

AntiCoincidence Detector

**GLAST Large Area Telescope:
Cost/Schedule Review
April 26, 2005
AntiCoincidence Detector (ACD)
Subsystem
WBS: 4.1.6**

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Significant Accomplishments

- **Performed hundreds of hours of testing on the Electronic Chassis's**
- **Made significant progress on resolving the noise anomaly.**
- **Repaired 3 Electronic Chassis that had noisy PMT assemblies**
- **Performed 2 Electronic Chassis TVAC tests**
- **Successfully completed the EMI/EMC re-test on a flight Electronic Chassis**
- **Integrated 2 Electronic Chassis to the ACD. Delivered 2 additional chassis for final integration to the ACD**
- **Made significant progress on the EGSE.**
- **Working several facility issues. Resolved silicon contamination due to cleanroom garments.**
- **Operated ACD channels with an external trigger, using a muon hodoscope to emulate a tracker.**
- **Completed all spare PMT assemblies.**

Noise Anomaly - Summary

- Identified 6 phototube assemblies with a noise problem (rapid increase of noise after some running time at high voltage).
- We have not found additional noisy channels during testing/screening of the Electronic Chassis's.
- **Have determined that the noise pulses are significantly smaller than the signals from real particles and that the noise only occurs at voltages higher than we expect to operate.**
- The only way to resolve this random anomaly is through additional testing and screening. This has required a significant amount of time, but has proved to be of great benefit.
- The root cause has been narrowed down to the PMT
 - Hamamatsu believes they know the root cause – discharge between two electrodes across an isolator
 - A noisy PMT has been sent to them and they will be testing it. Tune Kamae has made contact with Hamamatsu so that they will make this a priority.
- Continuing with final integration of the ACD.
- **The last of the 6 noisy tubes is being replaced today.**

Summary and Actions – Noise Issue

- **Electronic Chassis Summary and Status:**
 - **1L – single row: Long duration testing completed this month. Integrated to the ACD.**
 - **1R – single row: Noisy PMT has been replaced and unit is in testing. Delivery to I&T on May 6.**
 - **2R – double row: Long duration testing complete. No significant anomalies (had a suspect tube, but can fly “as-is”). Currently in TVAC. Delivery to I&T on May 2.**
 - **2L – double row: Long duration testing completed this month. Delivered to I&T on April 26.**

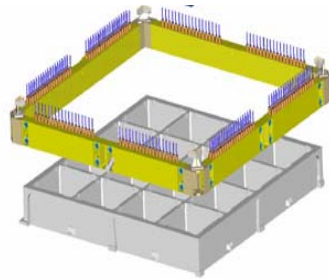
Summary and Actions – Noise Issue

- **Electronic Chassis Summary and Status:**
 - **3L – single row: Long duration testing completed this month. Integrated to the ACD.**
 - **3R – single row: This chassis has a noisy PMT. Performed TVAC and long duration testing on this unit this month with the noisy PMT to determine if noise anomaly would get worse due to time and environment. It did not. This unit is currently being repaired and will be retested (functional and vibration). Delivery to I&T on May 6.**
 - **4R – double row: This unit had a noisy PMT assembly. It was replaced this month and long duration testing is currently being performed. Functional testing will end on May 3, a vibration test will be performed and it will be delivered to I&T on May 9..**
 - **4L – double row: Completed TVAC and EMI testing this month. No anomalies detected. Delivered to I&T on April 26.**

Near Term Milestones

Milestone Description	Date	New Date	Status/Notes
(4) electronic chassis vib/ tvac tested and RFI	3/5/05	<u>4/26/05</u>	<u>COMPLETED</u>
(4) electronic chassis vib/ tvac tested and RFI	3/28/05	<u>5/9/05</u>	<u>Last EC is in repair, other 3 are in testing.</u>
ACD Integration Complete	4/6/05	<u>5/16/05</u>	<u>Assuming noise issue is resolved next week and limited re-testing is performed. Slipped 17 days from last months WAG.</u>
ACD Functional Test	4/13/05	<u>5/23/05</u>	<u>EGSE and Test Scripts are the primary schedule threat.</u>
ACD PER	5/24/05		<u>Working with Mark Goans to finalize date.</u>
Efficiency Verification Test	6/3/05		<u>Recently resolved a data format and analysis issue.</u>
Thermal Vacuum	6/15/05		<u>Two issues. 1. MMS/TB will not be ready for start of test. 2. Need to complete test by 6/24 due to facility constraints.</u>
MMS/TB Installation	6/17/05		<u>Completion date for MMS is June 1, TB is June 15.</u>
Vibration	6/23/05		

Electronics Chassis Assembly and Test Plan – Completion Dates (WAS > NOW)



Base Electronics Assembly (1)

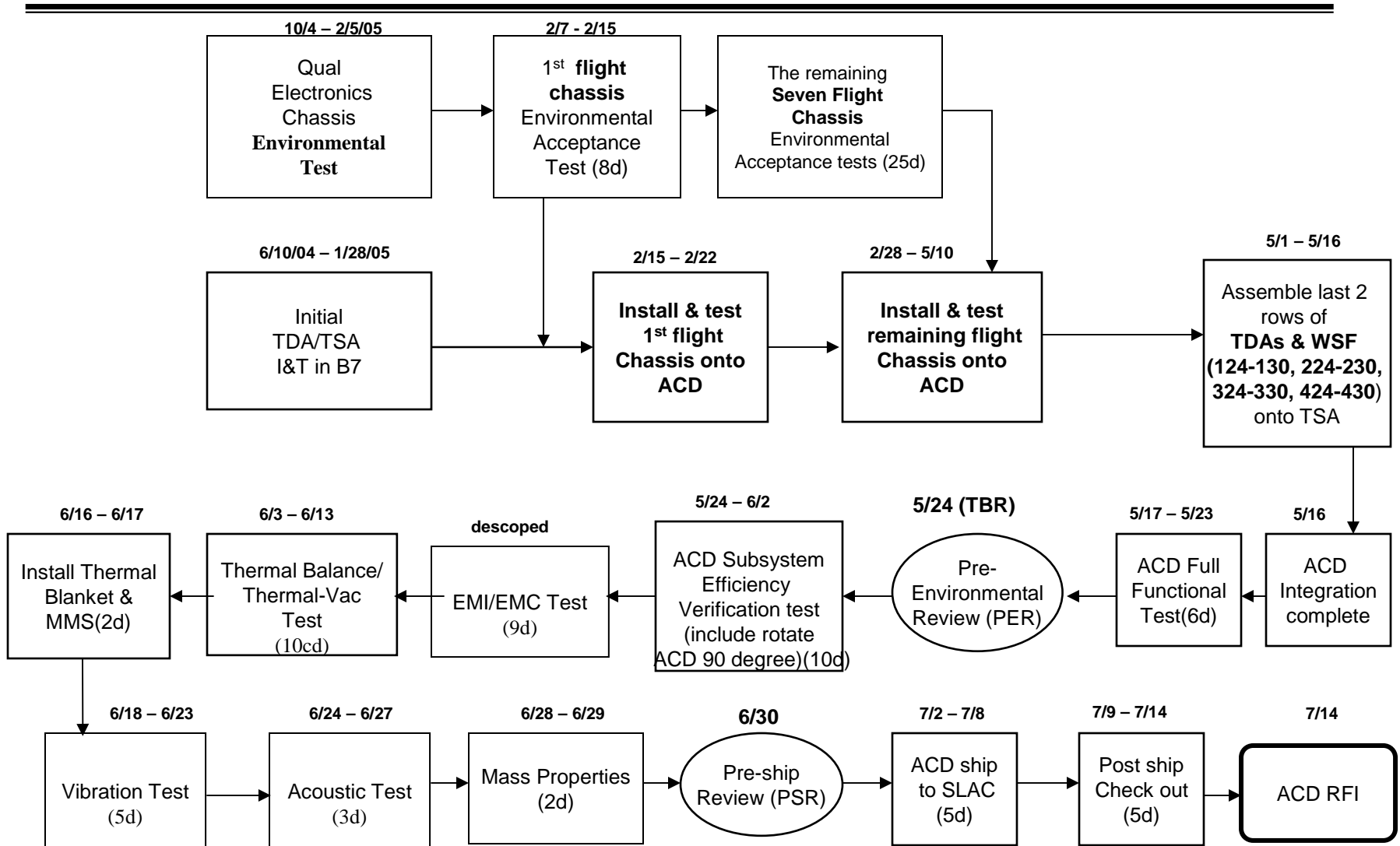
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Electronics Chassis (8) (4 double + 4 single)

Electronics Chassis	Assembly	EMI/EMC	Vibration	Thermal Vacuum
Qualification / Flight Spare	Complete	Qualification (completed)	Qualification (completed)	12 cycles (completed)
#1	Complete	Not planned	Complete	Complete
#2	Complete	Not planned	Complete	Complete
#3	Complete	Not planned	Complete	Complete
#4 (4L-double)	Complete	Not planned > Performed	Complete	Descoped > Complete
#5 (4R-double)	Complete / 4/6	Not planned	Complete > 5/3	Complete
#6 (1R-single)	Complete / 4/20	Not planned	3/11/05 > 5/5	Descoped
#7 (3R-single)	Complete / 4/27	Not planned	3/11/05 > 5/5	Descoped > Complete
#8 (2R-double)	Complete	Not planned	Complete	3/10/05 > 4/29

Schedule Flow



EGSE – Test Stands

Recent Activities

- We have developed a plan to complete software and scripts, using all available resources
- Byron Leas from the Calorimeter is working on dynamic allocation of calibration files
- Some scripts being used for chassis testing are still being debugged. Progress, but not complete. Partly an issue of differences in GASUs. The LAT Online group has recently provided some workarounds for software and firmware deficiencies.
- Tested ACD using external hodoscope as a tracker emulator, including processing data – LDF, digi, ntuples, root
- Software for handling calibration files and establishing baselines is still in development (not just scripts)
- We have working (though not final) versions of all but one of the ACD test scripts. The real test will not come until the ACD is fully assembled.

ACD Problem /Failure Report Status

As of 4/26/05 a total of 243 PR's have been opened (35 opened this month)

- ▶ 187 PR's have been closed (45 closed this month)
- ▶ 56 PR's open (10 less than last month)
 - ▶ Majority for test script failures

A total of 18 PFR's have been opened (4 opened this month)

- ▶ 5 PFR's are open
 - ▶ 3 Red, 2 yellow
- ▶ 13 PFR's closed (3 closed this month)

AntiCoincidence Detector

Milestone Variance Explanation

- **ACD Test Scripts to LAT I&T**
 - **Schedule Impact – 2 weeks for ACD, no impact to LAT I&T.**
 - **Cost Impact - \$60K (direct manpower)**
 - **Corrective Action – Retain ACD software engineer and get additional support from Cal software engineer. All remaining tasks detailed and prioritized. Will not deliver until successful completion of ACD Functional testing.**
- **ACD at SLAC, RFI**
 - **Schedule Impact – -21 days.**
 - **Causes - Noise issue, facility contamination, Additional EMI testing, EGSE/Test Scripts, and PMT assembly.**
 - **Cost Impact – \$729K**
 - **Corrective Actions – 1. Do not perform EMI testing at full ACD level. 2. Perform ACD TVAC without MMS/TB. 3. Resolve noise anomaly**

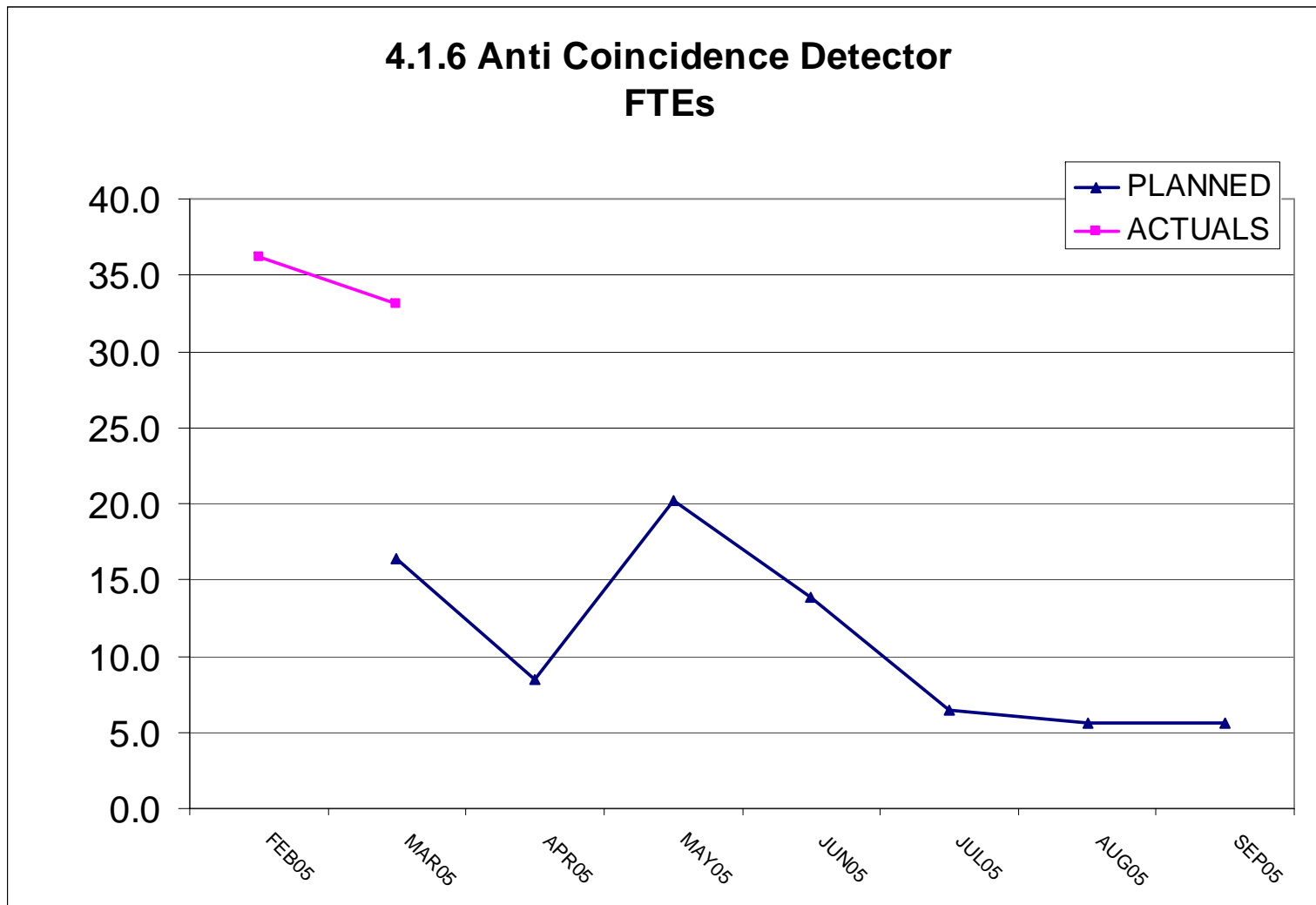
Cost Report

Reporting Category	Cost Incurred				Estimated Cost			Estimated Final Cost		Unfilled Orders Outstanding
	During Month		Cum. to Date		Detail		Balance of Contract	Contractor Estimate	Contract Value	
	Actual	Planned	Actual	Planned	APR05	MAY05				
4.1.6 ANTICOINCIDENCE DETECTOR										
4.1.6.1 ACD PROJECT MANAGEMENT/SYS ENGRG /SCI S	29	45	3,614	3,758	96	41	361	4,113	4,113	125
4.1.6.2 SAFETY & MISSION ASSURANCE	48	10	769	760	9	9	30	817	817	
4.1.6.3 TILE SHELL ASSEMBLY (TSA)	1		3,770	3,733			-37	3,733	3,733	17
4.1.6.4 BASE ELECTRONICS ASSEMBLY (BEA)	87		6,497	6,284			-213	6,284	6,284	87
4.1.6.5 MICROMETEOROID SHIELD/THERMAL BLANKET	37	48	441	577			136	577	577	0
4.1.6.6 ACD MECHANICAL QUALIFICATION & CALIBRATIO			177	160			-17	160	160	
4.1.6.7 ACD INTEGRATION & TEST	110	46	350	311	59	172	9	589	589	
4.1.6.8 LAT INTEGRATION & TEST SUPPORT							17	17	17	
4.1.6.B GROUND SUPPORT EQUIPMENT (GSE) & FACILIT	3	124	778	951			173	951	951	19
CAPW[3]Totals:	315	274	16,395	16,534	165	222	459	17,241	17,241	248

Cost Variance Explanation

- **Why overrun/underrun? Late PMT completion, EGSE/Test script development, vibration test anomaly resolution, EMI radiation emission exceedence, facility contamination, noise anomaly, schedule variance.**
- **What will be done to correct? PMTs are complete, EGSE/Test scripts making good progress, vibration test anomaly resolved, EMI issues resolved, descope EMI testing, descope ACD TVAC with thermal blanket installed, facility contamination resolved, close out noise anomaly. Change Request submitted.**

FTE Report (DOE/NASA-funded only)



Manpower Plan

- Where did the manpower plan on the previous page come from? The following information is the plan the ACD provided in November, 2004.
- The following table provides both the Contractor and Civil Servant manpower plan for FY05-FY07

FY05														Total	Total
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	FY06	FY07		FY05
CS	26.1	20.4	18.2	21.7	16.8	16.3	16.6	8.6	1.3	1.3	1.3	0.8	0.0	13.2	12.4
CON.	25.6	17.7	20.1	14.6	10.5	8.6	7.7	4.0	1.5	1.0	1.0	0.7	0.2	10.3	9.4
TOTAL	51.7	38.1	38.3	36.3	27.4	24.9	24.3	12.6	2.8	2.3	2.3	1.5	0.2	23.4	21.7

- **Assumptions:**
 - ACD RFI and integration to the LAT date is 5/17/04.
 - ACD Support Team ramps down significantly after 5/17/04.
 - From July – September, 1.8 FTE's are for Science Support and the remaining support is for Systems Engineering and Management.

FTE Variance Explanation

Approximate overrun of 6 FTEs in March

- **Why overrun/underrun? Late PMT completion, EGSE/Test script development, vibration test anomaly resolution, EMI radiation emission exceedence, facility contamination, noise anomaly, schedule variance.**
- **What is the impact? Cost**
- **What will be done to correct? PMTs are complete, EGSE/Test scripts making good progress, vibration test anomaly resolved, EMI issues resolved, descope EMI testing, descope ACD TVAC with thermal blanket installed, facility contamination resolved, close out noise anomaly.**