

GLAST Calorimeter

*Monthly Cost /
Schedule / Mission
September 2004*

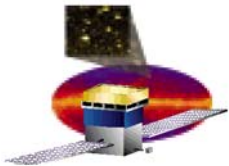
Monthly Cost/Schedule/Mission Review

GLAST LAT Calorimeter September 30, 2004

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GLAST Calorimeter

Outline

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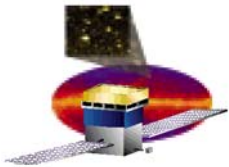
□ **Technical Status:**

- **Last Month's Accomplishments**
- **Near-term Milestones & Status towards them for next 3 months (from F2F)**
- **Drawing Release Plan & Status required to achieve production milestones**
- **Summary of issues & concerns**
- **Status of Subsystem's Documentation & qualification program**

□ **Cost & Schedule**

- **Variances**
- **Actions required to retain zero schedule variance**





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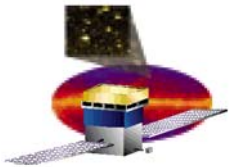
Significant Accomplishments

Crystal Detector Elements

Monthly Cost /
Schedule / Mission
September 2004

- ❑ **CsI Crystals – complete?**
 - To date Kalmar has delivered 1755 tested crystals to NRL. (Need 1728 CDEs)
 - Waiting for 78 additional crystals from Amcrys-H. Per Carlson expects shipment to Sweden next week.
 - Without the 78 crystals, we are short about 12 crystals to complete 18th module.
- ❑ **PIN Photodiode Assembly (PDA) – complete!**
- ❑ **CDE Assembly Process**
 - Essentially all possible CDEs (1755) have been built and tested at Swales
 - Most of team has been released at Swales. Small team is cleaning up potential spare crystals (lot acceptance CDE etc.) Waiting for final crystals from Sweden.





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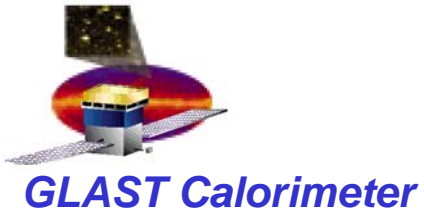
Significant Accomplishments Composite Structures

Monthly Cost /
Schedule / Mission
September 2004

- **19 flight structures have been manufactured (#3 - #21).**
 - **17 of these have completed strength verification testing.**
 - **One (#13) has been rejected due to test anomaly.**
 - **Structures #10 and #12 are being held at NRL for potential flight use.**
 - **A plan has been developed to correct alignment problem by re-machining 4 insert slots in base plate.**
 - **#12 can likely be used without base plate modification. Tolerance requirements and issues are being reviewed.**
 - **There are two spare base plates.**
 - **NRL has received 14 flight structures (including #10 and #12).**
 - **Ecole Polytechnique plans to fab 3 more structures (up to #24)**
 - **Two will replace #10 and #12**
 - **One is a spare that will remain at Ecole Polytechnique.**

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Significant Accomplishments Pre-Electronic Modules

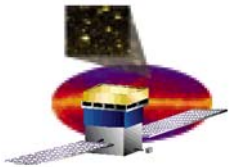
Monthly Cost /
Schedule / Mission
September 2004

- ❑ 8 PEMs have been completely assembled and tested with cosmic muons.
- ❑ PEMs are stored with dry nitrogen purge until electronics are installed.
- ❑ PEM assembly has been on hold for approximately 2 months.
- ❑ PEM 110 is set for CDE insertion this week. (PEM 108 is on hold – out of tolerance structure - #10)



Seven completed PEMs in ESD covers await electronics for completion of CAL modules.



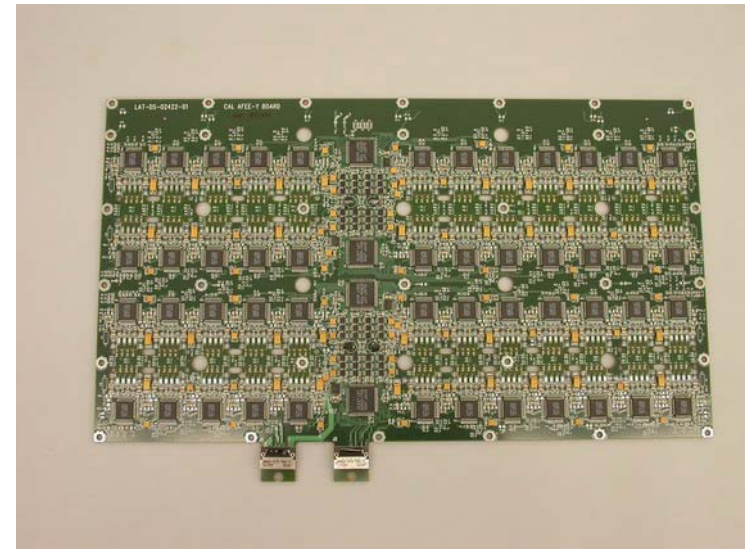


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Significant Accomplishments EEE Parts

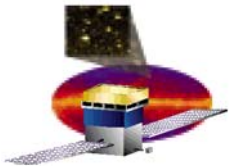
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Schedule / Mission
September 2004

- **ASICs (no change from last month – non accomplishment?)**
 - Qual testing of GCFE and GCRC at GSFC continues. Parts have completed DPA, CSAM after SMT simulation, post SMT simulation functional test. No issues reported to date.
 - 1000 hr life test ends in mid-October.
 - **New Issue: Recent tests show ASIC significantly more sensitive to ESD than expected.**
 - Sensitivity to HBM (human body model) test as low as 200V (expectation 2KV)
 - Mitigations: stringent adherence to NAS-STD-8739.7 (ESD Control).



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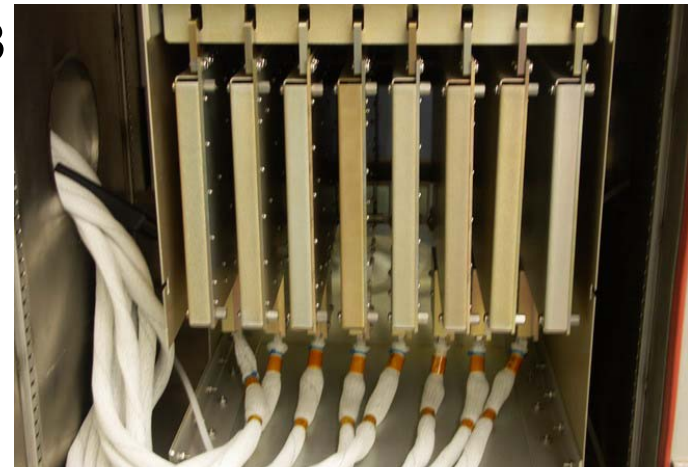
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Significant Accomplishments

Analog Front End Electronics

Monthly Cost /
Schedule / Mission
September 2004

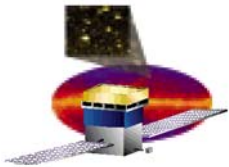
- ❑ All flight AFEE boards (110) have been manufactured
 - Remanufactured AFEE boards have been received, inspected and shipped to assembly vendor.
- ❑ Remaining AFEE board assembly
 - AFEE board cleaning issues have been resolved with assembly vendor - issue of solder flux residue under diode bias caps.
 - Assembly of remaining boards started last week.
- ❑ 32 AFEE boards have completed 168 hr burn in and 3 temperature acceptance tests.
- ❑ 22 of these boards have completed conformal coating.



AFEE burn-in and T cycling – 8 at once

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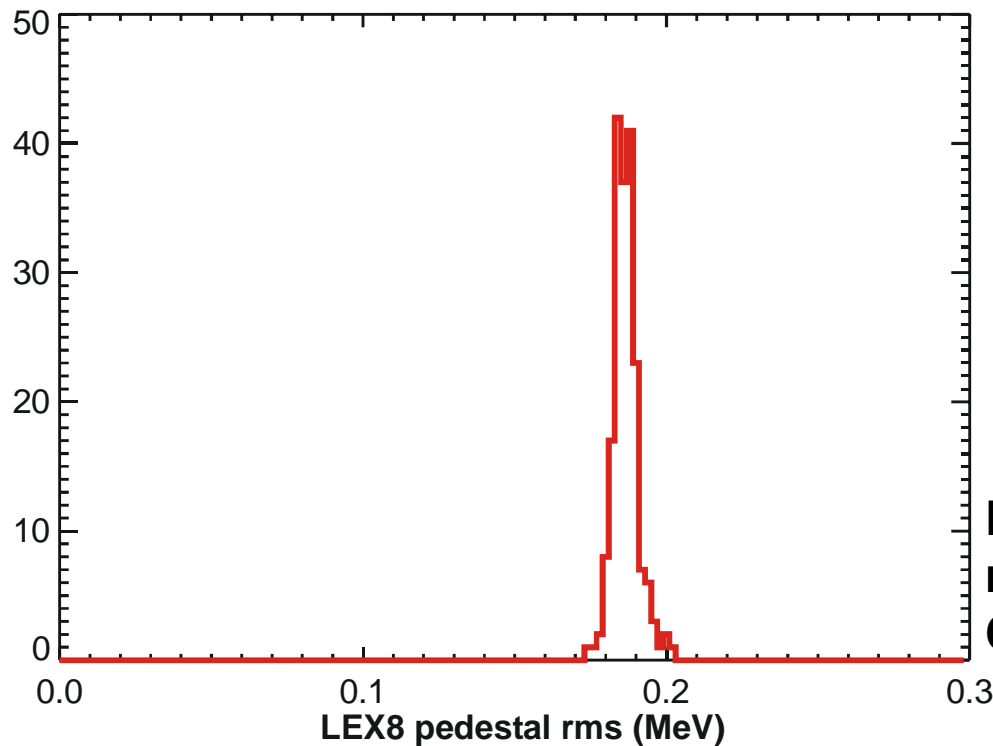
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Significant Accomplishments FM101

Monthly Cost /
Schedule / Mission
September 2004

- ❑ CAL FM 101 (FMA) Assembly Complete
- ❑ Cosmic muon performance good
 - Uniformly low noise, 0.2 MeV (rms)

CAL FM101

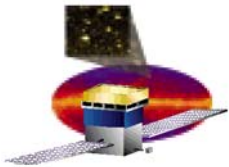


Distribution of noise
measurements for the 192
CDE ends (rms)



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Significant Accomplishments

FM101 (cont 1)

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Schedule / Mission
September 2004

Test Readiness Review Completed

- No significant issues

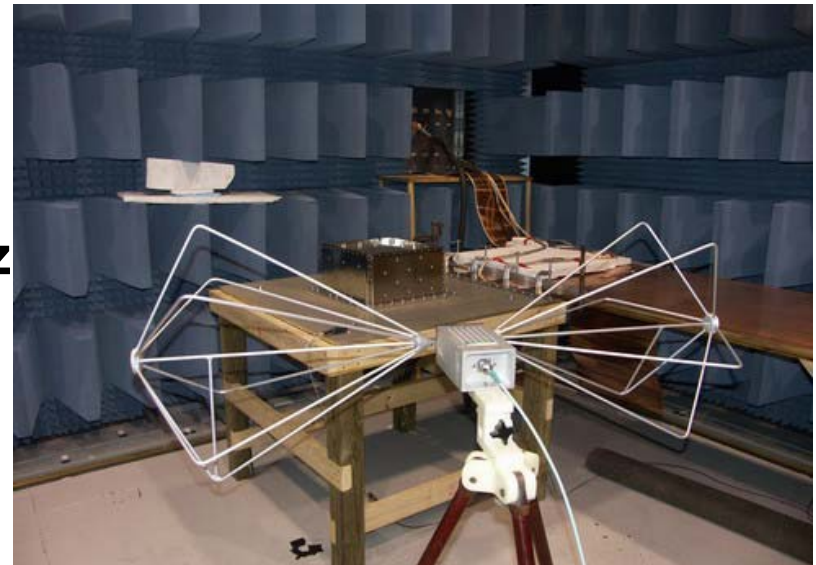
FM 101 EMI/EMC Test Complete

□ Issue: CSCM – 150 kHz to ~ 900kHz

- Detect noise increase in front ends by ~ x2. Likely secondary voltage ripple passed thru EM2 TPS.
- CAL meets spec even w/ increased noise

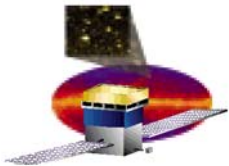
□ Issue: RE102 in GPS and S-band notches

- Harmonics of 20 MHz clocks fail notch spec.
- These failures were corrected by installing TEM/TPS shroud and copper tape around CAL-grid tab leakage paths
- All of this emission is below the base of the GRID.



FMA in EMI/EMC Testing





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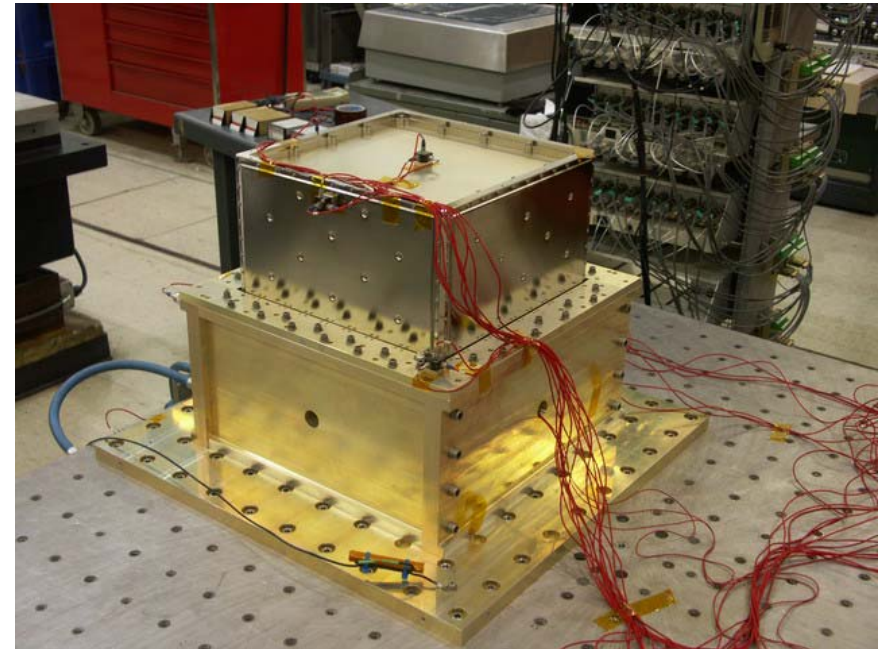
Significant Accomplishments FM101 (cont 2)

Monthly Cost /
Schedule / Mission
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FM 101 Vibration Test Complete (Protoflight Levels)

- ❑ ISSUE: No CAL Issues
- ❑ ISSUE: EM2 TPS experienced electrical failure (electro-mechanical?)
 - Post vibe comprehensive performance test – TEM/TPS failed to power up.
 - 28V current monitor suggests TEM was not receiving power.
 - TPS replaced, new configuration tested normally.
 - Failed TPS returned to SLAC for diagnostics under CAL problem report.

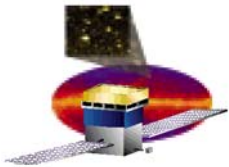
Installation in TVAC occurred yesterday



FMA on vibe slip table for lateral test

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Significant Accomplishments FM102

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- ❑ CAL FM 102 (FMB) AFEE installation complete
- ❑ TEM/TPS mounted
 - During Safe-to-mate another “ESD” event occurred
 - 8 of 16 GCRC had failed cmd, data, or reset lines.
 - Replaced all 16 GCRC
- ❑ Performance testing underway
- ❑ Staking and conformal coating of wires in progress.
- ❑ Vibe test starts next Wednesday



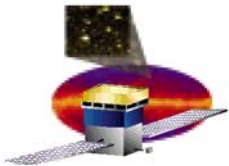
The evil eye of QA inspector

AFEE soldering – 192 wires per side



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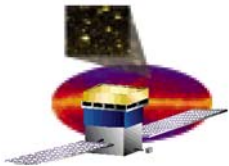
Near Term Schedule

Monthly Cost /
Schedule / Mission
September 2004

Flight Module A (FM 101)		Completion
	2 week Thermal Vacuum Test	13-Oct-2004
	Final Calibration and Performance Tests	27-Oct-2004
	Ship to SLAC I&T	1-Nov 2004
	Ready for Integration	4-Nov-2004
Flight Module B (FM 102)		
	Assembly Complete	1-Oct-2004
	Environmental Tests Complete	5-Nov-2004
	Ready for Integration	2-Dec-2004
Flight Module 1 (FM 103)		
	Assembly Complete	8-Oct-2004
	Environmental Tests Complete	5-Nov-2004
	Ready for Integration	8-Dec-2004

**Last Month
6-Nov-04**





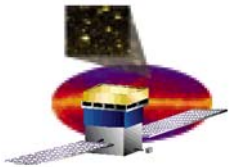
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CAL Module Deliveries

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Schedule / Mission
September 2004*

November '04	FMA
December '04	FMB – FM3
January '04	FM4 – FM7
February '04	...
March '04	FM8 – FM11
April '04	FM12 – FM13
May '04	FM14 - FM16

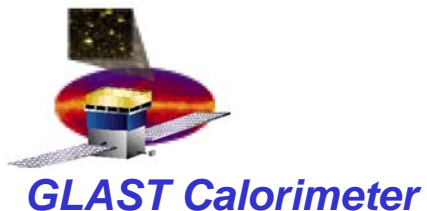




Issues and Concerns

- ❑ **AFEE Boards and CAL-TEM electrical interface**
 - ESD sensitivity of ASICs continues to be an assembly and safe-to-mate problem. Still perfecting handling and test issues
 - NRL is planning to provide copy of our AFEE monitor / breakout box for use at SLAC for replacement of EM2 TEMs with flight TEMs
- ❑ **Availability of flight TEM/TPS**
 - Assembly plan calls for NRL to support the immediate replacement of EM2 TEM/TPS with flight versions at delivery of CAL to I&T. EM2 TEM/TPS is needed back at NRL for subsequent module assembly – this could limit deliveries after FM8.
 - Will flight TEM be available Nov 4th?
 - Do not want to leave CAL stored without TEM/TPS attached waiting for flight TEMs
- ❑ **NRL Thermal Vac Chamber refurbishment in January**
- ❑ **Cost**
 - AFEE card burn in and temperature cycling is not proceeding at scheduled rate. Assembly and test has exceeded the budgeted cost at completion with about 4 months work left to do. Overrun in the range 300 – 400K is projected.
 - Availability of 2nd lot of boards from assembly vendor may put AFEE cards back on the critical path in November.





Drawing Release Summary

Monthly Cost /
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September 2004

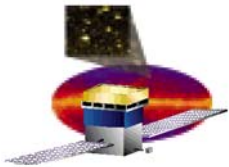
No Change From Last Month

Flight Hardware Drawings

Element	Total Dwgs	Completed Dwgs	Comments
Module Assy	11	11	AFEE Cable support & shield – 3 parts.
PEM Assy	6	6	
Structure	12	12	Includes CAL-TEM stand off
CDE	5	5	
AFEE	8	8	
TOTAL	42	42	100% Complete

- ❑ Effort now is on completing module environmental and functional test procedures





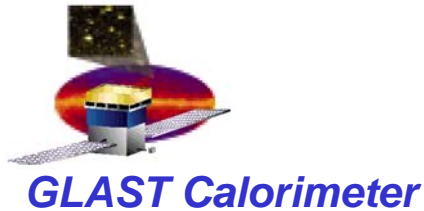
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Documentation and Qualification Program

*Monthly Cost /
Schedule / Mission
September 2004*

- ❑ **CDE manufacture and test procedures – 100% complete**
- ❑ **Composite Structure manufacture and test procedures – 100% complete**
- ❑ **PEM Assembly and Test – 100% complete**
- ❑ **EEE qualification and screening procedures – 100% complete**
- ❑ **AFEE PCB manufacture and assembly – 100% complete**
- ❑ **Module Assembly and Qualification/Acceptance – 100% complete**
 - **Improving / revising verification matrix.**
 - **Environmental test procedures are released**
 - Redlines / improvements from lessons learned are on-going.



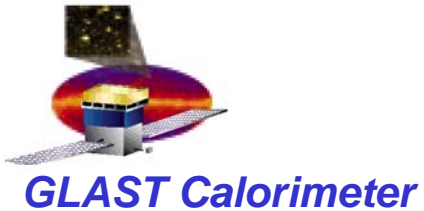


PMCS - August '04 Cost Variances

Monthly Cost /
Schedule / Mission
September 2004

- **Cost Variance: + \$113 cum (-\$116 for Aug)**
 - **+117: Mgmt, Eng, R&QA, (-10 for Aug)**
 - **+586: CDE Manuf.**
 - PDA manufacturing - materials cost underrun.
 - CDE manufacturing - labor underrun (+479)
 - **-43: PEM**
 - **-353: AFEE (-136 for Aug)**
 - Much higher labor costs balanced by savings in GSE materials
 - Fabrication problems, parts problems, you name it.
 - **-249: Module Ass'y & Test**
 - EM CAL overrun (-53)
 - Software (-40)
 - Labor (-69)
 - Facilities (-92)





PMCS – August '04 Schedule Variances

Monthly Cost /
Schedule / Mission
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- **Schedule Variance: - \$1762 cum (-222 for Aug)**
 - **- 87: CDE Manuf.**
 - Stopped bonding CDE for about 1 month due to lack of end caps to complete CDEs. Material storage problem. (No issue: CDE manufacturing is weeks off of the CAL critical path)
 - **- 269: PEM**
 - Delay in delivery of 1st composite structures.
 - **- 172: AFEE**
 - Delay in delivery of ASICs causing delay in screening and qualification work
 - Problems in manufacture of AFEE PCB.
 - **-1201: Module Assy & Test (-208 for Aug)**
 - Delay in electronics delivery for module A&T finally arrived at baseline environmental test costs.

