

GLAST Calorimeter

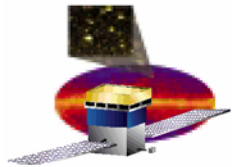
*Monthly Cost /
Schedule / Mission
Feb 2004*

Monthly Cost/Schedule/Mission Review

GLAST LAT Calorimeter Feb 25, 2004

**W. Neil Johnson
Naval Research Lab**





GLAST Calorimeter

Outline

Monthly Cost /
Schedule / Mission
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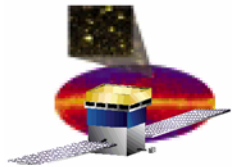
Technical Status:

- ❑ Last Month's Accomplishments
- ❑ Near-term Milestones & Status towards them for next 3 months
- ❑ Drawing Release Plan and Status
- ❑ Summary of issues & concerns
- ❑ Status/Closure of action items – **none open**
- ❑ Open Design/Engineering model/manufacturing issues and closure plan for them
- ❑ Documentation and qualification program

Cost & Schedule

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





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Significant Accomplishments February 2004

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□ CDEs

■ Csl Crystals

- To date Kalmar has delivered ~1021 fully tested crystals to NRL. They have received ~1500 (out of 1950) from Amcrys-H.
- NRL is planning to correct light taper on ~150 crystals that do not meet spec.

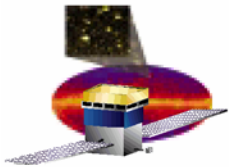
■ PIN Photodiode Assembly (PDA)

- All 4800 Dual PIN Photodiodes have been received from Hamamatsu
- ~ 1470 flight PDAs have been manufactured, tested and delivered to Swales.

■ CDE Assembly Process

- ~470 CDEs have been bonded at Swales
- Of these, 25 have been wrapped and capped. (12 are qualification units).
- Qual CDEs are thru 22/50 thermal cycles – light yields nominal, no problems to date.
- Completion of the CDEs has been limited by availability of end caps from LLR Ecole Polytechnique. (50 have been delivered, 600 more are in customs in USA).
- The planned production 60 CDE per week is apparently an easily obtained goal.





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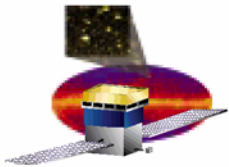
Significant Accomplishments

February 2004 (2)

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- **Composite Structure Manufacture – LLR Ecole Polytechnique**
 - **Composite structure #1**
 - Prepreg inspection and handling issues have been addressed. More detailed procedure and inspections to be used at cutting vendor. Review of the procedure with LLR and NRL at vendor will occur before next prepreg kit manufacturing.
 - **Composite structure #2**
 - Manufacturing and metrology optimized before flight structure delivery.
 - Application and polishing of mold release
 - During strength test, shaker anomaly caused excessive stress on structure. The resultant load exceeds margin of safety. Declared non-flight.
 - Vibration test procedure and test methods have been revised and will be verified during 1st flight structure test.
 - **Composite structure #3**
 - Manufacturing and metrology was completed last week.
 - NRL team, including structural test experts, are visiting LLR to review revisions to vibration test procedure and to witness the vib test of #3 on Friday.





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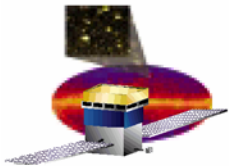
Significant Accomplishments February 2004 (3)

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□ Structure Machined Parts – NRL

- All aluminum machined parts for the CAL structures have been completed and plated.
 - Installation of helicoils remains to be completed on some pieces.
- Stainless steel (A-286) shear pins for base plate have been completed
- Side panels have been completed in France. LLR has performed inspections. Delivery awaiting gathering of appropriate certifications.
- All NCRs (all minor) have been closed.





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Significant Accomplishments February 2004 (4)

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□ AFEE Electronics

▪ Radiation Testing

- Final Heavy ion testing at BNL for MAX145, MAX5121, GCFE9A and GCRC5 occurred last week. No issues. Data similar to previous runs but more complete.
- Remaining radiation testing, Total Ionizing Dose, will be performed next month after burn in of flight lot parts.

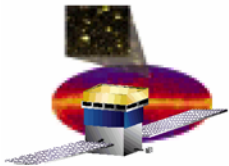
▪ Prototype of flight AFEE boards (X & Y) have been received, assembled and tested.

- Minor routing errors have been identified.
- Potential mechanical interference of added parts (EMI filtering) on bottom side of board with close out plate ribs.
- Board re-layout is complete, in verification. Need to print flight boards NOW.

▪ All LAT flight ASICs have now been received from ASAT.

- CAL ASICs arrived > 9 weeks late.
- Flight backups to DAQ ASICs are still in transit from Hong Kong.





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Significant Accomplishments February 2004 (5)

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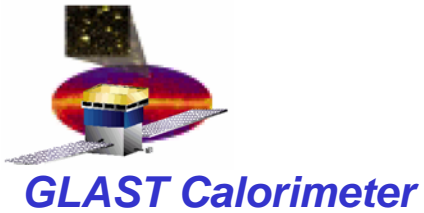
❑ AFEE Electronics (cont)

- 6 GCFE test stations have been qualified and are being used to test flight GCFE9A parts.
 - 5500 parts in test.
 - 5500 parts complete thermal cycling today prior to test.
- 2 GCRC test stations have been qualified for functional testing of flight GCRC5 parts
- Temperature forcing unit has been setup and is operating.
 - Required for –30 deg and +85 deg C screening of flight parts.

❑ I&T Facilities

- CAL clean room in the NCST I&T building has been commissioned. Contract for improved humidity control has been let.
- Certification of ESD clean rooms in SSD is complete.

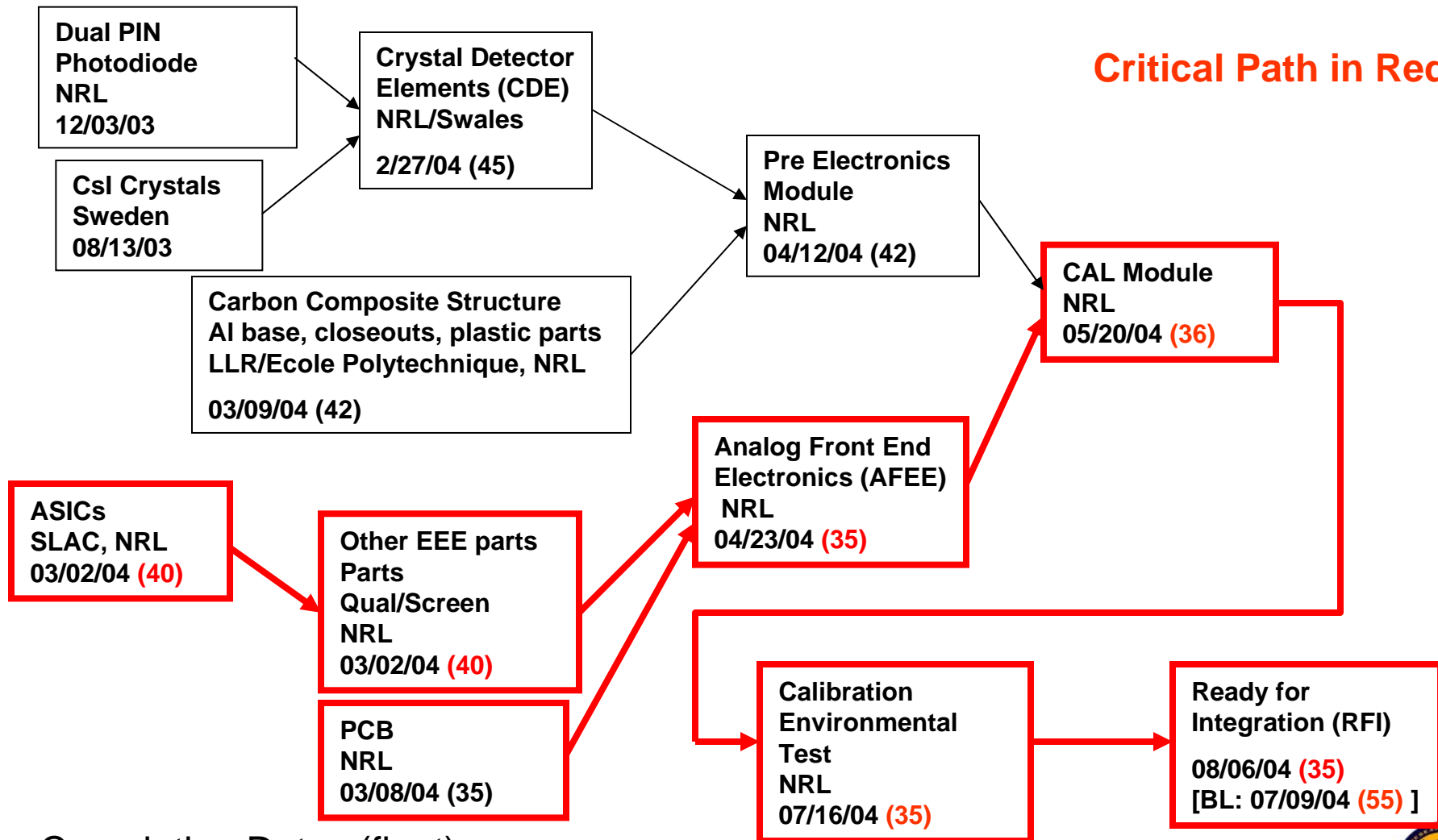




PMCS Critical Path Protoflight Module (FMA)

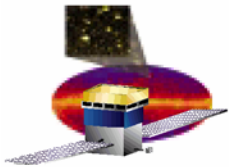
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Critical Path in Red



Completion Dates (float)





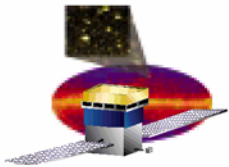
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CAL Near Term Milestones

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Activity ID	WBS	Activity description	Early Start	Early Finish	Current Finish	Comments
5C61500030	4.1.5.6.1.5	Aluminum Parts Manufacture	3-Nov-03	6-Feb-04	27-Feb-04	Helicoil insertion
5C62300000	4.1.5.6.2.3.1	IN: Receive FMA Mechanical Struct		9-Feb-04	9-Mar-04	Structure #3
5C62300030	4.1.5.6.2.3.1	CDE Inspection	10-Feb-04		2-Mar-04	FMA CDE - need end caps to finish acceptance testing
5C62300040	4.1.5.6.2.3.1	CDE - Mech Struct Integration	25-Feb-04		9-Mar-04	Begin FMA PEM assembly
5C76000224	4.1.5.7.6.1	Package ASIC Lot T36T	30-Oct-03	17-Dec-03	17-Feb-04	Finally arrived!
5C76000460	4.1.5.7.6.1	100% functional test GCFE/GCRC	17-Dec-04	23-Dec-04	2-Mar-04	Test equipment is ready. Test in Progress
	4.1.5.7.6.1	ASIC Screening Complete			13-Apr-04	Using parts before screening complete - for 6 modules
	4.1.5.7.6.1	ASIC Qual Program Complete			6-May-04	End of 1000 hr life test.
5C76001000	4.1.5.7.6.2	AFEE PCB manufacturing	15-Jan-04	5-Feb-04	8-Mar-04	Finish check prototype revisions this week.
5C76001050	4.1.5.7.6.3	Board Assembly (vendor)	9-Mar-04		7-May-04	Have agreement of vendor. Contract in works.
	4.1.5.7.6.1	First flight AFEE-TEM Cables			15-Mar-04	
	4.1.5.7.6.2	AFEE Board Assy - 1st Article Testing			24-Mar-04	functional test, thermal cycle, release for flight
	4.1.5.7.6.2	AFEE Board Assy - 1st Flight Lot			7-Apr-04	1st 6 flight modules
5C77300120	4.1.5.7.7.3	ND: (5) EM2 TEM/PS for AFEE board ass'y & test		15-Jan-04	15-Mar-04	Need for AFEE Board testing
5C77300130	4.1.5.7.7.3	ND: (5) CAL Test Stations for AFEE ass'y & test		15-Jan-04	15-Mar-04	Need for AFEE Board testing





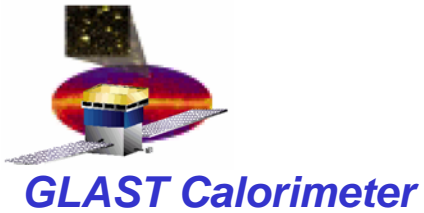
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Plans for March

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- ❑ **Continue flight production of PDA, CDE, Structures**
- ❑ **Complete qualification testing of DPD and CDE**
- ❑ **Complete remaining radiation testing (TID) on all plastic encapsulated parts.**
- ❑ **Complete functional testing of flight ASICs. Start qualification program at GSFC.**
- ❑ **Complete flight AFEE PCB manufacture**
- ❑ **Manufacture and test 1st article AFEE board assemblies.**
- ❑ **Complete Assembly of FMA and FMB PEMs.**





Drawing Release Summary

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Flight Hardware Drawings

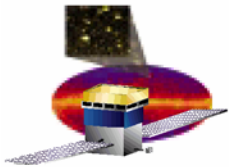
Element	Total Dwgs	Completed Dwgs	Comments
CDE	6	6	
AFEE	10	4	Schematics, Assy Dwgs, Parts Lists, Released after completion of prototype testing
Structure	20	18	Revised module assembly drawing; design AFEE-TEM cable shield.
TOTAL	36	28	78% Complete

All flight hardware drawings will be released by end of March.

Total Drawings – Flight hardware + fab tooling and GSE

- **Identified: 141**
- **Completed: 112 (79%)**

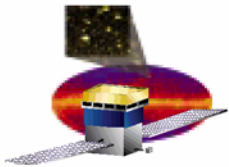




Issues and Concerns

- ❑ **EEE Parts**
 - **Ability to execute functional testing and thermal sampling of GCFE in scheduled time.**
 - Equipment and personnel to are available but can we execute.
 - **Vendor has failed to deliver tantalum capacitors on schedule – some issue with surge testing.**
 - **Airborn has slipped delivery schedule of AFEE-TEM cables. Work around established (I think.)**
 - **Radiation Testing issues**
 - Completion of test reports from Feb BNL tests. TID testing at NRL. Key personnel are over scheduled.
- ❑ **AFEE Assembly**
 - **Verify redesign of AFEE layout.**
 - Errors/problems w/ prototype boards are still being worked at layout house – something about a virus attack destroying some progress.
 - **Flight assembly**
 - Board assembly vendor has been selected. Prototype boards have been sent to him for profiling, etc.
 - Schedule is aggressive.
- ❑ **Composite Structure manufacture**
 - **Adequate resources to sustain build and test rate.**
 - **Scheduling of vibration facilities (vendor) for strength tests**
- ❑ **New Requirement – support DAQ flight module testing w/ flight(-like) AFEE**
 - **Request for 8 AFEE cards capable of DAQ flight environmental test support.**
- ❑ **Current TVAC cycle time breaks budget (schedule/cost by ~40%)**





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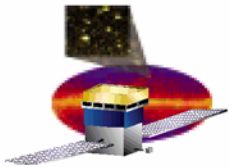
Open Design / EM / Manufacturing Issues

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□ EMI/EMC performance

- Outstanding issues are closing holes thru base plate around AFEE-TEM cable and getting good shield on cable.
- Design of aluminum cable shield is not complete.
- EM testing failed EMI/EMC specs for CAL. Will not be able to test design changes until FMA. Still need testable spec and reasonable test configuration.





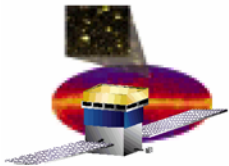
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Documentation and Qualification Program

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- ❑ CDE manufacture and test procedures – 100% complete
- ❑ Composite Structure manufacture and test procedures – 100% complete
- ❑ EEE qualification and screening procedures – 90% complete
- ❑ ASIC documentation – need GCFE9A design and operation parameters specification.
- ❑ AFEE PCB manufacture and assembly
 - Procurement specifications – 100% complete
 - Parts lists and assembly drawings – 95% complete
 - AFEE functional test procedure – 50% complete.
- ❑ PEM Assembly and Test
 - EM versions of procedures exist. Need modifications for flight – mainly tooling changes
- ❑ Module Assembly and Qualification/Acceptance
 - EM versions of procedures exist from EM qualification program. Need modifications for flight protoflight/acceptance testing.





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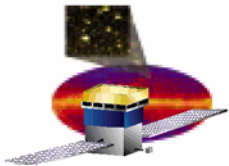
PMCS - Jan '04 Cost Variances

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□ Cost Variance: + \$1,262 cum

- **+280: Mgmt, Eng, R&QA, ~ 1/2 labor, 1/2 travel**
- **+651: CDE Manuf.**
 - Change request returned \$550K to contingency - savings in mgmt labor and tooling costs. Will be realized next month.
 - Remaining is delays in invoicing and approximations in representation of the work.
- **+39: PEM**
 - Invoicing delay in facilities preparation
- **+45: AFEE**
 - Much higher labor costs balanced by savings in GSE materials
- **+225: Module Ass'y & Test**
 - Invoicing for mech and elect GSE handled as 50-50 tasks in PMCS.





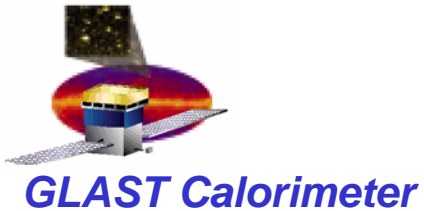
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PMCS – Jan '04 Schedule Variances

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- **Schedule Variance: - \$497 cum (-181 for Jan)**
 - **- 12: CDE Manuf.**
 - Completion of DPD qualification testing, completion of PDA tooling
 - **- 186: PEM**
 - Delay in start/completion of machining. (Now finished)
 - **- 294: AFEE**
 - Delay in delivery of ASICs causing delay in screening and qualification work





Actions to obtain Zero Schedule Variance

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- ❑ **Can't be done unless we deliver FMA without part of environmental testing.**
- ❑ **Mitigations**
 - **Use ASICs before completion of screening and qualification programs.**
 - Already implemented this option.
 - It recovered about 6 of 9 weeks of schedule lost to ASIC
 - **TVAC FMA by itself rather than waiting for FMB**
 - Good for 1 - 2 weeks of float
 - **Assemble first 9 modules as quickly as possible (~ 1/week), rather than the 2 week cadence in PMCS. This could incrementally improve deliveries until modules 9 – 16 are back on schedule.**

