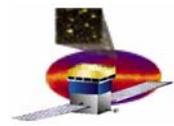


# GLAST Large Area Telescope Calorimeter Subsystem

EMI / EMC Test

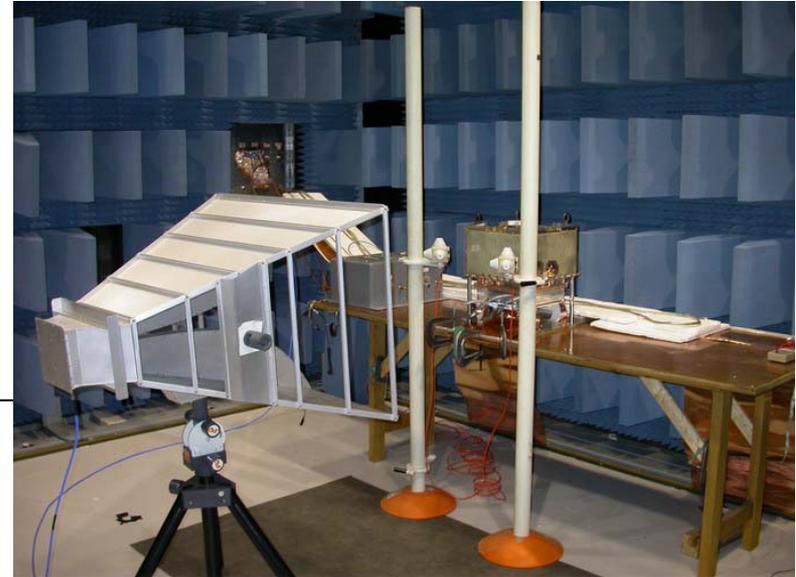
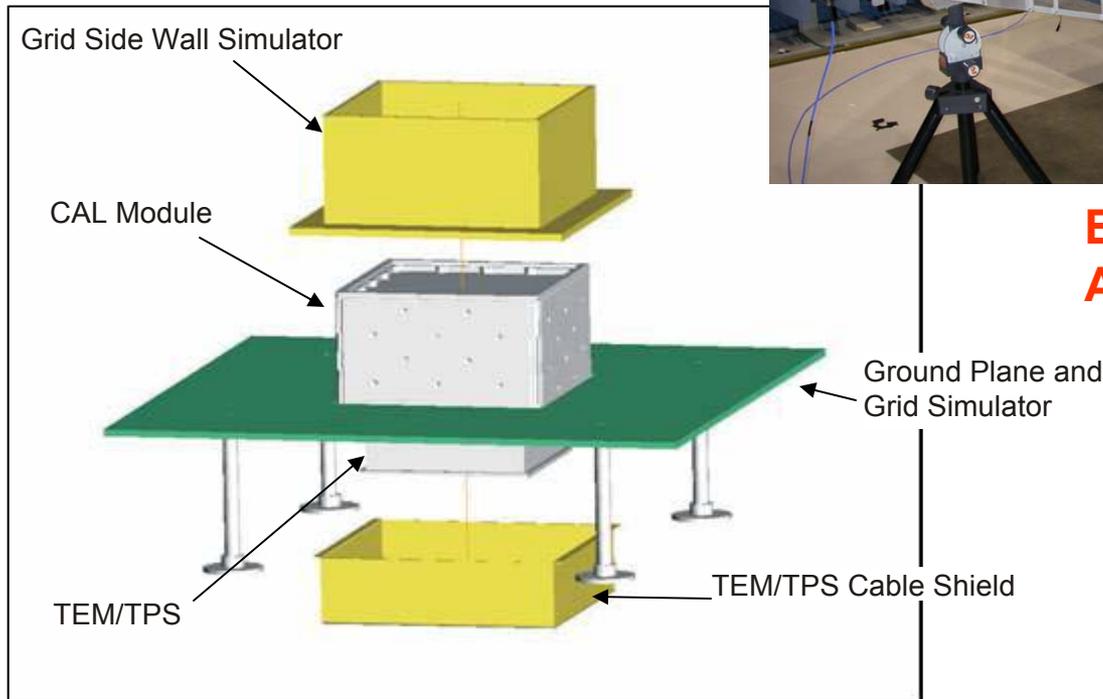
*Lisa Gelston*





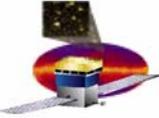
# EMI/EMC Test

## Flight Test Configuration



**EM CAL in NRL  
Anechoic Chamber**



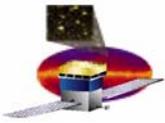


# EMI/EMC Requirements, Traceability, Pass/Fail

---

- ❑ **Requirements (Reference LAT-PS-03929-02, Section 2.2)**
  - **Design requirements for supporting test equipment, EM2 TEM/TPS, have been verified by SLAC**
    - grounding, shielding, filtering of power converters, and switching transient noise (ensures the noise is restricted to individual box)
  - **Wires between the TEM, the Calorimeter and the connectors will be shielded**
    - with the shortest wire connections (pigtailed)
  
- ❑ **Traceability**
  - **LAT-SS-00778, LAT Environmental Specification**
  
- ❑ **Pass/Fail Criteria**
  - **LAT-PS-03929-02, Section 3.7**
    - The Pre-EMI Functional Testing will establish a nominal CAL performance baseline for operation during EMI emissions and susceptibility testing**





# EMI/EMC Testing to Date

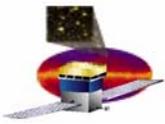
- ❑ **Engineering Model CAL Module**
  - Full suite of EMI/EMC tests conducted using EGSE version of TEM/TPS
  - Test configuration did not reflect flight shielding (see photo)
  - Results indicated significant radiated emissions and conducted emissions
  - CAL design changes instituted for flight to seal cracks: EMI gaskets, O-rings
  - Quality of TPS precluded meaningful conducted emissions/susceptibility testing
- ❑ **Component Testing**
  - None



**EM CAL Module in NRL  
Anechoic chamber**

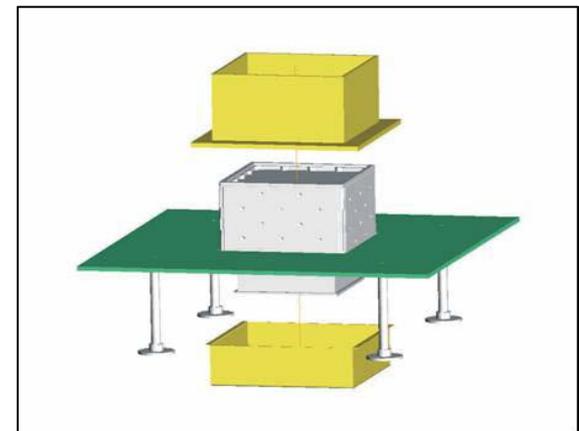
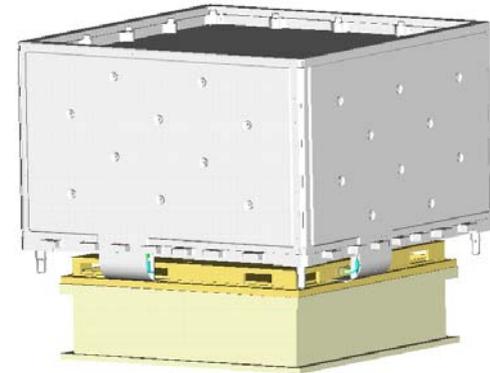
**July 2003**

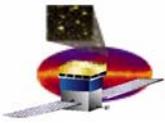




# EMI/EMC Test Configuration

- ❑ The test specimen shall consist of the following as documented in the as-built configuration list:
  - CAL Tower Module (LAT-DS-04536)
- ❑ Deviations from flight configuration
  - EM2 TEM/TPS Assembly (replaces flight unit)
  - TEM/TPS Cable Shield
  - Ground Plane and Grid Simulator
  - Grid Sidewall Simulator





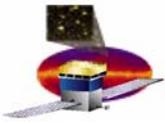
# EMI/EMC Test Flow

Each of these tests require the CAL to be configured and operated in specific modes of operation to simulate a worst case operating scenario for each of the specified test configurations.

<b><i>Protoflight Test Flow (QM)</i></b>		<b>Pass/Fail from LAT-SS-00778</b>
<b>CE102</b>	<b>Conducted Emissions, Power Leads</b>	<b>Figure 12</b>
<b>CECM</b>	<b>Conducted Emissions, Time Domain</b>	<b>Figure 16</b>
<b>CS102</b>	<b>Conducted Susceptibility, Power Leads</b>	<b>Figure 24</b>
<b>CSCM</b>	<b>Conducted Susceptibility, Common Mode</b>	<b>Figure 27</b>
<b>CS06</b>	<b>Conducted Susceptibility, Spike, Power Leads</b>	<b>Figure 28</b>
<b>RE101</b>	<b>Radiated Emissions, Magnetic Field</b>	<b>Figure 10</b>
<b>RE102</b>	<b>Radiated Emissions, Electric Field</b>	<b>Figure 9a</b>
<b>RS101</b>	<b>Radiated Susceptibility, Magnetic Field</b>	<b>Figure 20</b>
<b>RS103</b>	<b>Radiated Susceptibility, Electric Field</b>	<b>Figure 18</b>
	<b>Static Magnetic Field</b>	<b>verified by analysis</b>

<b><i>Acceptance Test Flow (FM)</i></b>		<b>Pass/Fail from LAT-SS-00778</b>
<b>CE102</b>	<b>Conducted Emissions, Power Leads</b>	<b>Figure 12</b>
<b>CS102</b>	<b>Conducted Susceptibility, Power Leads</b>	<b>Figure 24</b>



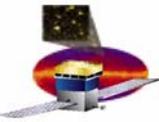


# EMI/EMC Facility Status

---

- ❑ Facility is ready
- ❑ Test Fixtures are ready (delivery 20 August 2004)
- ❑ Potential schedule conflict with SECCHI program



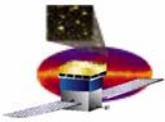


# EMI/EMC Known Risks and Limitations

---

- ❑ **The LAT-SS-00778 requirements for QM and FM modules do not address testable configurations**
  - Specified limits are for a CAL module alone
  - Testable configuration requires a TEM and TPS
  - EMI/EMC impact of having all of these items in test not reflected in allocation of LAT system requirements to the CAL module
- ❑ **Simulation of GRID and TEM/TPS areas shielding may give inaccurate representation of LAT system shielding (too little or too much)**
- ❑ **Testing with EM2 TEM/TPS may not reflect actual performance of flight TEM/TPS**





# EMI/EMC Status

ITEM	STATUS
Requirements	Defined
Pass-Fail Criteria	Defined
Testing to Date	Problems discovered resulted in CAL design changes
Configuration	Defined
Handling/Installation	Defined
Facility Status	Ready
Test Equipment	Ready
Risks and Limitations	Need F. Blanchette attention and participation
Procedure	Configured
Status	On Schedule

