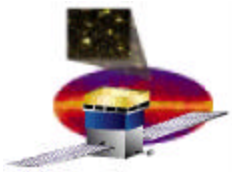


Monthly Cost/Schedule/Mission Review

GLAST LAT Calorimeter August 5, 2004

**W. Neil Johnson
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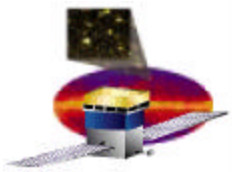
□ **Technical Status:**

- **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**





GLAST Calorimeter

Significant Accomplishments

Crystal Detector Elements

Monthly Cost /
Schedule / Mission
July 2004

❑ CsI Crystals – complete?

- Kalmar has received all crystals (1902) from Amcrys-H. However, 78 crystals have been returned to Amcrys for non-compliance.
- To date Kalmar has delivered ~1760 tested crystals to NRL. (Need 1728 CDEs)
- Per Carlson has declared success and released all the test staff at Kalmar.
- Without the 78 crystals, we have 9 spare crystals to complete the CDE construction. To date, fallout has been 16 crystals.

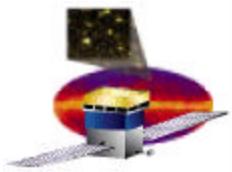
❑ PIN Photodiode Assembly (PDA) – complete!

- PDA manufacture has been completed. ~4600 PDAs manufactured, about 1000 more than we need. (Fallout from CDE bonding has been dramatically different than the experience in France.

❑ CDE Assembly Process

- 1534 CDEs (84%) have been bonded at Swales
- 1452 (79%) have been acceptance tested.
- 1316 (72%) have been delivered to NRL
- Swales will run out of material before the end of August. Delay in delivery of final 78 crystals (October?) presents production line problems and potential costs.



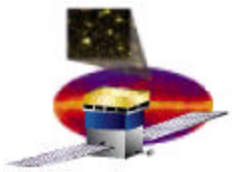


Significant Accomplishments

Composite Structures

- **15 flight structures have been manufactured (#3 - #17).**
 - **One (#13) has been rejected due to strength test anomaly.**
 - **Tooling wear problems began appearing in structure #9.**
 - Result is clocking or rotation of base plate relative to structure and top frame.
 - Temporary repair instituted for structure #14.
 - Structures #10 and #12 exhibit this problem, #11 is within tolerances.
 - **New tooling manufactured and has been used for #15 onward.**
 - Insert position problems have been resolved. More detailed inspection in France will catch any new problems earlier.
 - **NRL plans to correct problem in #10 and #12 by re-machining 4 insert slots in baseplate.**
 - If result is not satisfactory, we will manufacture additional structures. Cost is not significant, but schedule impact could be annoying.
 - There are two spare base plates.
 - **NRL has received 11 flight structures (including #10 and #12).**





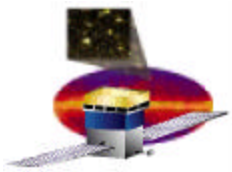
Significant Accomplishments Pre-Electronic Modules

- ❑ 7 PEMs have been completely assembled and tested with cosmic muons.
- ❑ 8th is on hold (#10 structure)
- ❑ 9th has been assembled, preparing for cosmic muon testing.
- ❑ PEMs are stored with dry nitrogen purge until electronics are installed.



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





Significant Accomplishments

EEE Parts

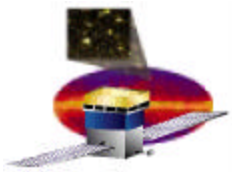
❑ ASICs

- 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-September.

❑ Novacap Capacitors

- Continued investigations and tests on Novacap 56 nF parts at NRL, GSFC, and vendor indicated that CAL should find another solution.
 - Leakage current behavior with temperature and moisture was a significant concern.
 - Novacap suggested process problem related to PbSn plating of solder pads.
- CAL selected an alternate part – 22 nF, 100V, QML – suitable for our needs with a waiver of voltage derating requirement.
 - We have received 5500 parts. Additional 12000 yet to be delivered.



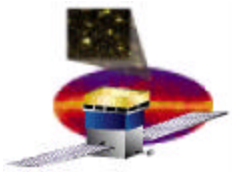


Significant Accomplishments

Analog Front End Electronics

- ❑ All flight AFEE boards (110) have been manufactured
- ❑ 50 AFEE boards have been assembled, but
 - All were assembled with Novacap caps – needed to be replaced. 38 boards have been corrected (96 parts / board)
 - Solder paste residue under caps indicated more aggressive cleaning and process review with board assembly vendor.
 - Removal of caps and cleaning of boards resulted in solder mask peeling in few places.
 - Investigated solder mask issues with board manufacturer. Solder mask adhesion tests. More cleaning.
 - Touch up of solder mask, baked boards and retested.
 - Net result is several modifications to the inspection and test of AFEE boards – schedule impact
 - Test each bias capacitor for leakage.
- ❑ First lot of 8 boards will complete 168 hr burn in and 3 temperature tests today.





Significant Accomplishments

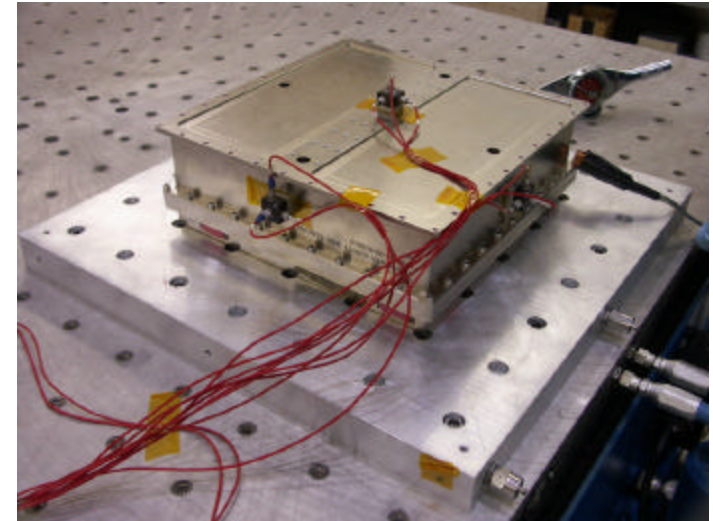
Module Assembly and Test

❑ EGSE

- 2 EM2 TEM/TPS for module tests have been received from SLAC. One has successfully completed workmanship vibration test at NRL.

❑ MGSE

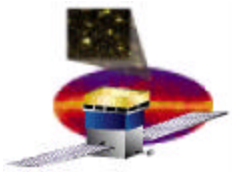
- EMI fixtures complete
- 2 TVAC fixtures in assembly
 - Piece parts complete, Cold plates in manufacture
 - 1 set of blankets and frames finished
- Vib fixture
 - Minor mods to EM fixture in process
- Shipping containers
 - 9 pressure vessels complete, 18 outer shells complete.



❑ Procedures

- Draft EMI/EMC procedure sent to SLAC/Blanchette. Preliminary response – no big deals. Need clarification from Spectrum Astro.
- TVAC and Vib procs in internal review. Distribute to SLAC later this week. Apparent discrepancies in GSFC and LAT requirements docs. (minor).





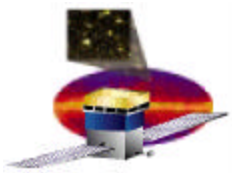
GLAST Calorimeter

Schedule for CAL FMA AFEE boards

Monthly Cost /
Schedule / Mission
July 2004

<i>Task_Name</i>	<i>Duration</i>	<i>Finish_Date</i>
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	3-Aug-04
FMA AFEE 100% visual inspection [21]	0.5 days	4-Aug-04
FMA AFEE data review, PCB approval [24,25]	0.5 days	4-Aug-04
FMA AFEE conformal coat [26]	6 days	10-Aug-04
FMA AFEE 100% functional 25C [27]	1 day	11-Aug-04
FMA AFEE Ready		11-Aug-04





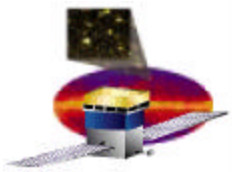
GLAST Calorimeter

Schedule for FMA Ass'y & Test

Monthly Cost /
Schedule / Mission
July 2004

Task_Name	Duration	Finish_Date
PEM-to-AFEE integration	3 days	16-Aug-04
TEM & PS Integration	1 day	17-Aug-04
Comprehensive State Functional test	1 day	18-Aug-04
AFEE Stake and conformal coat	4 days	24-Aug-04
Limited Functional	1 day	25-Aug-04
Electronic calib	1 day	26-Aug-04
Muon calibration #2	3 days	31-Aug-04
Mass Properties #1	1 day	1-Sep-04
EMC/EMI test	6 days	10-Sep-04
Vibration test	4 days	16-Sep-04
A Thermal Vac Test (NEW)	16 days	2-Oct-04
Muon calibration #3 (PSR)	2 days	5-Oct-04
PSR Muon calibration - external trigger	3 days	8-Oct-04
Comprehensive Func Test #2 (PSR)	1 day	12-Oct-04
PSR Mass properties	1 day	13-Oct-04
Preship review and signoff	2 days	15-Oct-04
Ship to SLAC	2 days	20-Oct-04
Post Ship Functional	2 days	22-Oct-04
AV: Calorimeter Module A RFI		22-Oct-04

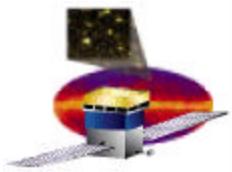




CAL Module Deliveries

Task_Name	Finish_Date
AV: Calorimeter Module A RFI	22-Oct-04
AV: Calorimeter Module B RFI	4-Nov-04
AV: Calorimeter Module 1 RFI	10-Nov-04
AV: Calorimeter Module 2 RFI	22-Nov-04
AV: Calorimeter Module 3 RFI	22-Nov-04
AV: Calorimeter Module 4 RFI	2-Dec-04
AV: Calorimeter Module 5 RFI	2-Dec-04
AV: Calorimeter Module 6 RFI	15-Dec-04
AV: Calorimeter Module 7 RFI	15-Dec-04
AV: Calorimeter Module 8 RFI	23-Dec-04
AV: Calorimeter Module 9 RFI	23-Dec-04
AV: Calorimeter Module 10 RFI	11-Jan-05
AV: Calorimeter Module 11 RFI	11-Jan-05
AV: Calorimeter Module 12 RFI	26-Jan-05
AV: Calorimeter Module 13 RFI	26-Jan-05
AV: Calorimeter Module 14 RFI	1-Feb-05
AV: Calorimeter Module 15 RFI	1-Feb-05
AV: Calorimeter Module 16 RFI	14-Feb-05





Issues and Concerns

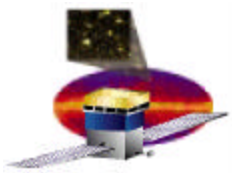
❑ AFEE Assembly

- **AFEE board assembly process resulted in solder paste residue under low profile (Novacap) parts.**
 - Repaired on 50 boards in hand in the process of replacing Novacap capacitors.
 - Need to verify that the assembly and cleaning process has been corrected at the vendor for the remaining 60 boards. Do not want to replace any more capacitors.
 - Test board has been assembled with new capacitors and sent to NRL for inspection.
 - Assembly of remaining AFEE boards is waiting for delivery of remaining AVX replacement bias capacitors.
- **Additional testing and parts replacement is cost (staffing) issue. Essentially guaranteed to blow the AFEE assembly and test budget.**

❑ Burn Out / Staffing

- **CAL began 24 x 7 operations last week – burn in of AFEE cards**
- **It will continue until the end of January, 2005 – last TVAC test.**





Drawing Release Summary

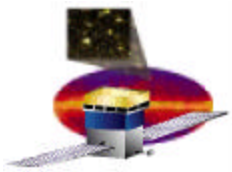
No Change From Last Month

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**

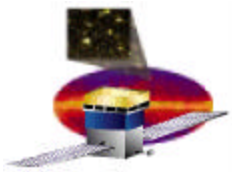




Documentation and Qualification Program

- ❑ 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
 - Improving / revising test plan and verification matrix.
 - Draft of new EMI/EMC test procedure is in circulation.
 - Draft of Vibration test procedure is in internal review. (Comments received from Chris Fransen, Swales)
 - Draft of TVAC test procedure is in internal review.
 - Looking to Test Readiness Review around last week of Aug/ 1st of Sept.

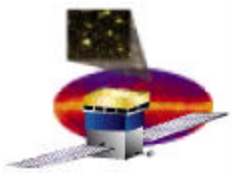




PMCS - June '04 Cost Variances

- ❑ **Cost Variance: + \$451 cum (-\$65 for June)**
 - **+148: Mgmt, Eng, R&QA, (-57 for June)**
 - **+432: CDE Manuf.**
 - PDA manufacturing - materials cost underrun.
 - CDE manufacturing - labor underrun (+372)
 - **+104: PEM**
 - Accounting confusion in facilities preparation – mixed with Module A&T facilities.
 - **-104: AFEE**
 - Much higher labor costs balanced by savings in GSE materials
 - **-198: Module Ass'y & Test**
 - **+81: GSFC allocated funds that apparently can't be spent – CR to return funds in process.**





PMCS – June '04 Schedule Variances

- **Schedule Variance: - \$1353 cum (-426 for June)**
 - **- 148: 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)
 - **- 154: PEM**
 - Delay in delivery of 1st composite structures.
 - **- 280: AFEE**
 - Delay in delivery of ASICs causing delay in screening and qualification work
 - Problems in manufacture of AFEE PCB.
 - **- 772: Module Assy & Test (-413 for June)**
 - Delay in electronics delivery for module A&T finally arrived at baseline environmental test costs.

