

**GLAST Calorimeter**

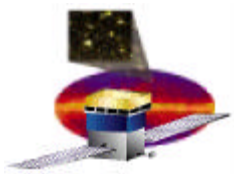
*Monthly Cost /  
Schedule / Mission  
Oct 2003*

# **Monthly Cost/Schedule/Mission Review**

## **GLAST LAT Calorimeter October 29, 2003**

**W. N. Johnson  
Naval Research Lab**





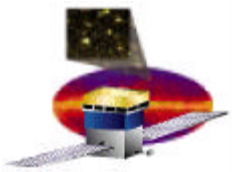
## Technical Status:

- ❑ **Last Month's Accomplishments**
  - Summary of issues & concerns
  - Status/Closure of action items
- ❑ **Open Design/Engineering model/manufacturing issues and closure plan for them**
- ❑ **Near-term Milestones & Status towards them for next 3 months**

## Cost & Schedule Status – September PMCS Status:

- ❑ **Significant cost and schedule variances (for Aug and cumulative)**
- ❑ **Identify threats to maintaining schedule and cost**





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# Significant Accomplishments

## October 2003

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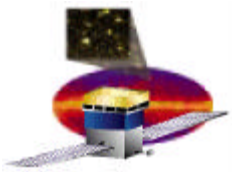
### ❑ Management

- Completed rebaseline PMCS submission for CAL
- Incorporated change requests for
  - GSFC EEE parts branch support for testing
  - Adjustments for SLAC support of CAL EM design and fab
  - Directed EMI/EMC workmanship testing on FMB – FM16.

### ❑ CDEs

- Csl Crystals
  - To date Kalmar has received ~600 Csl xtals (including 48 proto-flight) from Amcrys H. Of these, 493 (+48) have been fully tested and shipped to NRL. Flight deliveries to Swales have begun.





# Significant Accomplishments

## October 2003 (2)

### □ CDEs (cont.)

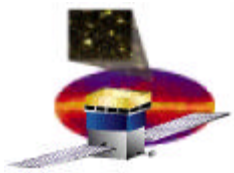
#### ■ PDA Manufacturing

- Prototype tooling is in second iteration to improve staking process.
- Vendor is producing units which meet the specification requirements.
- 48 qual unit PDAs have been made.
- Tooling needs to be replicated ~ 50 times.

#### ■ CDE Assembly Process

- MRR for CDE assembly is scheduled for Friday, Oct 31..
- 12 pre-Qual CDEs have been bonded (48 PDAs) at Swales with flight tooling.
  - Assembly room environmental control issues have been resolved.
- 12 mini-EM CDEs have been fabricated. Waiting for end caps.
- 12 more Qual CDEs will be fab'ed after MRR.
- The 12 pre-Qual CDEs have started qualification test program. No issues to date.





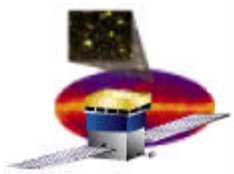
# Significant Accomplishments

## October 2003 (3)

### □ Mechanical Structure

- Revised, reviewed and released flight machined part drawings.
  - EMI/EMC revisions required update to most of the drawings.
    - EMI gasket under side panel.
    - EMI O-ring in vertical corner of closeout plate joint.
    - Electroless nickel surface treatment everywhere except for 100 um foil on top of structure – alodine.
  - Need IPO approval of base plate modifications. Currently incorporating comments from IPO review.
- MRR for carbon composite structure was completed Oct 24<sup>th</sup> – no issues identified.
- Manufacture of SM2 structure was completed as part of MRR.
- SM2 is being assembled for strength test. Test will occur 1<sup>st</sup> week of Nov.





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# Significant Accomplishments

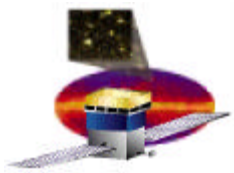
## October 2003 (4)

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### □ AFEE Electronics

- Received OSE-packaged GCFC9A and GCRC5 – 1 wafer.
  - Performance is acceptable. Issue may be screening fallout.
- Flight functional test boards have been used to screen both GCFC and GCRC chips.
- On two (of four) AFEE cards on EM CAL, GCFC7 have been replaced with GCFC9A for GSI beam test.
- Flight AFEE layout is complete. Prototype board is in fabrication.
- CAL and T&DF ASICs (Lot T31D) submitted to ASAT for packaging. Completed - currently in customs at Dulles.
- Documentation for packaging of CAL, ACD and T&DF ASICs (Lot T36T, flight) is complete. Procurement in place by end of this week.
  - Lot T36T currently in wafer grinding and dicing at GDSI.





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# Significant Accomplishments

## October 2003 (5)

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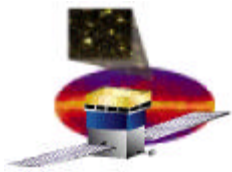
### ❑ EM CAL Module

- EM returned to NRL from LAT I&T activities at SLAC
- Modified 2/4 AFEE for flight version of GCFE (9A). Works as well or better. Noise is somewhat higher however.
- Unable to upgrade CAL EGSE to LATTE 1.9. Too many problems with LATTE 1.7. Reverting to 1.3.

### ❑ Mini-EM

- Aluminum components/modifications have been manufactured.
- CDEs are being capped this week.
- CDE insertion begins next week.
- AFEE card assembly delayed by replacement of GCFEs on EM.
- Expect mid- to late- Nov delivery to SLAC.



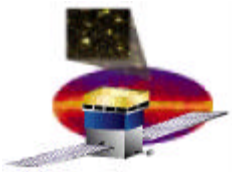


# CAL Near Term Milestones

Activity ID	WBS	Activity description	Total float	Early Start	Early Finish	Current Finish	Comments
5C52000241	4.1.5.5.2.2	IA: FM5 Csl Crystals	114		14-Oct-03	14-Oct-03	
5C91000010	4.1.5.9.1	ND: EM CAL Returned to NRL (arrives on c	49		17-Oct-03	17-Oct-03	
5C61300048	4.1.5.6.1.3.1	SM2 Manufacture	41	21-Oct-03	27-Oct-03	24-Oct-03	MRR Activity
5C61500030	4.1.5.6.1.5	Aluminum Parts Manufacture	40	3-Nov-03	6-Feb-04		Awaiting base plate release and approval.
5C76000224	4.1.5.7.6.1	Package ASIC Lot T36T	9	30-Oct-03	26-Nov-03		Need completion of grind/dice 10/30. Need contract in place.
5C52000261	4.1.5.5.2.2	IA: FM6 Csl Crystals	112		28-Oct-03		
5C52000281	4.1.5.5.2.2	IA: FM7 Csl Crystals	110		11-Nov-03		
5C52000301	4.1.5.5.2.2	IA: FM8 Csl Crystals	108		25-Nov-03		
5C53100070	4.1.5.5.3.1.3	Receive 1st 600 diodes	7		26-Nov-03		Critical path to FMA - Preventing start of CDE manufacture.
5C76000228	4.1.5.7.6.1	IA: GCFE9A, GCRC5 for Screen/Qual	9		1-Dec-03		
5C61300590	4.1.5.6.1.3.2	AV: Flight Mech Dwgs	755		8-Dec-03		
5C1130	4.1.5.9.1	Hadronic beam test	44	10-Nov-03	9-Dec-03		
5C52000321	4.1.5.5.2.2	IA: FM9 Csl Crystals	106		11-Dec-03		
5C62300000	4.1.5.6.2.3.1	IN: Receive FMA Mechanical Struct	41		15-Dec-03		
5C52000341	4.1.5.5.2.2	IA: FM10 Csl Crystals	104		5-Jan-04		
5C58200140	4.1.5.5.8.2	Lot 1 - Bond, Clean, Form Wraps	7	15-Dec-03	5-Jan-04		
5C57000051	4.1.5.5.7	IA: PDA Lot 1 (600)	19		6-Jan-04		
5C62300100	4.1.5.6.2.3.2	IN: Receive FMB Mechanical Struct	46		7-Jan-04		
5C77300120	4.1.5.7.7.3	ND: (5) EM2 TEM/PS for AFEE board ass	37		15-Jan-04		
5C77300130	4.1.5.7.7.3	ND: (5) CAL Test Stations for AFEE ass'y	37		15-Jan-04		
5C52000361	4.1.5.5.2.2	IA: FM11 Csl Crystals	102		20-Jan-04		
5C62300200	4.1.5.6.2.3.3	IN: Receive FM1 Mechanical Struct	59		20-Jan-04		







# Issues - PIN Diode Update

## DPD Bond failures at Hamamatsu

### ❑ Investigations into process problems identified two components

- Contamination of bond pads caused by de-golding of empty ceramic carriers and inadequate cleaning.
- High stresses placed on bonds during 175C bake out and re-tinning process of completed units.

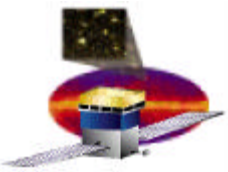
### ❑ Corrective action

- Do not de-gold empty carriers – no contamination.
- Use double bond (wedge and ball) to give stronger bonds.
- Reduce bake out to 125C. (Approved by Fred Gross).
- Modify tinning process of completed units to use heat shield.

### ❑ Status

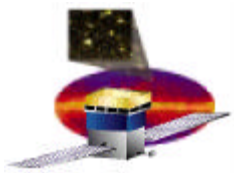
- 100 parts have been fabricated w/ various combinations of the corrective action. 90 parts have completed accelerated thermal cycling - 100 cycles.
- 10 parts have been examined by NRL/GSFC and used to manufacture PDAs. No problems found.
- Flight production has been authorized, first flight deliveries expected late November





- ❑ **EMI/EMC performance – CAL has implemented modifications to mech structure to improve EMI/EMC results.**
  - EMI gaskets seal side panels to closeout plates.
  - EMI o-ring in vertical edges where closeout plates join.
  - Electroless nickel everywhere except 100 um Al foil co-cured into structure. Use alodine there.
  - Outstanding issues:
    - EMI shielding around AFEE-TEM cable
    - Reasonable subsystem EMI/EMC specs and test configurations are still needed.
- ❑ **AFEE – TEM Cable**
  - Prototype of revised (more flexible) cable has been received.
  - Will not be using connector savers during module test with mounted TEM.
- ❑ **LAT environmental instrumentation**
  - CAL has made no provisions for mounting or routing instrumentation / cabling used in LAT testing.

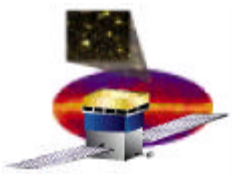




# Plans for November

- ❑ Complete qualification testing of 12 CDE qualification units.
- ❑ Complete assembly and ship miniEM to SLAC.
- ❑ Ship EM CAL to GSI and execute 10-night beam test.
- ❑ Complete strength verifications on SM2 carbon composite structure.
- ❑ Fab FMA carbon composite structure.
- ❑ Assemble and test prototype flight AFEE boards.
- ❑ Begin manufacture of aluminum parts.
- ❑ Receive flight diodes and begin PDA manufacture
- ❑ Complete documentation on ASICs and remaining analyses on AFEE boards.





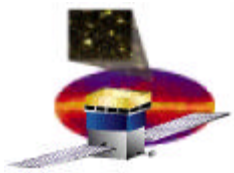
# Schedule Variances

**Cumulative SV = - \$1,436K ( - \$197K for Sept)**

## SV major components

- ❑ **PEM Assembly: -\$289K**
  - Baseline shows PEMs for A – 3 complete; HA! HA! No flight CDEs or structure yet.
- ❑ **Flight AFEE boards: -\$906K (critical path)**
  - Baseline has all flight parts delivered, tested and ready for ass'y. HA! HA!
    - Actually, deliveries have just begun (not critical).
    - Order for AFEE-TEM cable has not been placed (not critical).
    - Prototype Flt AFEE board is about to be submitted for assembly (not critical).
    - New ASIC fab will not be available until Dec. (critical path)
- ❑ **Prep for flight ass'y & test: -\$242K (not critical path, disappears Oct '03)**
  - Held release of flight MGSE/EGSE and facilities until EM assembly complete.
  - We are now documenting changes and preparing for flight MGSE/EGSE build.



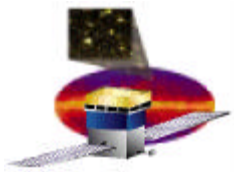


# Cost Variances

## Cumulative CV = -\$562K (-\$302K for Sept)

- ❑ **Mgmt + Sys Eng (CV = +323K):** caused mainly by less travel than planned.
  - Reallocated in rebaseline
- ❑ **4.1.5.5 CDE: (CV = -\$762K, -\$127K for Sep)**
  - Swales is now preparing for CDE build. (Originally French responsibility)
  - PIN photodiodes have been delivered (planned for FY04)
- ❑ **4.1.5.6 PEM, EM and Assy Facilities & Support (CV +67K):**
  - -\$82K, Overrun in EM PEM assembly – required more testing and repair of EM CDEs than planned
  - +\$197K, Late start and non-uniform expenditures on facilities and staffing (LOE).
  - -\$48K, Planning and procurement of Flt Machined parts – not a baseline task
- ❑ **4.1.5.7 AFEE (CV ~ -\$410K) Unprogrammed SLAC contributions to ASICs and PCB.**
- ❑ **4.1.5.7.4 & 5 AFEE boards (CV -\$189K) Higher than programmed costs for design, assy and test of AFEE boards.**
- ❑ **4.1.5.7.6 AFEE Flight Units (CV +\$89K) Delay in contractor invoicing.**
- ❑ **4.1.5.9 Ass'y & Test (CV +\$141K) Cost savings in completion of PEM Checkout electronics and accounting variations in parts procurements and level of effort activity**





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# Top 4 Threats to Cost / Schedule

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- ❑ **Delivery of DPDs and sustaining the delivery rate.**
- ❑ **Inability to qualify the plastic encapsulated ASICs.**
- ❑ **ASIC performance problem.**
- ❑ **Inability to sustain the flight module assembly and test schedule.**

