST LAT Project, featuring a stylized satellite or probe with a blue and white body and a red and yellow circular element, set against a dark background with a star.

# Engineering Modeling Tests - Mechanical

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## 1. CAL-Grid Joint Testing

- Objectives
  - Maximize friction characteristics of joint
  - Select bolt - Helicoil combination for max preload
  - Validate joint capabilities (coupon test)
- Risks mitigated
  - CAL-Grid bolted interface failure
- Procedure overview
  - Determine coefficient of friction for different surfaces at high & low preload values
  - Bolt preload & torque at failure for combo's of thread type, finishes & lubes
  - Load vs. deflection of tab coupons pulled in tension

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## Engineering Modeling Tests - Mechanical

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### 2. CAL-Grid Joint 1 bay testing

- Objective
  - Verify that joint behavior scales up in 3 dimensions
- Risks mitigated
  - CAL-Grid bolted interface failure (slippage)
- Procedure overview
  - Preload indicating film determines preload distribution of CAL plate on 1 bay Grid
  - Random vibrate with CAL mass simulator
  - Induce slippage of CAL plate via static loading (TBD)

The logo for the GLAST LAT Project, featuring a stylized satellite or probe with a blue and white body and a red and yellow orbital path, set against a black background with a star.

## Engineering Modeling Tests - Mechanical

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3. CAL-Grid Cantilever Beam Test (probably folded into 1 x 4 Grid tests)
  - Objective
    - Validate FEM of Grid (predicted stresses, deflections)
    - Verify CAL – Grid bolted interface behavior
    - Demonstrate manufacturability of Grid
  - Risks retired
    - CAL-Grid bolted interface failure
    - Grid structural behavior (predicted distortions)
  - Procedure overview
    - Apply bending loads to “spline” of Grid with CAL plates
    - Record load, deflection & strain gages
    - Repeat w/ missing fasteners (TBD)

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# Engineering Modeling Tests - Mechanical

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## 4. 1 x 4, 4-bay Grid Unit

- Objective
  - Demonstrate Grid manufacturability
  - Demonstrate purge gas system
  - Verify CAL – Grid joint behavior scales up
  - Provide to I&T group
- Risks retired
  - CAL-Grid bolted interface failure
  - Fabrication errors, process problems
  - Flex cable routing to TEM box
- Procedure overview
  - Preload indicating film determines preload distribution of CAL plates on 4 bay Grid
  - “Smoke” test of purge gas system
  - Feasibility of structural (static load, vibe) tests under investigation

The logo for the GLAST LAT Project, featuring a stylized satellite or space station component with a blue and white base and a red and yellow top section, set against a black background with a white star.

# Engineering Modeling Tests - Thermal

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3 Thermal tests planned + 1 proposed

- Thermal contact tests (completed)
  - Thermal gasket material performance vs. contact pressure
- X-LAT EM heat pipe characterization tests
  - Preload distribution under contact area (completed)
  - Thermal performance of EM heat pipe
- Thermal joint interface conductance tests
  - Empirical conductance values for actual bolted joint configurations
- X-LAT Thermal joint repeatability study (CCB req'd)
  - Propose design mods that allow better access to E-boxes during I&T operations & LAT verification tests
  - Demonstrate repeatability of X-LAT – E-box thermal joint
  - Demonstrate thermal performance of this joint
  - Sell GSFC on no penalty test required after X-LAT removal (?)



The logo features a stylized satellite or space station component in blue and white, positioned above a colorful, multi-layered circular graphic that resembles a heat pipe or a cross-section of a component. The colors transition from purple at the top to red, orange, and yellow at the bottom.

## Engineering Modeling Tests - Process

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### 4 Process tests planned

- Grid Heat Pipe bonding process qualification test
- 4 bay Grid unit fabrication (Mfg processes)
- X-LAT Plate fabrication process development tests (part of Vendor subcontract)
- LAT EMI Skirt accessibility study (with I & T)