GLAST Large Area Telescope:
Cost/Schedule Review
December 2, 2004
AntiCoincidence Detector (ACD) Subsystem
WBS: 4.1.6

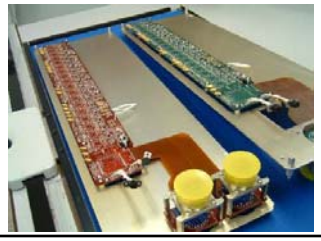
David J. Thompson
Thomas E. Johnson
NASA Goddard Space Flight Center
Subsystem Manager/Instrument Manager

David.J.Thompson@nasa.gov
Thomas.E.Johnson@nasa.gov

Significant Accomplishments

- Completed installation of all top 25 TDAs
- Successfully completed all qualification testing of the new PMT mounting design.
- Started EMI testing
- Completed the assembly and functional testing of all (8) Electronic Chassis (minus the PMTs)
- Successfully passed an internal ISO Audit
- Prepared for cost/schedule rebaseline

Recent Accomplishments - Electronic Component Status

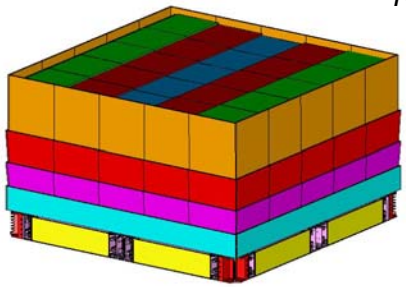
ITEM	Quantity Required Flight (Spare)	Assembly Complete	Functional Testing	Conformal Coating	Thermal Testing	Ready for next assembly
Front End Electronics Boards 	12 (4)	16	16	16	16	16
High Voltage Bias Supply 	24 (6)	30	30	30	30	30
Photomultiplier Tube Assembly 	196 (40)	33	10	10	10	10

Fabrication, Assembly and Testing status

Number needed in parenthesis

STATUS KEY

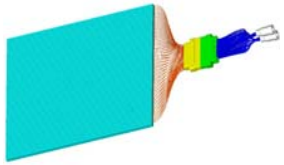
- Prototyped
- In Fabrication or Ordered
- Received
- In assembly
- Assembled
- Tested



ACD Assembly (1)

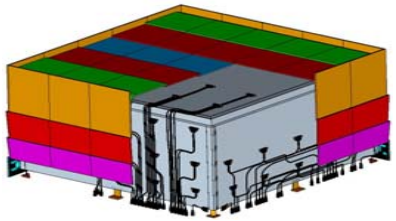
Clear fiber cables (130)

6
130
130 (All)

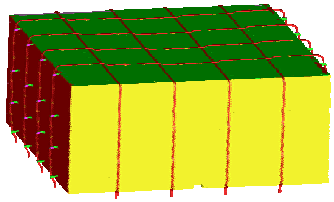


12
All 89 + spares
All
All
45

Detector assemblies - TDA - (4 basic types, 89 needed total)

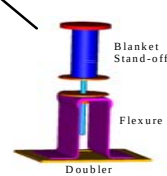


Tile Shell Assembly –TSA (1)



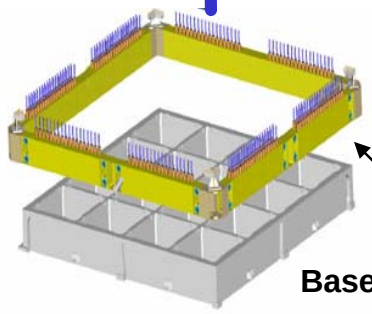
1
8
8
8
8
8

Fiber ribbon detectors (8)

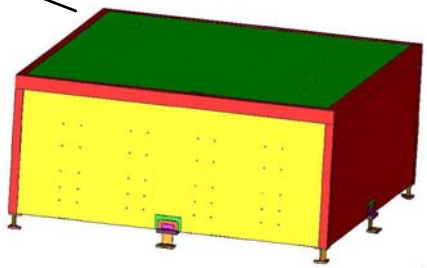


8
360
360, All

Detector Flexures (366+20 spares)



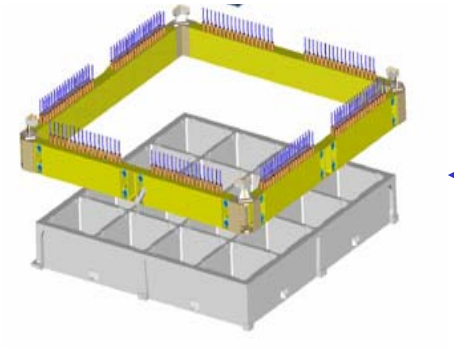
Base Electronics Assembly (BEA) From next page



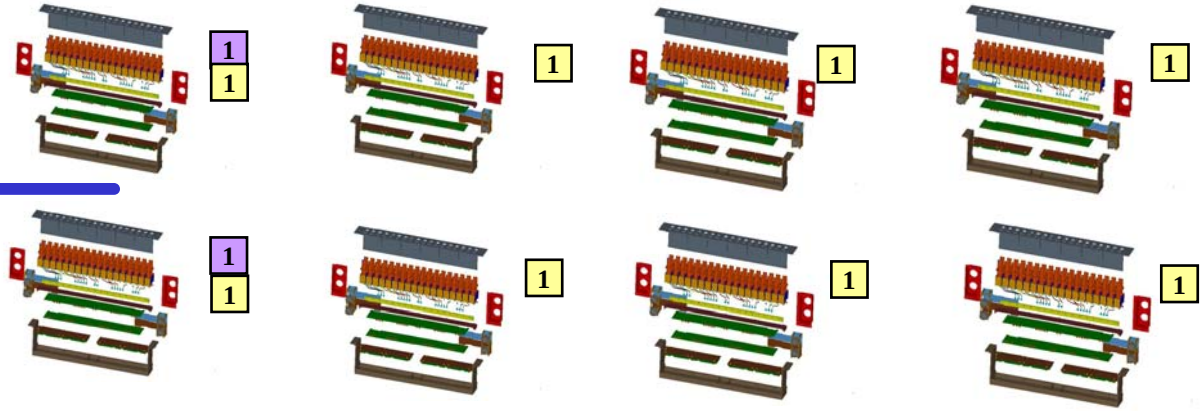
1
1

Composite Shell Assembly (1)

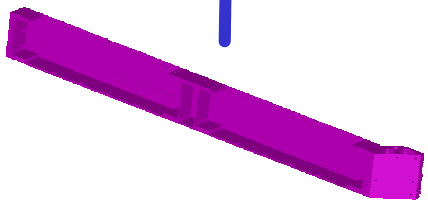
Fabrication, Assembly and Testing status



Base Electronics Assembly (1)

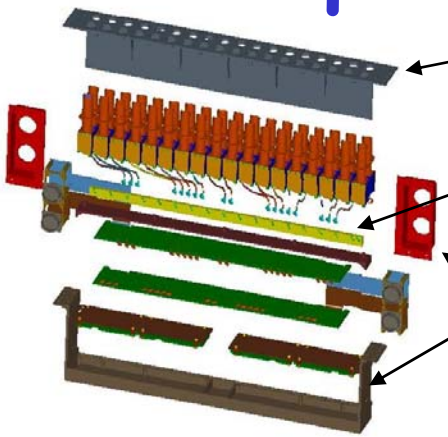


Electronics Chassis (8) (4 double + 4 single)



Base Frame Assembly (1)

– in and assembled



Photomultiplier Tube rails (8 + 2 spares) – All in

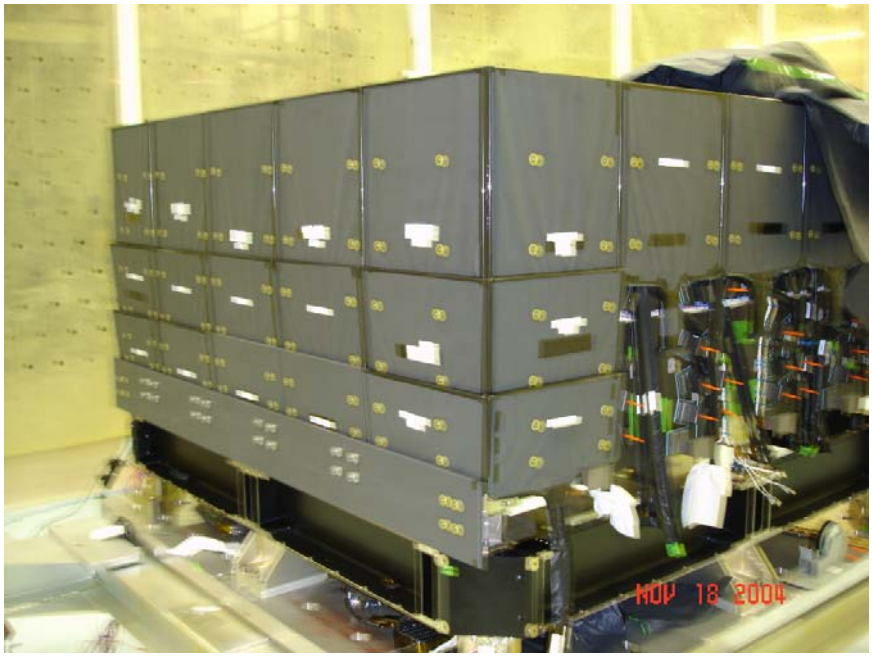
Power distribution board (8+2 spares) – All in

Chassis and connector frames (8) – All in

Connectors (32) – All in

TSA I&T

- ALL 25 TOP TDAs INSTALLED IN FINAL CONFIGURATION
- INSTALLATION OF SIDE TDAs IS UNDERWAY



TSA I&T

PICTURE SHOWING CLEAR FIBER ROUTING AND RIBBON DETECTORS UNDER A BENT TDA

Near Term Milestones

Milestone Description	Date	New Date	Status/Notes
Complete PMT Assembly	January, 2004	1/25/04	More detailed information to follow
Complete Flight Mechanical Drawings	September	12/23/04	One assembly drawings remains. Designer has been focused on problem resolution, revisions, and EOs.
Complete installation of 25 top TDAs	10/15/04	Actual 11/10/04	COMPLETE
EMI Testing of Qual/Flight Spare Electronics Chassis	11/29/04	12/06/04	Testing taking longer than planned due to non-standard requirements (facility engineers are not familiar with requirements).
Complete environmental and functional testing of first 10 flight PMTs	11/10/04	Actual 11/19/04	COMPLETED. All 10 PMTs successfully passed testing!
Complete 34 PMTs for first dual row Electronic Chassis	11/19/04	12/14/04	Contamination issues on the PMT leads (zinc chloride) and mechanical parts issues have delayed assembly.
Thermal vacuum test Qual/Flight Spare Electronic Chassis using fully functional EGSE	12/15/04		EGSE hardware and software need to be completed.

PMT Assembly - Schedule of Events

PMT QTY.	Cleaning (Materials)	Mechanical Assembly	Electrical Asm. & Test	Thermal Cycle	Coating & Enclosures	Connector Installation	Light Tight Testing
	IN / OUT	IN / OUT	IN / OUT	IN / OUT	IN / OUT	IN / OUT	IN / OUT
1 - 10	Done	Done	Done	Done	Done	Done	Done
11 - 17	Done	Done	Done	12/3 / 12/6	12/6 / 12/10	12/10 / 12/13	12/13 / 12/13
18 - 33	Done	11/24 / 12/1	11/30 / 12/3	12/3 / 12/6	12/6 / 12/10	12/10 / 12/13	12/13 / 12/14
34 - 64	12/1 / 12/2	12/1 / 12/6	12/7 / 12/10	12/11 / 12/12	12/13 / 12/17	12/17 / 12/20	12/21 / 12/23
65 - 95	12/2 / 12/3	12/6 / 12/10	12/13 / 12/17	12/17 / 12/18	12/20 / 12/23	12/27 / 12/28	12/29 / 12/30
96 - 126	12/6 / 12/7	12/13 / 12/17	12/20 / 12/23	12/23 / 12/26	12/27 / 12/30	1/3 / 1/4	1/4 / 1/5
127 - 157	12/6 / 12/7	12/20 / 12/23	12/27 / 12/30	12/30 / 1/2	1/3 / 1/7	1/7 / 1/10	1/10 / 1/11
158 - 188	12/7 / 12/8	12/27 / 12/30	1/3 / 1/7	1/7 / 1/8	1/10 / 1/14	1/14 / 1/17	1/17 / 1/18
189 - 209	12/7 / 12/8	1/3 / 1/7	1/10 / 1/14	1/14 / 1/15	1/17 / 1/21	1/21 / 1/24	1/24 / 1/25

EGSE – Test Stands

EGSE/G3 Test Stand upgrades completed Nov. 4 by LAT Electronics and I&T personnel. Thank you, Jana, Jim, Amedeo!

- **Included new cables, new LCB boards, and new software.**

ACD software developers have been working hard to adapt and complete test scripts

- **New version of qT software was incompatible with some approaches ACD tests had been using. Resolved, but at a price in performance.**
- **Test scripts are now in use for chassis EMI/EMC testing.**

Test Script Status: 31 scripts needed. 25 working, 6 in development.

- **Plan: make needed improvements in some working scripts, then complete three scripts needed for Full Functional Test of chassis (by next week), then work on three scripts needed for full ACD operation (by January).**

Issues, Concerns, & Documentation

- Issues
  - Schedule/Cost - PMTs
  - EGSE/Electronics Chassis testing
- Concerns
  - EGSE/Electronics Chassis testing
  - Schedule/Cost - PMTs
- Documentation
  - Status of PR/PFRs
    - 98 PR's Closed
    - 4 PFR's Closed
    - 10 PR's Open
    - 6 PFR's Open (1 black, 1 green, 3 yellow, 1 red)

ACD Schedule Variances

- 4.1.6 – ACD Subsystem (-$522K cum, +$52 current)
- 4.1.6.4 BEA Schedule Variances (-$221K cum, +$18K current)
  - All variance is due to the PMTs.
- 4.1.6.7 ACD I&T (-$273K cum, -$31K current)
  - Technical issues (PMTs and EGSE) have delayed progress. This will begin to improve when PMT completion allows the ACD to be integrated and tested
- 4.1.6.B GSE (-$23K cum, $0K current)
  - ($23K) – Shipping container work being pushed out to reduce manpower.

ACD Cost Variances

- 4.1.6 ACD (-$259K cum, -$217K current period)
- 4.1.6.1 ACD Project Management/Sys Eng/Science (+$217K cum, +$4K current period)
  - Science support lower than planned and a lag in accruals. This is one area that has been identified as needing additional support in the form of a Grad student. (+$150K)
  - Systems Engineering Support running lower than planned (+$32K)
  - CM and Scheduling support lag in accruals (+$31K)
  - MPS/Lab Tax (+$38K)
  - Materials, software maintenance and fabrication support ($18K)
- 4.1.6.2 Safety and Mission Assurance (-$10K cum, -$71K current period)
  - Correction was made this month for Materials support on the PMT anomaly that was assessed to 4.1.6.2 instead of 4.1.6.4
- 4.1.6.3 Tile Shell Assembly (-$148K cum, -$26K current period)
  - (-$77K) - Design and analysis manpower
  - (-$71K) - Fabrication charge backs higher than planned

ACD Cost Variances

- 4.1.6.4 Base Electronics Assembly (-$244K cum,-$152K current month)
  - (-$74K) – Labor for PMTs and chassis testing
  - (-$126K) – Materials, no earned value, but incurring costs on tasks that are in progress, but not completed
  - (-$44K) - SLAC ASIC charges.
- 4.1.6.5 MS/TB (+$33 cum, -$2K current month)
- 4.1.6.6 ACD Mech Qual and Cal Unit (-$52K cum, -$19K current month)
- 4.1.6.7 I&T (-$131K cum, -$65K current month)
  - Have not received credit for the amount of work done.
  - TSA Integration manpower overrunning
- 4.1.6.B Ground Support Equipment (+$75K cum, -$29K current month)
  - (+$38K) – Labor. Costs lagging on mechanical design and EGSE support.
  - (+$66K) – Materials. Not billed for work completed

Threats to Schedule and Cost

1. GASU/G3 EGSE
2. PMT Assembly
3. Electronics assembly and test
4. Minor Technical Issues that require manpower and time to resolve.