

**GLAST Calorimeter**

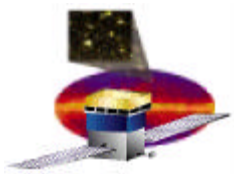
*Monthly Cost /  
Schedule / Mission  
Sept 2003*

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

## **GLAST LAT Calorimeter September 24, 2003**

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





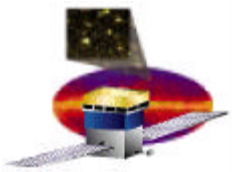
## Technical Status:

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

## Cost & Schedule Status – August PMCS Status:

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





# Accomplishments / Plans

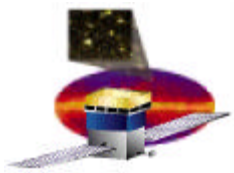
**DILBERT** By SCOTT ADAMS



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# Significant Accomplishments September 2003

## □ CDEs

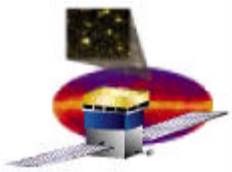
### ■ Csl Crystals

- To date Kalmar has received ~550 Csl xtals (including 48 proto-flight) from Amcrys H. Of these, 404 have been fully tested and shipped to NRL. Flight deliveries to Swales have begun.
- Minor quality issues continue to be worked.
  - Optical test bench at Amcrys was moved and reassembled incorrectly. This was fixed during visit in Sept by Swedish team. This explains discrepancy between Ukrainian and Swedish optical test results for the most recent ~200 crystals.
  - Roughly 5% of xtals have exceeded maximum chamfer-to-chamfer distance (by a tiny amount) and have been trimmed at Kalmar.

### ■ PDA Manufacturing

- PDA assembly fixture has been modified for flight production.
- Flight PDA vendor has been selected: Capton Inc. Vendor is beginning practice assembly with rejected DPDs.
- PDAs for CDE Qual units were manufactured at NRL.





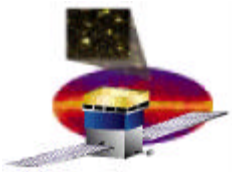
# Significant Accomplishments September 2003 (2)

## □ CDEs (cont.)

### ▪ CDE Assembly Process

- MRR for pre-Qual CDE assy completed successfully at Swales.
- 12 pre-Qual CDEs have been bonded (24 PDAs) at Swales with flight tooling with some minor issues.
  - Assembly room continues to experience short-duration (~ half hour) humidity spikes. Change to a/c control should fix this. Humidity is closely monitored.
  - Two bonds were disturbed during removal of bonding fixture and may have suffered some delamination. Procedure for disassembly of fixture was modified for the last 12 bonds to prevent this. Optical test of assembled pre-Qual CDEs will be final test for delamination.
- Optical tests at NRL have been completed on 9 more CDEs from practice work with Flight tooling. More practice CDEs will be sent from Swales.
- More bond shear strength tests will be performed on practice CDEs. Tests have been completed on 2 CDE – exceed specs by > x2.
- CDE MRR for flight scheduled for Oct 17<sup>th</sup>.





GLAST Calorimeter

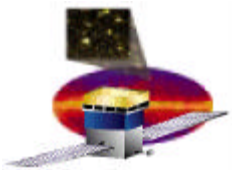
# Significant Accomplishments September 2003 (3)

Monthly Cost /  
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## □ Mechanical Structure

- Revised, reviewed and released flight machined part drawings.  
But....
  - Waiting for IPO approval of base plate modifications
  - Waiting for IPO direction on base plate surface passivation – alodine vs electroless nickel.
  - EMI/EMC modifications require revisions to most of the drawings.
- Titanium insert manufacturing complete.
- Procurement spec for Al parts is in review.
- Revisions to carbon composite structure tooling are complete. Tooling in manufacture.





GLAST Calorimeter

# Significant Accomplishments

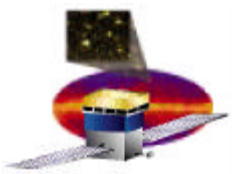
## September 2003 (3)

Monthly Cost /  
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### □ AFEE Electronics

- ADC, DAC radiation testing – SEL – completed at TAMU. Thanks to Jim Howard and Scott Kniffin of GSFC. Meets requirements.
- ASIC functional test boards and software environment are fully functional. GCFE detailed test is now reduced to creating a test script that executes in the environment.
- Flight AFEE layout is essentially complete. Prototype board to be fab'ed in early October.
- CAL and T&DF ASICs (Lot T31D) submitted to ASAT for packaging. Documentation for packaging of CAL, ACD and T&DF ASICs (Lot T36T, flight) is in process.
  - Lot T36T currently in wafer grinding and dicing at GDSI.
  - Sample parts packaged at OSE will be available late Sept.



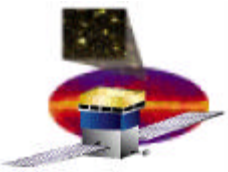


# Issues - DPD

- ❑ Hamamatsu has recently reported (9/8/03) a manufacturing process problem in the construction of the CAL Dual PIN Photodiode (DPD).
- ❑ Final test uncovered broken wire bonds (open circuit) on several pieces. Visual inspection by “expert” suggests as many as 7% of parts have problem.
- ❑ Wire bonds break near the ceramic carrier.
- ❑ **HPK requests that the ~600 diodes in hand at NRL not be used for flight.**
- ❑ **Suspected process problems:**
  - Contamination of carrier bonding pad caused by de-golding process of electrical leads (dip in solder pot). But ultrasonic cleaning occurs after de-golding.
  - Thermal shock caused by 1) bake out of optical window (175 deg C, 24 Hr) or 2) re-tinning of electrical leads.
- ❑ **Remedial actions:**
  - Stop de-golding empty carriers. Tin completed assemblies. This removes suspected contamination issues and returns process to HPK standards.
  - Bake out optical window at 125 deg C, 24 Hrs. (Agreed by Fred Gross)
  - Use heat shield when de-golding (tinning) electrical leads.
- ❑ **Schedule Impact:**
  - Fabrication of 1<sup>st</sup> flight CDEs will be delayed about 1 month – becomes close to critical path. Need better idea of deliveries of new diodes to assess actual impact.

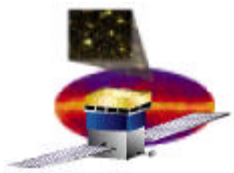






- ❑ **EMI/EMC performance – CAL is investigating modifications to mech structure to improve EMI/EMC results. Actions to date:**
  - Double # of fasteners holding side panel to closeout plate. [Done]
  - Build lip into top frame to provide better seal of side panel to top.
  - Considering EMI gasket between side panel and closeout plate.
  - Electroless nickel plating everywhere (except GRID I/F???)
  - CAL-GRID stay clear does not permit Al shield around chamfer area of vertical CAL edges.
  - Reasonable subsystem EMI/EMC specs and test configurations are still needed.
  
- ❑ **AFEE – TEM Cable**
  - Revising EMI/EMC wrap on cable to provide better flexibility – use weave rather than copper tape.
  - Stiffness of cable may require use w/o connector savers during module assembly and test prior to installation of flight TEM.

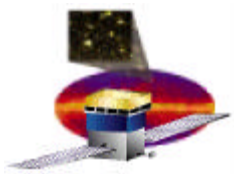




# Parts List and Qualification Plan Update

- ❑ **Maxim ADC's & DAC's have essentially completed qualification and screening**
  - Successful SEL radiation testing at TAMU. Thanks to Jim Howard and Scott Kniffen at GSFC.
  - Total dose testing still to be done.
- ❑ **Pre-flight lot of Hamamatsu PIN photodiodes have completed qualification testing without problem. Flight lot in process.**
  - But HPK says don't use them. Previous ISSUE Slide.
- ❑ **Flight ASICs are in wafer grinding and dicing at GDSI.**
- ❑ **ASIC burn in procedure approval is waiting on additional ASIC design criteria and documentation from SLAC.**

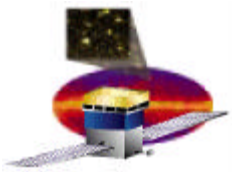




# Plans for October

- ❑ Rebaseline the cost and schedule of CAL.
- ❑ Qualification testing of 12 CDE qualification units.
- ❑ Fab additional 12 pre-flight CDEs.
- ❑ Hold MRR for flight CDE manufacturing.
- ❑ Release CAL base plate drawings and begin manufacture of aluminum parts.
- ❑ Test Structural Model 1 for strength.
- ❑ Fab Carbon composite Structural Model 2 w/ GLAST mission assurance participation.
- ❑ Manufacture prototype of flight AFEE boards.
- ❑ Assemble miniCAL for testing at SLAC.
- ❑ Receive EM CAL from SLAC and prepare GSI test configuration.

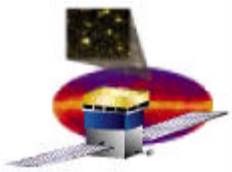




# Near Term CAL Milestones

Activity ID	Activity description	Early finish	Actual or Current	Milestone Level
5C1132	AV: EM from Calorimeter to I&T	7-Aug-03	7-Aug-03	3
	Fab Struc Model (SM) carbon structure	8-Aug-03	8-Aug-03	4
	Release Flt drawings - new base plate	15-Aug-03	30-Sep-03	4
5C52000121	FMA Csl Crystals at NRL	29-Aug-03	29-Aug-03	4
5C52000141	FMB Csl Crystals at NRL	2-Sep-03	2-Sep-03	4
	Fab CDE Qual Units	7-Sep-03	23-Sep-03	4
	Strength Test SM structure	8-Sep-03	6-Oct-03	4
5C52000161	FM1 Csl Crystals at NRL	15-Sep-03	15-Sep-03	4
5C76000421	AV: GCRC V5 from manuf	18-Sep-03	15-Sep-03	4
5C52000181	FM2 Csl Crystals at NRL	26-Sep-03	22-Sep-03	4
5C54300020	FM A DPD ready for CDE	1-Oct-03	17-Nov-03	4
	FM A structure fab	8-Oct-03	3-Nov-03	4
5C54300050	FM B DPD ready for CDE	8-Oct-03		4
5C54300080	FM 1 DPD ready for CDE	15-Oct-03		4
5C91000010	ND: EM CAL Returned to NRL (arrives on dock)	17-Oct-03		3
5C54300110	FM 2 DPD ready for CDE	22-Oct-03		4
5C76000221	AV: GCFE V9A from manuf	27-Oct-03		4
5C61300590	AV: Flight Mech Dwgs	29-Oct-03		4
5C62300020	IN: FMA CDE	30-Oct-03		4
5C62300000	IN: Receive FMA Mechanical Struct	5-Nov-03		4





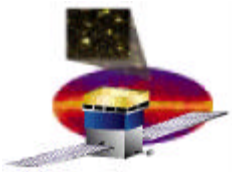
# Schedule Variances

**Cumulative SV = - \$1,239K ( - \$198K for August)**

## SV major components

- ❑ **PEM Assembly: -\$206K**
  - Baseline shows PEMs for A,B,1 complete; HA! HA! No flight CDEs or structure yet.
- ❑ **Flight AFEE boards: -\$635K (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 Oct - Nov. (critical path)
- ❑ **Prep for flight ass'y & test: -\$218K (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.



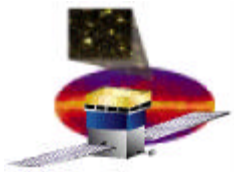


# Cost Variances

## Cumulative CV = -\$259K (-\$198K for Aug)

- ❑ **Mgmt + Sys Eng (CV = +250K):** caused mainly by less travel than planned.
- ❑ **4.1.5.5 CDE: (CV = -\$635K, -\$165K for Aug)**
  - 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 ~ -\$385K) 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 +\$146K) Delay in contractor invoicing, lower than programmed labor costs and inaccuracies in description of work plan.**
- ❑ **4.1.5.9 Ass'y & Test (CV +\$269K) Cost savings in completion of PEM Checkout electronics and accounting variations in parts procurements and level of effort activity**





# Top 5 Threats to Cost / Schedule

- ❑ Resolution of the DPD manufacturing problems.
- ❑ Resolution and implementation of design changes for EMI/EMC
- ❑ Inability to qualify the plastic encapsulated ASICs.
- ❑ Late transfer of flight CDE and PDA manufacturing to US.  
Problems or delays in getting this work going at the required production rate.
- ❑ Inability to sustain the flight module assembly and test schedule.

