

GLAST Calorimeter

*Monthly Cost /
Schedule / Mission
August 2004*

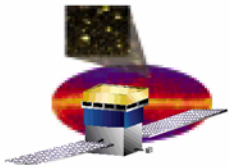
Monthly Cost/Schedule/Mission Review

GLAST LAT Calorimeter September 1, 2004

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GLAST Calorimeter

Outline

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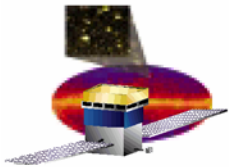
□ **Technical Status:**

- **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

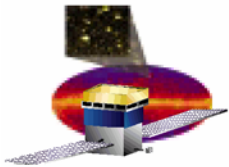
Crystal Detector Elements

Monthly Cost /
Schedule / Mission
August 2004

- ❑ **CsI Crystals – complete?**
 - To date Kalmar has delivered 1752 tested crystals to NRL. (Need 1728 CDEs)
 - Issue of 70 additional crystals appears hung up by import/export issues between Per Carlson and Amcrys-H.
 - Per Carlson has declared success and released all the test staff at Kalmar.
 - Without the 70 crystals, we have - 4 spare crystals to complete the CDE construction. To date, fallout has been 28 crystals (12 qual, 16 rejects).
 - Because of limited # of spares, we are forced to use others that meet spec but are of poorer quality / outliers.
- ❑ **PIN Photodiode Assembly (PDA) – complete!**
- ❑ **CDE Assembly Process**
 - Essentially all CDEs (1752) have been bonded at Swales
 - Wrap / cap / acceptance testing is on-going, ~ 1596 complete to date.
 - 1376 have been delivered to NRL. Deliveries to NRL have been halted since we are out of space to store them.
 - Half of bonding team have been released to other programs. Two techs are available to finish bonding if we get the final ~70 crystals (6 weeks ARO).

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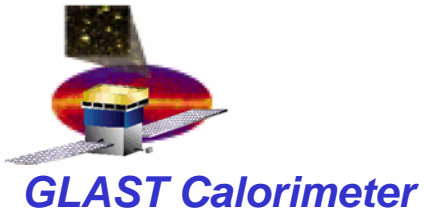
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Significant Accomplishments Composite Structures

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Schedule / Mission
August 2004

- **16 flight structures have been manufactured (#3 - #18).**
 - **15 of these have completed strength verification testing.**
 - **One (#13) has been rejected due to test anomaly.**
 - **Tooling wear problems seen in #10 - #13 have been corrected.**
 - New tooling has been used on structures 15 – 18. Insert positions are good.
 - **Structures #10 and #12 are being held at NRL.**
 - 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 12 flight structures (including #10 and #12).**





Significant Accomplishments Pre-Electronic Modules

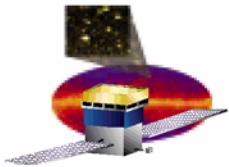
Monthly Cost /
Schedule / Mission
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- ❑ 8 PEMs have been completely assembled and tested with cosmic muons.
- ❑ PEMs are stored with dry nitrogen purge until electronics are installed.



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





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Significant Accomplishments EEE Parts

Monthly Cost /
Schedule / Mission
August 2004

□ ASICs

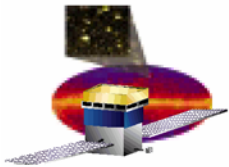
- Qual testing of GCFE and GCRC at GSFC continues. Parts have completed DPA, CSAM after SMT simulation, post SMT simulation functional test. No issues reported to date.
- 1000 hr life test ends in mid-October.
- New Issue: Recent tests show ASIC significantly more sensitive to ESD than expected.
 - Sensitivity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

□ Novacap Capacitors – history, CAL not using

- CAL selected an alternate part – 22 nF, 100V, QML – suitable for our needs with a waiver of voltage derating requirement.
 - We have replaced Novacap caps on all assembled (~50) AFEE cards.
 - Delivery of additional 12,000 new caps from AVX is imminent.

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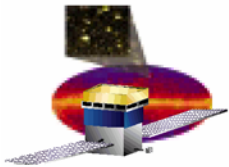
Significant Accomplishments

Analog Front End Electronics

Monthly Cost /
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August 2004

- ❑ **All flight AFEE boards (110) have been manufactured**
 - After assembly of ~50 boards, discovered solder mask peeling problem.
 - Rejected remaining boards, they are being re-manufactured. Available 9/10/04.
 - On assembled boards, solder mask has been retouched by hand in areas of peeling.
- ❑ **Remaining AFEE board assembly**
 - Working with assembly vendor to resolve board cleaning issues relating to solder flux residue under diode bias caps – a potential leakage current (noise) problem. Tests in progress
 - Assembly of remaining boards should start mid-September.
- ❑ **16 AFEE boards have completed 168 hr burn in and 3 temperature acceptance tests.**
- ❑ **6 of these boards have completed conformal coating**
 - 4 of these have completed functional test.





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Significant Accomplishments

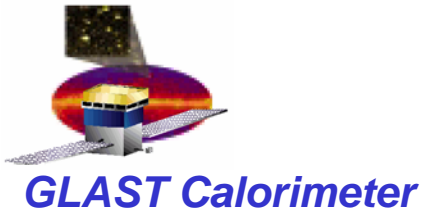
Module Assembly and Test

*Monthly Cost /
Schedule / Mission
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- ❑ **FM A Assembly in progress**
 - **AFEE card installation complete**
 - **TEM/TPS installation complete**
 - **Functional and performance testing in progress**
 - **Next steps are stake and conformal coat of diode wires and final close out.**
- ❑ **MGSE**
 - **EMI fixtures complete**
 - **2 TVAC fixtures in assembly**
 - Piece parts complete, Cold plates in manufacture
 - 2 set of blankets and frames finished
 - **Vib fixture**
 - Minor mods to EM fixture in process
 - **Shipping containers**
 - 18 pressure vessels complete, 18 outer shells complete, assembly in progress
- ❑ **Procedures**
 - **All environmental test procedures are released**
- ❑ **Test Readiness Review scheduled for tomorrow (2 Sept).**

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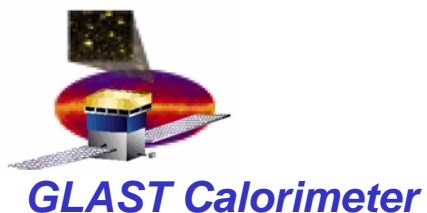
Schedule for CAL FMA AFEE boards

*Monthly Cost /
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August 2004*

Task_Name	Duration	Actual Finish	Plan Finish
8 AFEE 100% therm cycle (unpwr) -30C,85C, 20 cycles	3 days		25-Jul-04
FMA Dynamic burn in 168Hr 85C (new plan)	7 days		2-Aug-04
FMA AFEE 100% functional -30C [19]	1 day	17-Aug-04	3-Aug-04
FMA AFEE 100% visual inspection [21]	0.5 days	18-Aug-04	4-Aug-04
FMA AFEE data review, PCB approval [24,25]	0.5 days	18-Aug-04	4-Aug-04
FMA AFEE conformal coat [26]	6 days	25-Aug-04	10-Aug-04
FMA AFEE 100% functional 25C [27]	1 day	30-Aug-04	11-Aug-04
FMA AFEE Ready		30-Aug-04	11-Aug-04

- ❑ **Test anomalies at -30C required investigation and retest at three temperatures.**
 - **Front end noise at -30C was caused by FLE discriminator setting error in test script.**
 - **GCFE more susceptible to input noise without capacitive load of PIN diode. Boards are tested without PIN diodes.**





Schedule for FMA Ass'y & Test

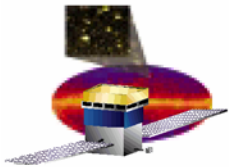
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Schedule / Mission
August 2004*

Task Name	Duration	Finish
PEM-to-AFEE integration	3 days	2-Sep-04
TEM & PS Integration	1 day	3-Sep-04
Comprehensive State Functional test	1 day	7-Sep-04
AFEE Stake and conformal coat	4 days	13-Sep-04
Limited Functional	1 day	14-Sep-04
Electronic calib	1 day	15-Sep-04
Muon calibration #2	3 days	20-Sep-04
Mass Properties #1	1 day	21-Sep-04
EMC/EMI test	6 days	29-Sep-04
Vibration test	4 days	5-Oct-04
A Thermal Vac Test (NEW)	16 days	21-Oct-04
Muon calibration #3 (PSR)	2 days	25-Oct-04
PSR Muon calibration - external trigger	3 days	28-Oct-04
Comprehensive Func Test #2 (PSR)	1 day	29-Oct-04
PSR Mass properties	1 day	1-Nov-04
Preship review and signoff	2 days	3-Nov-04
Ship to SLAC	2 days	4-Nov-04
Post Ship Functional	2 days	6-Nov-04
AV: Calorimeter Module A RFI		6-Nov-04

Was
22-Oct-04

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CAL Module Deliveries

*Monthly Cost /
Schedule / Mission
August 2004*

Task	Finish
AV: Calorimeter Module A RFI	6-Nov-04
AV: Calorimeter Module B RFI	23-Nov-04
AV: Calorimeter Module 1 RFI	1-Dec-04
AV: Calorimeter Module 2 RFI	13-Dec-04
AV: Calorimeter Module 3 RFI	13-Dec-04
AV: Calorimeter Module 4 RFI	22-Dec-04
AV: Calorimeter Module 5 RFI	22-Dec-04
AV: Calorimeter Module 6 RFI	6-Jan-04
AV: Calorimeter Module 7 RFI	6-Jan-04
AV: Calorimeter Module 8 RFI	19-Jan-05
AV: Calorimeter Module 9 RFI	19-Jan-05
AV: Calorimeter Module 10 RFI	1-Feb-05
AV: Calorimeter Module 11 RFI	1-Feb-05
AV: Calorimeter Module 12 RFI	8-Feb-05
AV: Calorimeter Module 13 RFI	8-Feb-05
AV: Calorimeter Module 14 RFI	21-Feb-05
AV: Calorimeter Module 15 RFI	21-Feb-05
AV: Calorimeter Module 16 RFI	2-Mar-05

Assumes that EM2 TEM/TPS are available when needed.

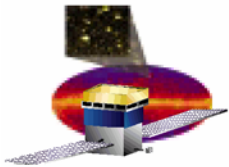
Have 7 enviro-safe TEM/TPS now.

Expect at least 2 more.

Others will be recycled from earlier module deliveries. Likely need timely turn around.

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Issues and Concerns

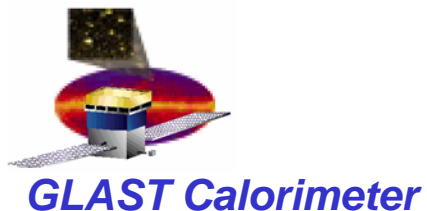
❑ AFEE Assembly

- **AFEE board assembly process resulted in solder paste residue under low profile parts.**
 - Cleaned and repaired on 50 boards while replacing Novacap capacitors.
 - Working with assembly vendor to demonstrate improved cleaning before additional boards are made.
- **Staking and conformal coating of diode wires on AFEE cards mounted on CAL module is a time consuming process**
 - Evidently not much experience at GSFC in length of cure at room temp required before changing board configuration with respect to local vertical.
 - Can only stake or conformal coat 1 side of CAL at a time. How long do we have to wait before its safe to rotate to the next side? Answers vary between 2 hours and 24 hours.

❑ Cost

- **AFEE Card 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.**





Drawing Release Summary

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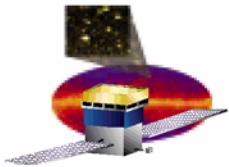
No Change From Last Month

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





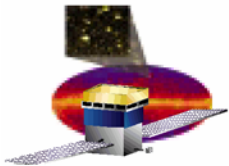
GLAST Calorimeter

Documentation and Qualification Program

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Schedule / Mission
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- ❑ **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 – 90% complete**
 - **Improving / revising verification matrix.**
 - **Environmental test procedures are released**
 - **Test Readiness Review tomorrow - Sept. 2, 2004**





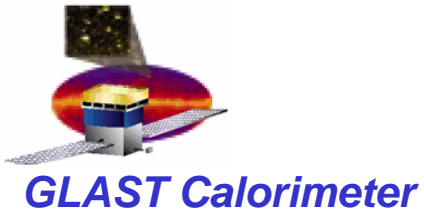
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PMCS - July '04 Cost Variances

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- **Cost Variance: + \$229 cum (-\$223 for July)**
 - **+126: Mgmt, Eng, R&QA, (-22 for July)**
 - **+521: CDE Manuf.**
 - PDA manufacturing - materials cost underrun.
 - CDE manufacturing - labor underrun (+417)
 - **-1: PEM**
 - **-217: AFEE**
 - Much higher labor costs balanced by savings in GSE materials
 - Fabrication problems, parts problems, you name it.
 - **-243: Module Ass'y & Test**
 - EM CAL overrun (-53)
 - Software (-43)
 - Labor (-70)
 - Facilities (-87)





PMCS – July '04 Schedule Variances

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- **Schedule Variance: - \$1539 cum (-223 for July)**
 - **- 136: 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)
 - **- 195: PEM**
 - Delay in delivery of 1st composite structures.
 - **- 203: AFEE**
 - Delay in delivery of ASICs causing delay in screening and qualification work
 - Problems in manufacture of AFEE PCB.
 - **- 993: Module Assy & Test (-221 for July)**
 - Delay in electronics delivery for module A&T finally arrived at baseline environmental test costs.

