

GLAST Calorimeter

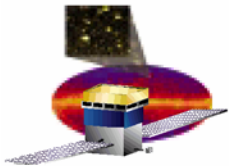
*Monthly Cost /
Schedule / Mission
June 2004*

Monthly Cost/Schedule/Mission Review

GLAST LAT Calorimeter June 30, 2004

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GLAST Calorimeter

Outline

*Monthly Cost /
Schedule / Mission
June 2004*

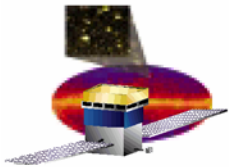
□ Technical Status:

- 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 June 2004

Monthly Cost /
Schedule / Mission
June 2004

□ CDEs

■ Csl Crystals

- To date Kalmar has delivered ~1662 tested crystals to NRL. They have received all crystals (1902) from Amcrys-H. Approximately 100 crystals have been returned to Amcrys for non-compliance.
- NRL has corrected light taper on ~200 crystals that did not meet spec.

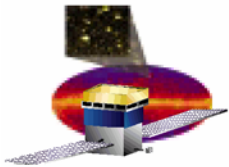
■ PIN Photodiode Assembly (PDA)

- ~ 3400 (out of 4800) flight PDAs have been manufactured, tested and delivered to Swales.

■ CDE Assembly Process

- 1200 CDEs have been bonded at Swales
- 1037 have been wrapped and capped.
- 956 (~ 50% of total) have been tested and delivered to NRL
- Production has increased to 72 CDE per week





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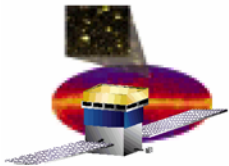
Significant Accomplishments June 2004 (2)

*Monthly Cost /
Schedule / Mission
June 2004*

- **Composite Structure Manufacture – LLR Ecole Polytechnique**
 - **12 flight structures have been manufactured (#3 - #14).**
 - New prepreg has been delivered and inspected, 4 more kits have been cut.
 - **9 of these have successfully completed strength verification vibration test.**
 - **8 of these are at NRL.**
 - **Expect 3 more structures to be manufactured before August holiday in France.**

- **Mechanical Structure Assembly – NRL**
 - **All parts have been manufactured and plated; in flight stores.**
 - **Structures are assembled as needed – 7 have been completed.**





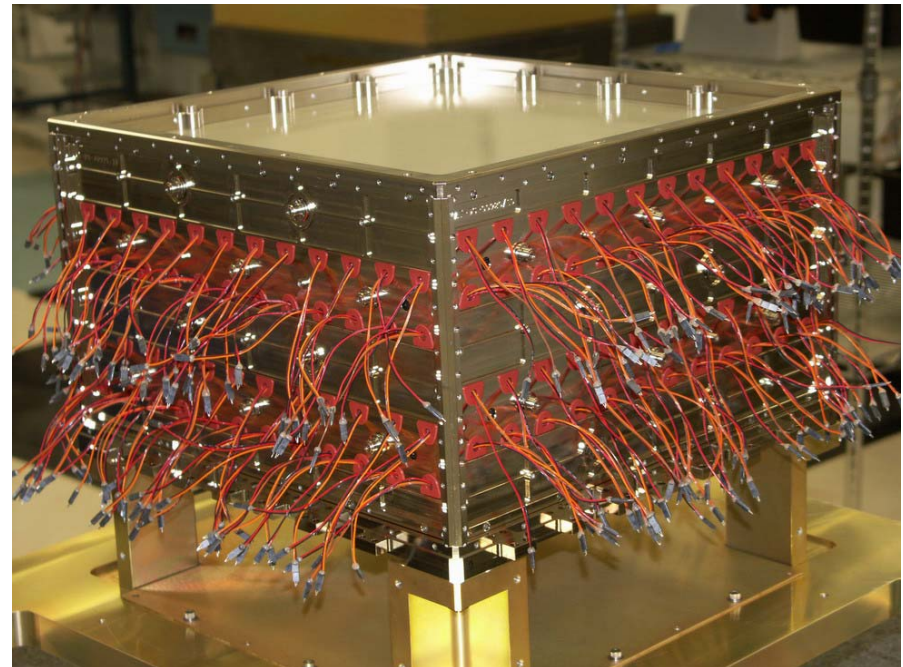
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Significant Accomplishments June 2004 (3)

Monthly Cost /
Schedule / Mission
June 2004

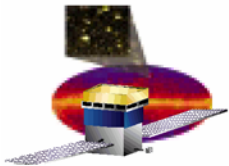
□ PEM Assembly

- 6 PEMs have been completely assembled.
- 5 have completed cosmic muon verification testing with the EGSE checkout electronics; the 6th is currently in muon testing.
- Have manufactured 4 more platforms for PEM assembly to deal with delay of AFEE card installation. PEMs are stored on platform until electronics are installed.



PEM 106 is ready for installation in muon verification test unit.





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Significant Accomplishments

June 2004 (4)

Monthly Cost /
Schedule / Mission
June 2004

□ AFEE Electronics

■ ASICs

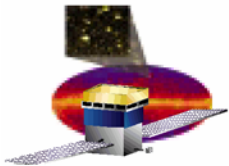
- Qual testing of GCFE and GCRC at GSFC continues. Parts have completed CSAM after SMT simulation. No issues reported to date.
- Interim results available in mid-July, life test ends in mid-August.

■ Flight AFEE boards have been manufactured and assembled.

- Six of each PCB fab'ed at two vendors. Coupons have been delivered to GSFC.
 - Sovereign Circuits was selected for remaining PCB manufacture.
 - 32 more boards have been delivered to assembly vendor.
 - Remaining ~60 boards complete next week.
- 20 boards (10 X and 10 Y) have been SMT assembled and delivered to NRL.
- 32 more will be complete next week.
- Incomplete cleaning under some low profile parts necessitated recleaning of existing boards at NRL and modifications to process at assembly house.

Big Concern: Quality of 56nF Novacap Capacitors





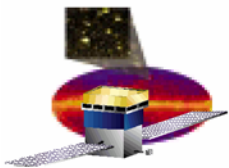
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CAL Near Term Milestones

*Monthly Cost /
Schedule / Mission
June 2004*

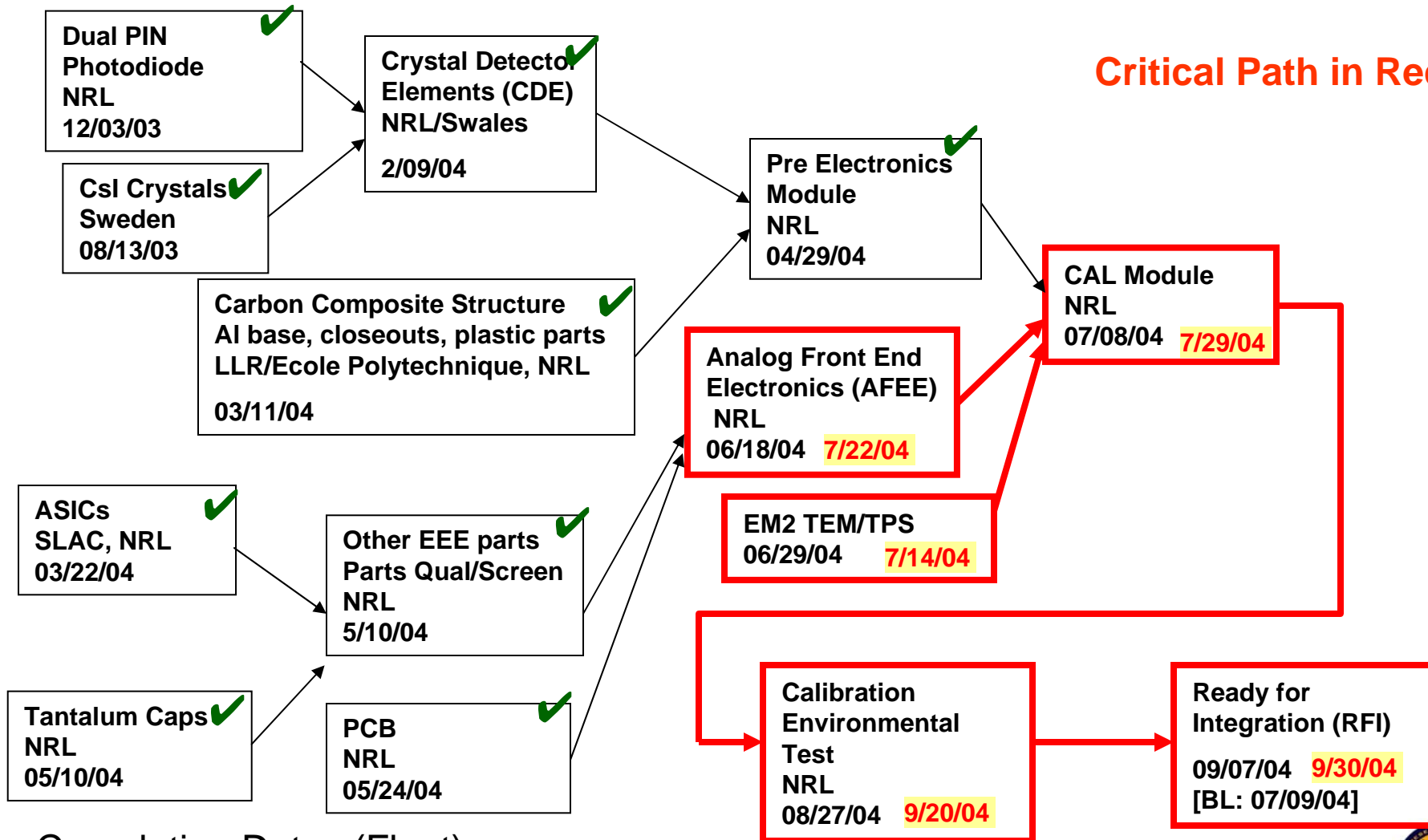
FMA Build	Duration	Early Start	Early Finish	Comments
AFEE Thermal Cycle	3		2-Jul-04	
AFEE Dynamic Burn-in	7		12-Jul-04	
AFEE Conformal Coat	6		21-Jul-04	
AFEE Ready			22-Jul-04	
FMA Test Rediness Review			26-Jul-04	Proposed Date
FMA EMI/EMC Test	6	13-Aug-04	20-Aug-04	
FMA Vibration Test	4	20-Aug-04	26-Aug-04	
FMA TVAC Test	16	27-Aug-04	11-Sep-04	
FMA Muons & Comprehensive Functional	6	13-Sep-04	20-Sep-04	
FMA Preship review	2		23-Sep-04	
FMA Ship to SLAC	2		28-Sep-04	
FMA Post ship functional	2		30-Sep-04	
FMA RFI			30-Sep-04	





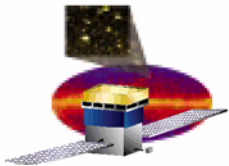
Path to first flight CAL Module (FMA)

Critical Path in Red



Completion Dates (Float)





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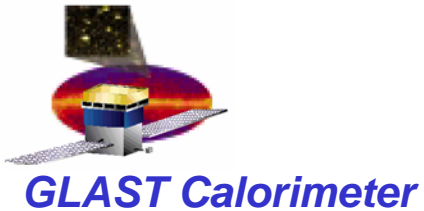
New Impact on FM A Delivery

Monthly Cost /
Schedule / Mission
June 2004

□ AFEE Boards

- **Functional testing delayed by certification of EM2 TEM/TPS**
 - 1st TEM had interface and functional problems detected in safe-to-mate testing.
 - Now have 3 certified EM2 TEM/TPS available for testing. Total of 2 are being returned for troubleshooting.
- **Functional test on 1st flight boards detected excessive leakage current in PIN diode bias circuits. Problem Report (PR) generated.**
 - PR investigations discovered flux residue under the low profile chip capacitors. Cleaning this residue dramatically reduced leakage currents.
 - Recleaned 10 AFEE boards at NRL with dishwasher using aqueous cleaner.
 - Worked with board assembly vendor to improve their cleaning process.





New Impact on FM A Delivery (2)

Monthly Cost /
Schedule / Mission
June 2004

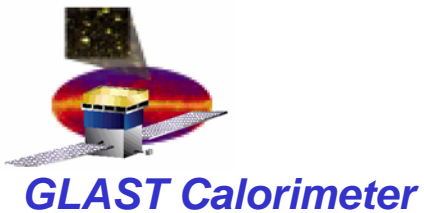
□ AFEE Cards (continued)

▪ PIN diode decoupling capacitors from Novacap remain a concern

- PR investigations showed clean caps with high leakage currents. All were screened at vendor to MIL-PRF-123.
- One reel of caps has been returned to NRL from board assembly vendor for more detailed testing of caps.
- 50 caps have been delivered to GSFC parts branch for accelerated testing – insulation resistance at 125 C. Results available today.
- Individual part testing at NRL indicates that a significant percentage of parts do not pass room temp insulation resistance test of MIL-PRF-123
- We are actively looking for alternate part options and assessing schedule impact.

This issue has not been factored into any schedule forecasts.

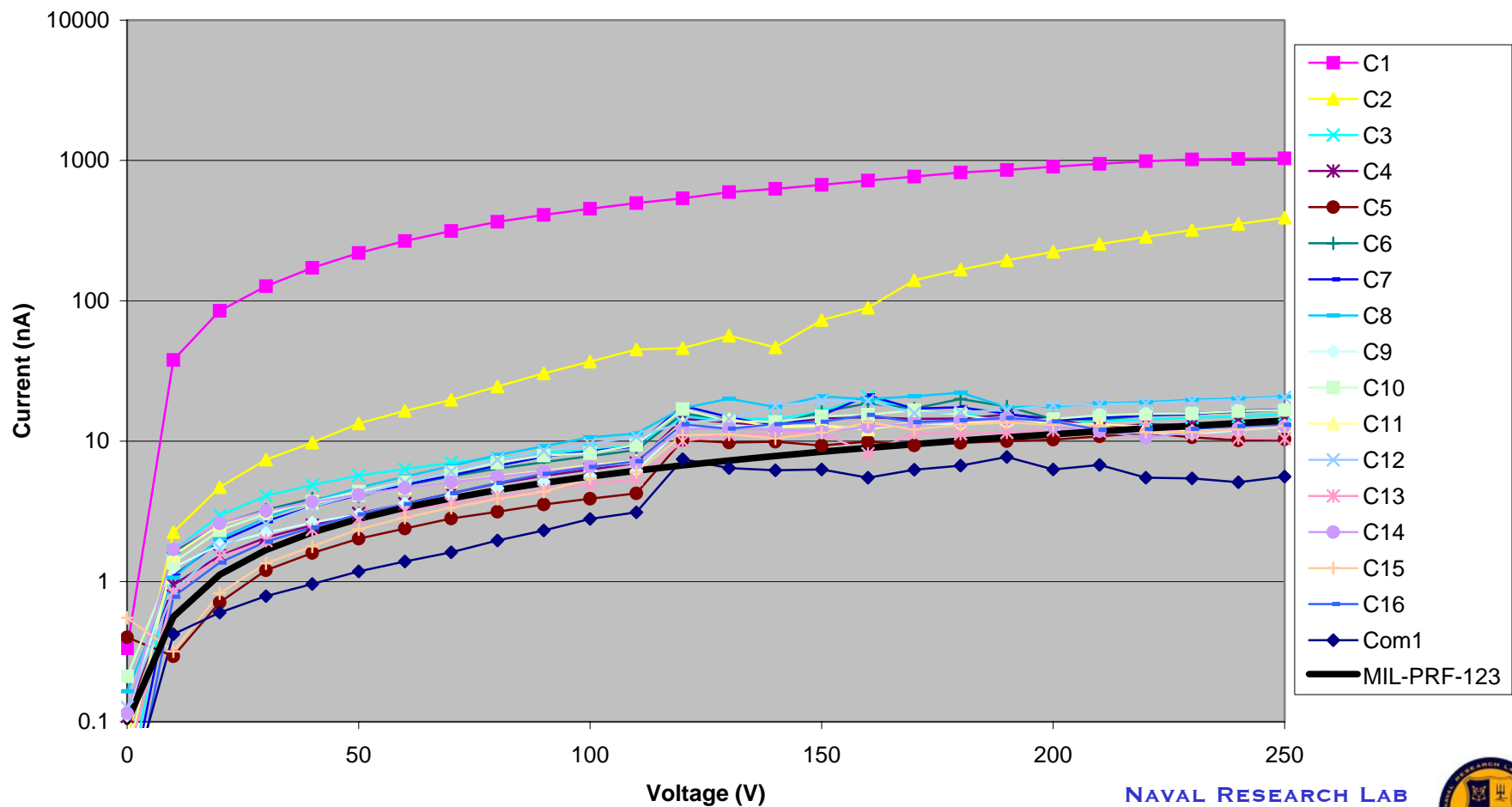


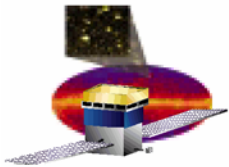


Novacap Measurements

Monthly Cost /
Schedule / Mission
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NRL, 28 June 2004, GLAST Calorimeter
Novacap Capacitors Leakage Current vs Bias Voltage
16 Capacitors + 1 commercial grade (Com1)





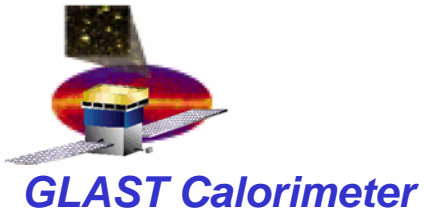
GLAST Calorimeter

Issues and Concerns

Monthly Cost /
Schedule / Mission
June 2004

- ❑ **AFEE Assembly**
 - Resolution of Novacap capacitor quality and applicability.
 - Additional testing and replacement of capacitors may be required. Either replace all Novacap capacitors (~11,000 or 96 per board) or replace those with high leakage currents.
- ❑ **AFEE Testing**
 - Short term logistics problem with not enough copies of TEM/TPS for board testing. Returned two units for repair.
 - Tenney chamber (one of two) controller broken. Out for repair. Other two chambers are tied up with SECCHI testing. Looking for alternatives. New test sequence could use three chambers in the short term.





Drawing Release Summary

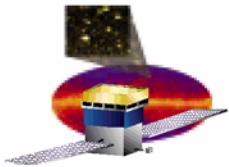
Monthly Cost /
Schedule / Mission
June 2004

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





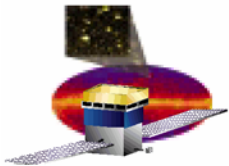
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Documentation and Qualification Program

Monthly Cost /
Schedule / Mission
June 2004

- ❑ 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.
 - EM versions of procedures exist from EM qualification program. Modifications in progress for flight protoflight/acceptance testing.
 - Draft of new EMI/EMC test procedure is in circulation.
 - Looking to Test Readiness Review around 26-July.





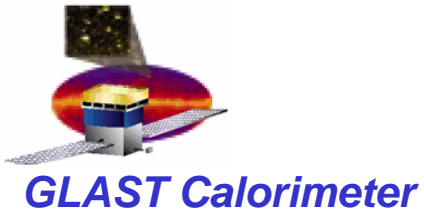
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PMCS - May '04 Cost Variances

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- **Cost Variance: + \$517 cum (-\$77 for May)**
 - **+204: Mgmt, Eng, R&QA, (-65 for May)**
 - **+389: CDE Manuf.**
 - PDA manufacturing - materials cost underrun.
 - CDE manufacturing - labor underrun (+296)
 - **+39: PEM**
 - Invoicing delay in facilities preparation
 - **-62: AFEE**
 - Much higher labor costs balanced by savings in GSE materials
 - **-156: Module Ass'y & Test**
 - **+61: GSFC allocated funds that apparently can't be spent**





PMCS – May '04 Schedule Variances

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- **Schedule Variance: - \$927 cum (-160 for May)**
 - **- 119: 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)
 - **- 172: PEM**
 - Delay in delivery of 1st composite structures.
 - **- 278: AFEE**
 - Delay in delivery of ASICs causing delay in screening and qualification work
 - Problems in manufacture of AFEE PCB.
 - **- 358: Module Assy & Test**
 - Delay in electronics delivery for module A&T

