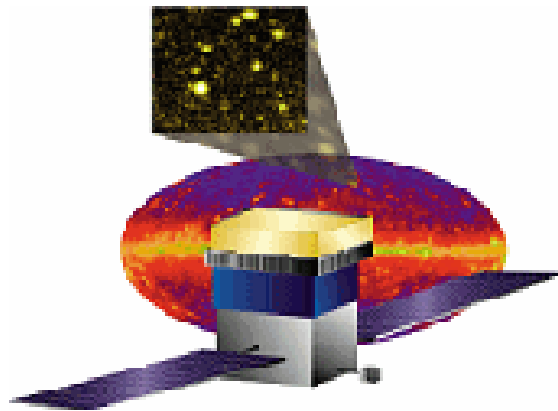


# **Monthly Progress Report**

**(Month Ending March 2005)**

## **GLAST Large Area Telescope (LAT)**



LAT-MR-06339-01

May 4, 2005

## 1.0 Introduction

This monthly progress report is submitted to the GLAST Project Office at the Goddard Space Flight Center and the Department of Energy SLAC Site Office. The report summarizes LAT project status as of the end of March, 2005.

## 2.0 Recent Progress and Status

### 4.1.4 Tracker

The first flight tower is ready for integration into the flight grid; the second has been integrated into the single-bay grid. The third tower has been reassembled and is ready for the second environmental test. The fourth tower has been shipped from Italy. The fifth tower is assembled and ready for environmental test; trays for the sixth tower are being assembled.

An average of 20 good multichip modules (MCMs) have been delivered per week since the restart of MCM production. The rate has been limited by quality problems and rework in the pitch adapter flex circuit bonding to the printed wiring board. Four copies of the new bonding fixture have been delivered to the vendor, and two more are underway. Testing has demonstrated improved bond quality.

There has been no recurrence in the new production of the delamination problem seen in last year's production. The conclusion is that the use of Kapton masking tape with silicone adhesive was the root cause. The mechanical cover alternative will not be implemented.

Production of pitch adapters has resumed, with new parts made with electrolytic plating. Very few parts are now being rejected due to cracked traces.

A shorted ladder was observed in the third flight tower. The affected tray was removed and tested; the root cause of the ladder failure is delamination of the bias circuit from the tungsten surface. This was a known problem; trays now in production use tiles etched and primed at GSFC in a procedure that was thoroughly developed, tested, and controlled.

Technical, workmanship, and schedule performance issues have continue to be a problem at the flight cable vendor. Several potential modifications to vendor procedures, work scheduling, and improved tooling are underway. Alternate sources are being investigated.

### 4.1.5 Calorimeter

Flight Calorimeter modules 8 through 10 have completed environmental testing, and are in final calibration and performance testing. Flight modules 11 through 14 are being installed in thermal-vacuum test fixtures. Modules 15 and 16 are assembled and awaiting environmental and initial performance testing, respectively. Module 17 is undergoing conformal coating; analog front-end electronics (AFEE) is being installed on the eighteenth module. All flight AFEE boards are completed; the last four are in conformal coating.

#### 4.1.6 Anticoincidence Detector

Assembly and test of the flight photomultiplier tubes (PMTs) was completed. The first flight electronics chassis was re-integrated after stripping the anodize coating on the base frame, to reduce radiated emissions. First muons were detected using flight detectors and electronics. All nine electronics chassis are assembled and functionally tested. Six have completed vibration testing; four have completed thermal-vacuum testing. A spontaneous rate increase was detected during thermal-vacuum testing on five of eight electronics chassis. The root cause is under investigation.



Figure 1: The first re-integrated ACD flight electronics chassis.

#### 4.1.7 Electronics, Data Acquisition, and Flight Software

The second Tower Electronics Module (TEM) and Tower Power Supply (TPS) are ready for integration. Six TEMs and four TPSs are being tested (pre-coat stage). Low-ESR (Equivalent Series Resistance) of flight-lot capacitors has resulted in a 100-mV ripple. Measurements and simulation are underway. Assembly of the power distribution unit is underway, and expected to be completed in early April. An analog mux card for thermal vacuum test is being assembled; the vibration fixture has been fabricated. There has been a delay in the parts kitting of the GASU due to manpower shortage. Coupon failures have resulted in refabrication of the SIU/EPU (spacecraft interface unit and event processor unit) boards. The amount of copper in the boards has been reduced to simplify connector assembly. The wave-solder connector assembly looks promising, but requires some additional troubleshooting before flight assembly can commence. Two sets (of four) of global positioning systems and spacecraft/LAT communication boards have been received for the virtual spacecraft simulator. The hardware interface modules have been completed and tested.

A demonstration of event filtering was conducted. The development environment has been retooled to produce flight software executables for Windows; it has also been proved that major components of the development environment itself can be ported to

Windows. Developers met to design a configuration system for a more flexible initialization process. An upgraded inter-task communications system is scheduled for release in early April. Flight Software test executive changes are being made to support the use of the virtual spacecraft simulator. The web-based control system for the front-end simulator has been completed, and is being used for filter development and integration. Unit testing of the CPU monitoring package is underway. Telecommands have been added to allow operators to control thermal control telemetry. The instrument physics gamma filter code is complete, and is now being run on the test bed. Work on the physics data output formats is underway.

#### 4.1.8 Mechanical Systems

The grid box weight and center-of-gravity measurements are complete. The grid is ready for integration. Procurement activities for the grid static load test have commenced. The grid and grid perimeter ring were successfully mated and de-mated. The radiators are complete, except for edge taping. The heat pipe and cooling tube bonding process for the cross-LAT (X-LAT) plate assembly is complete. Drawings for the heaters and sensors are in signoff.

#### 4.1.9 Integration & Test (I&T)

New Calorimeter and Tracker configurations and trigger test scripts were validated on the first tower. CPTs, trigger optimization, calibration, data collection, and aliveness tests were conducted on the first tower. The second tower was integrated into the single-bay test stand. The second TEM and TEM/PS were received. Preparation for the two-tower test is underway.



Figure 2: Second tower in the single-bay grid, being prepared for electrical testing

Rework of the grid perimeter ring was completed. Proof testing of the integration stand, grid perimeter ring, and personnel access platforms was conducted. The integration stand was relocated to the LAT integration & test facility. The grid perimeter ring lift-off test was conducted, to verify ACD clearance. A second single-bay stand was completed.

An instrument analysis workshop with the first flight tower data was conducted. Calibration of single-tower data was successfully turned around in four hours. The offline data processing system is now operating under configuration control.

Single-tower Van de Graaff testing is complete. The muon telescope was used to complete the single tower and trigger test. A second muon telescope is being used in the test bed. Preparations were made for Am241 testing, and the tests are in progress.

Version 4.7.5 of the LAT Test Executive was released, and installed in flight directories in the LAT I&T facility.

### 3.0 Schedule Status

The critical path for the project is driven by fabrication of the Spacecraft Interface Board (SIB) and Spacecraft Interface Unit (SIU) Backplane, as well as the fabrication of the LAT Communications Boards. There are 16 days of float to the shipment of the LAT.

The status of significant milestones is summarized in Attachments 1 and 2. Attachment 1 presents the status of the Level 1 and Level 2 milestones. LAT integration has commenced (1M1000740).

Attachment 2 shows the status of the remaining Level 3 milestones. The following level 3 milestones were completed during this reporting period:

Milestone Number	Description	Date Completed
1M79001020	Flight TEM Assy B	3/9/05
1M79002020	Flight TEM PS Assy B	3/9/05
1M79250	Demo: Event Filtering	3/10/05
1M1000240	Flight Grid RFI	3/30/05

Unfavorable variance projections greater than one week are discussed below, listed by responsible subsystem.

#### 4.1.4 Tracker

Delivery of the third Tracker tower (1M1000220) was delayed by failure of one ladder during thermal-vacuum testing. The tray was removed and environmental testing will be done in parallel with the fifth tower, resulting in minor impact to the overall schedule.

#### 4.1.6 Anticoincidence Detector

The ACD test scripts (1M1001000) milestone has been delayed due to the need for additional testing, and as more is learned about the performance of the ACD electronics. This milestone is not expected to be completed until the ACD is fully assembled and tested.

ACD delivery (1M1000410) has been delayed by three factors: additional EMI testing needed, problems with silicone contamination in the ACD assembly facility, and a new noise problem in the ACD phototube assemblies. The EMI re-testing has now been completed successfully. The clean-up of the assembly facility is done. Long-term testing seems to indicate that the noise issue was confined to a small number of units that are being replaced. The ACD schedule will be extended to accommodate this, with associated cost increase.

#### 4.1.7 Electronics

The following milestones have been delayed at the assembly vendor. The LAT project continues to work with the vendor to improve the situation.

- Flight PDU Box (1M17942000)
- Flight GASU Box (1M7941070)
- LCB Flight Units (1M7R050)
- Flight Event Processor Units (1M7941090)
- Flight EPU/SIUs (1M7R040, 1M7R010, 1M7R020, 1M7R030, 1M7941080)

The scope of the intertask communications (1M79180) has been underestimated, resulting in a delay in the delivery of the final EGSE (1M7941440), and the demonstrations of housekeeping (1M79230) and mode control (1M79270).

The complexity of the charge injection calibration was underestimated, resulting in a delay to the demonstration milestone (1M79220), as well as the demonstration of diagnostics (1M79280).

Extensive testing of the filter on the front-end simulator revealed software and firmware errors that needed to be corrected before moving on to event integrity and delivery testing (1M79240).

#### 4.1.8 Mechanical Systems

In December 2004, SLAC directed Lockheed Martin to postpone work on test-related activities and focus on the completion of flight hardware. The test-related activities have restarted, however this resulted in delay to the completion of the X-LAT plate (1M941710).

#### 4.1.9 Integration & Test

Variances to the “Ready to Ship” and subsequent milestones are driven by the critical path for the project, as described above.

## 4.0 Financial Status

Attachment 3 depicts the costs, commitments, and performance through the end of the current reporting period.

Attachments 4 and 5 summarize the actual costs through the current period, by WBS level 3 and institution, respectively. The hours worked/FTE lines include only DOE/NASA-funded labor.

## 5.0 Performance Status (Comparison to Project Baseline)

Attachment 6 is a Cost Performance Report (CPR) for the end of the current reporting period, by WBS level 3. The CPR shows the time-phased budget to date (BCWS), the earned value (BCWP), and the actual costs through the end of the month (ACWP). Attachment 7 shows the same information for each participating DOE- and/or NASA-funded institution. The schedule variance is equal to the difference between the budget-to-date and the earned value and represents a measure of the ahead (positive) or behind (negative) schedule position. The cost variance is equal to the difference between the earned value and the actual costs.

Attachment 8 shows performance analysis (by WBS level 3), including trends in the schedule and cost variances from the previous period. Cumulative cost variances exceeding 10% of the BCWP and cumulative schedule variances exceeding 10% of BCWS (favorable and unfavorable) are discussed below.

### 4.1.C Education & Public Outreach

There are several projects nearly completed, for which final costs have not yet been recorded. This is not a concern at this time.

## 6.0 Change Control and Contingency Analysis

A summary of change requests approved and implemented during this period (Level 3 and above), including the impacts on the LAT contingency, is below.

Change Request No.	Description	Submitted By	Current Status	Contingency Impact <sup>1</sup>
LAT-XR-05529-01	Changes to the Calorimeter System Spec.	N. Johnson	Approved	N/A

The cost baseline through FY05 is \$152,044K. Funding applicable to that baseline is \$155,985K; the resulting contingency is \$3,941K.

<sup>1</sup> A positive number indicates a draw on contingency.

## **7.0 Staffing**

Attachment 9 demonstrates the staffing plan funded by DOE/NASA, and reports of actual manpower received.

The format of this report has changed, to match the monthly status presentation format. This report now also includes contracted labor which is bookkept as M&S.

The 4.1.6 ACD manpower plan includes an error for civil servant labor; the actual manpower report includes a schedule delay. Both of these situations will be corrected via approved April change request.

More labor has been required in 4.1.7 Electronics than planned this month for documentation and thermal vacuum testing.

More labor has been required in 4.1.9 Integration & Test than planned this month for completion of ground support equipment. The current cost is within budget.



## Attachment 1 Milestones, Levels 1-2

Activity ID	Activity Description	Target Finish Date	Variance	Scheduled Finish Date	FY01	FY02	FY03	FY04	FY05	FY06	
<b>DOE/NASA Joint Oversight Group (Level 1)</b>											
1M1P000000	DOE Critical Decision (CD) 0 Approval	06/25/01A	0	06/25/01A	▼						
1M1P000010	CD-1 Approval	07/23/02A	0	07/23/02A		▼					
1M1P000020	CD-2 Approval	11/08/02A	0	11/08/02A			▼				
1M1P000030	CD-3 Approval	09/03/03A	0	09/03/03A				▼			
1M1P000060	Flight GRID Complete	11/08/04A	0	11/08/04A					▼		
1M1P000040	CD-4 Approval	03/15/06*	0	03/15/06*						▼	
<b>DOE/NASA Federal Project Managers (Level 2)</b>											
1M1BF00000	Launch Balloon Flight	08/01/01A	0	08/01/01A	▼						
1M1000100	Instrument Preliminary Design Review	01/08/02A	0	01/08/02A		▼					
1M1000110	I-CDR (Critical Design Review)	05/16/03A	0	05/16/03A			▼				
1M1000740	Start LAT Integration	03/23/05	-5	03/30/05A					▼		
1M1000700	Pre Environmental Testing Review	12/20/05	-9	01/10/06						▼	
1M1000120	PSR-(Instrument Pre-Ship Review)	04/18/06	-10	05/02/06						▼	
Run Date					04/28/05 19:23					<b>GLAST LAT PROJECT Project Milestones (Level 1 and 2)</b>	
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										Sheet 1 of 1	

**Attachment 2  
Future Level 3 Milestones  
Page 1 of 4**

Activity ID	Activity Description	Target Finish Date	Variance	Scheduled Finish Date	FY04		FY05		FY06	
					Q3	Q4	Q1	Q2	Q3	Q4
<b>Instrument Project Office (Level 3)</b>										
4.1.1 Instrument Management										
1M1001920	Pre-Environmental Test Review	12/20/05	-9	01/10/06						▼
4.1.4 Tracker										
1M1000220	Flight Tracker Tower 1 RFI	03/22/05	-27	04/28/05				▼		
1M1000221	Flight Tracker Tower 2 RFI	04/20/05	-2	04/22/05				▼		
1M1000250	Flight Tracker Tower 3 RFI	05/03/05	3	04/28/05				▼		
1M1000251	Flight Tracker Tower 4 RFI	05/16/05	0	05/16/05				▼		
1M1000260	Flight Tracker Tower 5 RFI	06/03/05	0	06/03/05				▼		
1M1000261	Flight Tracker Tower 6 RFI	06/16/05	-4	06/22/05				▼		
1M1000270	Flight Tracker Tower 7 RFI	06/27/05	-5	07/05/05				▼		
1M1000271	Flight Tracker Tower 8 RFI	07/06/05	-5	07/13/05				▼		
1M1000280	Flight Tracker Tower 9 RFI	07/15/05	-5	07/22/05				▼		
1M1000281	Flight Tracker Tower 10 RFI	07/26/05	-5	08/02/05				▼		
1M1000290	Flight Tracker Tower 11 RFI	08/04/05	-5	08/11/05				▼		
1M1000291	Flight Tracker Tower 12 RFI	08/15/05	-5	08/22/05				▼		
1M1000300	Flight Tracker Tower 13 RFI	08/24/05	-5	08/31/05				▼		
1M1000301	Flight Tracker Tower 14 RFI	09/02/05	-4	09/09/05				▼		
1M1000310	Flight Tracker Tower 15 RFI	09/13/05	-5	09/20/05				▼		
1M1000311	Flight Tracker Tower 16 RFI	09/22/05	-5	09/29/05				▼		
4.1.5 Calorimeter										
1MRTS030	Flight Calorimeter Module 6 Ready to Ship	04/18/05	0	04/18/05				▼		
1MRTS040	Flight Calorimeter Module 7 Ready to Ship	04/21/05	0	04/21/05				▼		
1MRTS050	Flight Calorimeter Module 8 Ready to Ship	04/25/05	0	04/25/05				▼		
1MRTS060	Flight Calorimeter Module 9 Ready to Ship	05/02/05	0	05/02/05				▼		
1MRTS070	Flight Calorimeter Module 10 Ready to Ship	05/10/05	0	05/10/05				▼		
1MRTS090	Flight Calorimeter Module 11 Ready to Ship	05/13/05	0	05/13/05				▼		
1MRTS080	Flight Calorimeter Module 12 Ready to Ship	05/18/05	0	05/18/05				▼		
1MRTS100	Flight Calorimeter Module 13 Ready to Ship	05/23/05	0	05/23/05				▼		
1MRTS110	Flight Calorimeter Module 14 Ready to Ship	05/25/05	0	05/25/05				▼		
1MRTS120	Flight Calorimeter Module 15 Ready to Ship Spare	05/31/05	0	05/31/05				▼		
1MRTS130	Flight Calorimeter Module 16 Ready to Ship Spare	06/08/05	0	06/08/05				▼		
Run Date	04/28/05 19:30	<b>GLAST LAT PROJECT Project Milestones (Level 3) Planned Milestones</b>			0421 LTX2 - MS3 (planned) FLX1- MS (L3)	Sheet 1 of 4				
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**Attachment 2**  
**Future Level 3 Milestones**  
**Page 2 of 4**

Activity ID	Activity Description	Target Finish Date	Variance	Scheduled Finish Date	FY04		FY05				FY06	
					Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
<b>4.1.6 ACD</b>												
1M1001000	ACD Test Scripts (from ACD to I&T)	03/15/05*	-54	05/31/05								
1M1000410	ACD Flight Unit at SLAC, Tested/Inspected & RFI	06/09/05	-21	07/11/05								
<b>4.1.7 Electronics</b>												
1M79180	Demo: Inter-task Communications	03/11/05	-25	04/15/05								
1M79230	Demo: Housekeeping	03/18/05	-30	04/29/05								
1M7941440	Final EGSE incl S/C Sim, FSW-Elec to I&T	04/01/05	-20	04/29/05								
1M79210	Demo: Watchdog	04/15/05	-5	04/22/05								
1M79001030	Flight TEM Assy 1: Elec to I&T	04/22/05	0	04/22/05								
1M79002030	Flight TEM PS Assy 1: Elec to I&T	04/22/05	0	04/22/05								
1M79270	Demo: Mode Control	04/22/05	-20	05/20/05								
1M79001040	Flight TEM Assy 2: Elec to I&T	04/29/05	0	04/29/05								
1M79002040	Flight TEM PS Assy 2: Elec to I&T	04/29/05	0	04/29/05								
1M79220	Demo: Charge Injection Calibration	04/29/05	-20	05/27/05								
1M79001050	Flight TEM Assy 3: Elec to I&T	05/06/05	0	05/06/05								
1M79002050	Flight TEM PS Assy 3: Elec to I&T	05/06/05	0	05/06/05								
1M79240	Demo: Event Integrity and Delivery	05/06/05	-19	06/03/05								
1M79280	Demo: Diagnostics	05/06/05	-19	06/03/05								
1M79001060	Flight TEM Assy 4: Elec to I&T	05/13/05	0	05/13/05								
1M79002060	Flight TEM PS Assy 4: Elec to I&T	05/13/05	0	05/13/05								
1M79001070	Flight TEM Assy 5: Elec to I&T	05/20/05	0	05/20/05								
1M79002070	Flight TEM PS Assy 5: Elec to I&T	05/20/05	0	05/20/05								
1M79260	Demo: GRB Detection and Response	05/20/05	-14	06/10/05								
1M79001080	Flight TEM Assy 6: Elec to I&T	05/27/05	0	05/27/05								
1M79002080	Flight TEM PS Assy 6: Elec to I&T	05/27/05	0	05/27/05								
1M79001090	Flight TEM Assy 7: Elec to I&T	06/06/05	0	06/06/05								
1M79002090	Flight TEM PS Assy 7: Elec to I&T	06/06/05	0	06/06/05								
1M79001100	Flight TEM Assy 8: Elec to I&T	06/13/05	0	06/13/05								
1M79002100	Flight TEM PS Assy 8: Elec to I&T	06/13/05	0	06/13/05								
1M79001110	Flight TEM Assy 9: Elec to I&T	06/20/05	0	06/20/05								
1M79002110	Flight TEM PS Assy 9: Elec to I&T	06/20/05	0	06/20/05								
1M79001120	Flight TEM Assy 10: Elec to I&T	06/27/05	0	06/27/05								
Run Date	04/28/05 19:30		<b>GLAST LAT PROJECT</b> Project Milestones (Level 3) Planned Milestones		0421 LTX2 - MS3 (planned) FLX1- MS (L3)		Sheet 2 of 4					
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**Attachment 2  
Future Level 3 Milestones  
Page 3 of 4**

Activity ID	Activity Description	Target Finish Date	Variance	Scheduled Finish Date	FY04		FY05		FY06		
					Q3	Q4	Q1	Q2	Q3	Q4	Q1
1M79002120	Flight TEM PS Assy 10: Elec to I&T	06/27/05	0	06/27/05							
1M7942000	Flight PDU Box-Elec to I&T	07/01/05	-13	07/21/05							
1M79001130	Flight TEM Assy 11: Elec to I&T	07/05/05	0	07/05/05							
1M79002130	Flight TEM PS Assy 11: Elec to I&T	07/05/05	0	07/05/05							
1M7941110	Flight Harness-Elec to I&T	07/05/05	0	07/05/05							
1M79001140	Flight TEM Assy 12: Elec to I&T	07/12/05	0	07/12/05							
1M79002140	Flight TEM PS Assy 12: Elec to I&T	07/12/05	0	07/12/05							
1M79001150	Flight TEM Assy 13: Elec to I&T	07/19/05	0	07/19/05							
1M79002150	Flight TEM PS Assy 13: Elec to I&T	07/19/05	0	07/19/05							
1M7941070	Flight GASU Box-Elec to I&T	07/19/05	-19	08/15/05							
1M7R050	LCB Flight Units - Elec to Elec	07/20/05	-16	08/11/05							
1M79001160	Flight TEM Assy 14: Elec to I&T	07/26/05	0	07/26/05							
1M79002160	Flight TEM PS Assy 14: Elec to I&T	07/26/05	0	07/26/05							
1M79001170	Flight TEM Assy 15: Elec to I&T	08/02/05	0	08/02/05							
1M79002170	Flight TEM PS Assy 15: Elec to I&T	08/02/05	0	08/02/05							
1M79001180	Flight TEM Assy 16: Elec to I&T	08/09/05	0	08/09/05							
1M79002180	Flight TEM PS Assy 16: Elec to I&T	08/09/05	0	08/09/05							
1M7941090	Flight Event Processor Units-Elec to I&T	08/19/05	-16	09/13/05							
1M7R040	1st Flight EPU/SIU-Elec to I&T	08/19/05	-16	09/13/05							
1M7R010	2nd Flight EPU/SIU-Elec to I&T	08/24/05	-16	09/16/05							
1M7R020	3rd Flight EPU/SIU-Elec to I&T	08/26/05	-15	09/19/05							
1M7R030	4th Flight EPU/SIU-Elec to I&T	08/30/05	-16	09/22/05							
1M7941080	5th Flight EPU/SIU-Elec to I&T	09/02/05	-14	09/23/05							
<b>4.1.8 Mechanical</b>											
1M941710	X-LAT Thermal Plate RFI from Mech to I&T	04/20/05	-29	06/01/05							
1M941720	Radiators ready for I&T (from Mech to I&T)	07/22/05	0	07/22/05							
<b>4.1.9 I&amp;T</b>											
1M99010	Start 2 Tower Comprehensive Performance Test	04/20/05	4	04/14/05							
1M99020	Start 4 Tower Comprehensive Performance Test	05/12/05	1	05/11/05							
1M99030	Start 8 Tower Comprehensive Performance Test	06/20/05	-4	06/24/05							
1M1001740	Online FU S/W Final Release-I&T to IOC	07/14/05	0	07/14/05							
1M99040	Start 16 Tower Comprehensive Performance Test	09/07/05	-4	09/13/05							
Run Date	04/28/05 19:30	<b>GLAST LAT PROJECT Project Milestones (Level 3) Planned Milestones</b>			0421 LTX2 - MS3 (planned) FLX1- MS (L3)	Sheet 3 of 4					
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**Attachment 2  
Future Level 3 Milestones  
Page 4 of 4**

Activity ID	Activity Description	Target Finish Date	Variance	Scheduled Finish Date	FY04		FY05				FY06	
					Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
1M1000130	LAT Ready to Ship to NRL for Env Test	12/20/05	-9	01/10/06								▼
1M19010	Ship LAT to NRL for Env Test	01/03/06	-13	01/16/06								▼
1M19020	LAT EMI/EMC Test	02/01/06	-14	02/15/06								▼
1M19030	LAT Sine Vibe	02/14/06	-14	02/28/06								▼
1M19040	LAT Acoustic Test	02/24/06	-16	03/12/06								▼
1M19050	LAT TVAC	04/14/06	-15	04/29/06								▼
1M19060	LAT Weight & CG	04/17/06	-14	05/01/06								▼
1M19070	Ship LAT to Spectrum Astro	04/21/06	-16	05/07/06								▼
<b>4.1.B ISOC</b>												
1M7941270	Ground System Interface Test start	06/15/05*	0	06/15/05*								▼
1M1000112	Mission Operations Review	01/17/06*	0	01/17/06*								▼

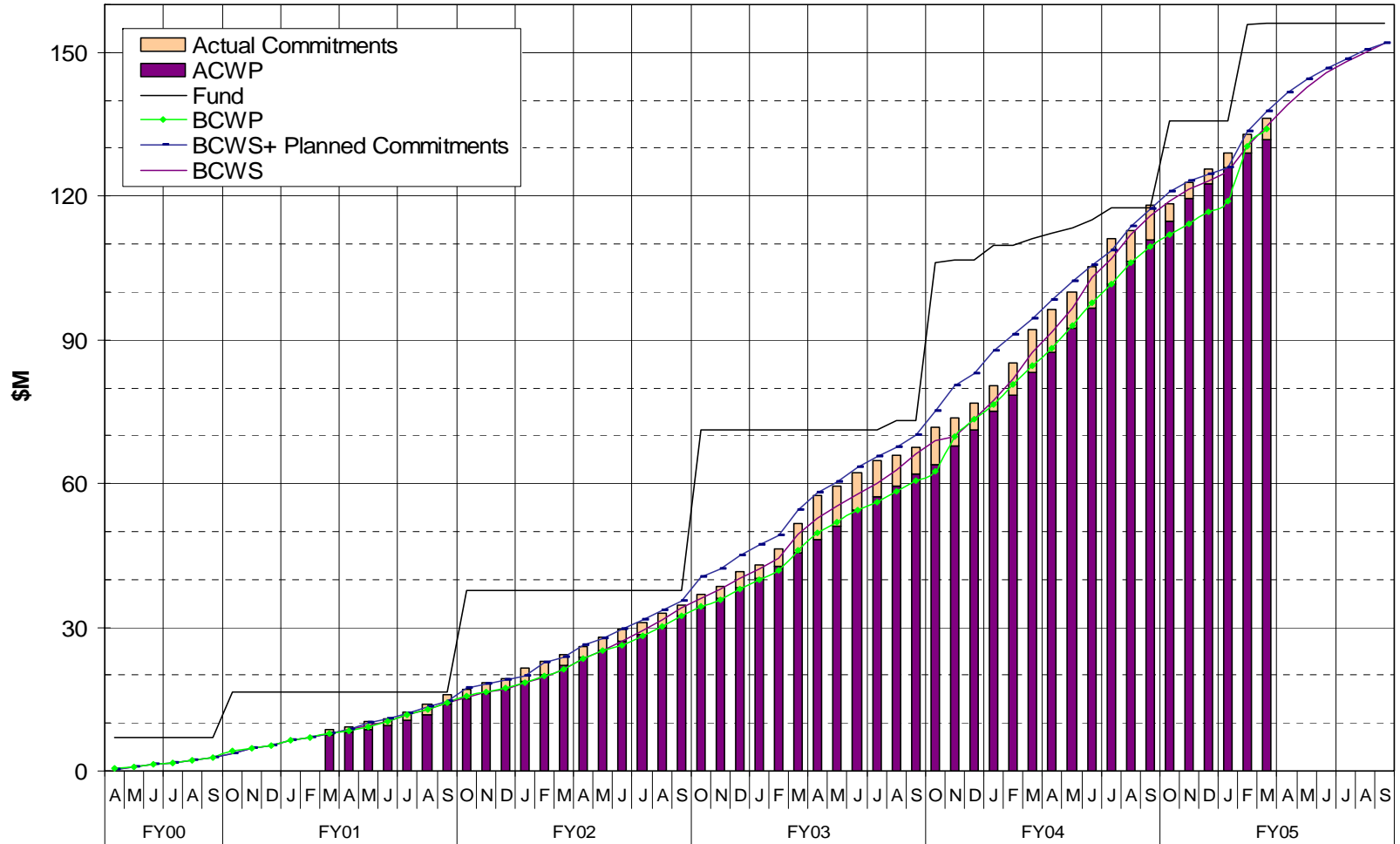
  

Run Date	04/28/05 19:30	<b>GLAST LAT PROJECT Project Milestones (Level 3) Planned Milestones</b>	0421 LTX2 - MS3 (planned) FLX1- MS (L3)	Sheet 4 of 4
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### Attachment 3

### Budget vs Actuals vs Performance DOE + NASA Project Expenditures 4.1 LAT



**Attachment 4  
LAT Costs, through March 2005, by WBS**

Monthly Contractor Financial Management Report								Report for Month Ending: 3/31/2005		
To: Kevin Grady, GLAST Project Manager (NASA) Ev Valle, LAT Project Manager (DOE)					From: Tanya Boysen, LAT Project Controls Manager			Budget Value		
								Cost: 0	Fee: 0	
LAT3 GLAST LAT Project		Type:						Fund Limitation: 0		
Reporting Category	Cost Incurred				Estimated Cost			4/3/2000	Billing	
	During Month		Cum. to Date		Detail		Balance of Budget	Estimated Final Cost		Unfilled Orders Outstanding
	Actual	Planned	Actual	Planned	APR05	MAY05		Project Estimate	Budget Value	
4.1.1 INSTRUMENT MANAGEMENT	312	358	15,631	15,803	327	327	1,360	17,645	17,645	
4.1.2 SYSTEM ENGINEERING	169	213	6,635	6,704	180	166	666	7,647	7,647	
4.1.4 TRACKER	575	853	18,134	18,357	787	760	1,634	21,316	21,316	
4.1.5 CALORIMETER	388	507	20,573	21,061	495	275	1,251	22,594	22,594	
4.1.6 ANTICOINCIDENCE DETECTOR	315	274	16,395	16,534	165	222	459	17,241	17,241	
4.1.7 ELECTRONICS	918	981	24,747	24,997	961	1,137	2,050	28,894	28,894	
4.1.8 MECHANICAL SYSTEMS	-624	211	13,570	14,525	540	243	1,645	15,998	15,998	
4.1.9 INTEGRATION & TEST	403	415	6,923	7,045	486	327	1,715	9,451	9,451	
4.1.A PERFORMANCE AND SAFETY ASSURANCE	215	203	3,144	3,194	179	103	420	3,846	3,846	
4.1.B LAT INSTRUMENT OPERATIONS CENTER	2	5	304	307	5	5	21	334	334	
4.1.C EDUCATION AND PUBLIC OUTREACH	68	55	1,963	2,230	98	70	553	2,684	2,684	
4.1.D SCIENCE ANALYSIS SOFTWARE	59	85	2,465	2,612	77	75	452	3,069	3,069	
4.1.E SUBORBITAL FLIGHT TEST	0	0	1,325	1,325	0	0	0	1,325	1,325	
Gen. and Admin.	0	0	0	0	0	0	0	0	0	
<b>Total</b>	<b>2,800</b>	<b>4,160</b>	<b>131,807</b>	<b>134,693</b>	<b>4,300</b>	<b>3,710</b>	<b>12,226</b>	<b>152,044</b>	<b>152,044</b>	

**Attachment 5**  
**LAT Costs, through March 2005, by Organization and Cost Code**

Monthly Contractor Financial Management Report								Report for Month Ending: 3/31/2005		
To: Kevin Grady, GLAST Project Manager (NASA) Ev Valle, LAT Project Manager (DOE)				From: Tanya Boysen, LAT Project Controls Manager				Budget Value		
								Cost: 0	Fee: 0	
LAT3 GLAST LAT Project		Type:						Fund Limitation: 0		
Reporting Category	Cost Incurred				Estimated Cost			4/3/2000	Billing	
	During Month		Cum. to Date		Detail		Balance of Budget	Estimated Final Cost		Unfilled Orders Outstanding
	Actual	Planned	Actual	Planned	APR05	MAY05		Project Estimate	Budget Value	
DG *** GSFC	336	315	17,814	18,198	202	259	853	19,128	19,128	
DH *** HEPL	364	347	7,157	7,206	257	240	1,020	8,674	8,674	
DL *** SLAC	1,522	2,774	77,434	79,136	2,965	2,675	7,812	90,886	90,886	
DN *** NRL	505	626	24,870	25,301	740	428	1,787	27,825	27,825	
DO *** Financial Plan Transfer/Sub Ou	0	0	59	59	0	0	0	59	59	
DS *** SSU	68	54	1,949	2,205	97	69	539	2,654	2,654	
DT *** Texas A&M	0	0	15	15	0	0	0	15	15	
DU *** UCSC	3	34	2,315	2,348	31	30	147	2,523	2,523	
DW *** UW	2	10	194	225	9	9	67	279	279	
<b>Total</b>	<b>2,800</b>	<b>4,160</b>	<b>131,807</b>	<b>134,693</b>	<b>4,300</b>	<b>3,710</b>	<b>12,226</b>	<b>152,044</b>	<b>152,044</b>	

Reporting Category	Cost Incurred/Hours Worked				Estimated Cost/Hours to Complete			Estimated Final Cost/Hours		Unfilled Orders Outstanding
	During Month		Cum. to Date		Detail		Balance of Budget	Project Estimate		
	Actual	Planned	Actual	Planned	APR05	MAY05		Budget Value		
RL LABOR	1,631	1,611	63,978	64,563	1,411	1,409	5,000	71,798	71,798	
RT TRAVEL	40	79	1,588	2,077	76	71	801	2,536	2,536	
RM MATERIAL & SERVICES	1,129	2,466	63,863	65,577	2,754	2,227	6,259	75,103	75,103	
RX MPS & LAB TAX	0	4	2,379	2,477	59	4	165	2,607	2,607	
<b>Total</b>	<b>2,800</b>	<b>4,160</b>	<b>131,807</b>	<b>134,693</b>	<b>4,300</b>	<b>3,710</b>	<b>12,226</b>	<b>152,044</b>	<b>152,044</b>	



**Attachment 6**  
**LAT Performance, through March 2005, by WBS**

Cost Performance Report - Work Breakdown Structure													
Contractor: Location:					Contract Type/No:			Project Name/No: GLAST LAT Project		Report Period: 2/28/2005 3/31/2005			
Quantity	Negotiated Cost		Est. Cost Authorized Unpriced Work		Tgt. Profit/ Fee %	Tgt. Price	Est Price	Share Ratio	Contract Ceiling	Estimated Contract Ceiling			
1	0		0		0	0	0	0	0	0			
CAPW[3]	Current Period					Cumulative to Date					At Completion		
	Budgeted Cost		Actual Cost	Variance		Budgeted Cost		Actual Cost	Variance			Latest Revised	
	Work Scheduled	Work Performed	Work Performed	Schedule	Cost	Work Scheduled	Work Performed	Work Performed	Schedule	Cost	Budgeted	Estimate	Variance
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
4.1.1 INSTRUMENT MANAGEMENT	358	358	312	0	46	15,803	15,803	15,631	0	171	17,645	17,645	0
4.1.2 SYSTEM ENGINEERING	213	213	169	0	43	6,704	6,704	6,635	0	69	7,647	7,647	0
4.1.4 TRACKER	853	815	575	-38	240	18,357	18,298	18,134	-59	163	21,316	21,316	0
4.1.5 CALORIMETER	507	532	388	25	144	21,061	21,012	20,573	-49	439	22,594	22,594	0
4.1.6 ANTICOINCIDENCE DETECTOR	274	66	315	-208	-249	16,534	16,314	16,395	-220	-81	17,241	17,241	0
4.1.7 ELECTRONICS	981	848	918	-133	-69	24,997	24,771	24,747	-225	25	28,894	28,894	0
4.1.8 MECHANICAL SYSTEMS	211	168	-624	-43	792	14,525	14,476	13,570	-49	906	15,998	15,998	0
4.1.9 INTEGRATION & TEST	415	317	403	-99	-87	7,045	6,953	6,923	-93	29	9,451	9,451	0
4.1.A PERFORMANCE AND SAFETY AS	203	203	215	0	-12	3,194	3,194	3,144	0	50	3,846	3,846	0
4.1.B LAT INSTRUMENT OPERATIONS C	5	5	2	0	4	307	307	304	0	4	334	334	0
4.1.C EDUCATION AND PUBLIC OUTRE	55	49	68	-6	-19	2,230	2,224	1,963	-6	261	2,684	2,684	0
4.1.D SCIENCE ANALYSIS SOFTWARE	85	85	59	0	26	2,612	2,612	2,465	0	147	3,069	3,069	0
4.1.E SUBORBITAL FLIGHT TEST	0	0	0	0	0	1,325	1,325	1,325	0	0	1,325	1,325	0
Gen. and Admin.	0	0	0	0	0	0	0	0	0	0	0	0	0
Undist. Budget											0	0	0
Sub Total	4,160	3,659	2,800	-501	858	134,693	133,992	131,807	-702	2,184	152,044	152,044	0
Contingency											3,941	3,941	0
Total	4,160	3,659	2,800	-501	858	134,693	133,992	131,807	-702	2,184	155,985	155,985	0

**Attachment 7**  
**LAT Performance, through March 2005, by Organization**

Cost Performance Report - Work Breakdown Structure													
Contractor: Location:				Contract Type/No:				Project Name/No: GLAST LAT Project		Report Period: 2/28/2005                      3/31/2005			
Quantity	Negotiated Cost		Est. Cost Authorized Unpriced Work		Tgt. Profit/ Fee %	Tgt. Price	Est Price	Share Ratio	Contract Ceiling	Estimated Contract Ceiling			
1	0		0		0	0	0		0	0			
OBS[1]	Current Period					Cumulative to Date					At Completion		
	Budgeted Cost		Actual Cost Work	Variance		Budgeted Cost		Actual Cost Work	Variance		Budgeted	Latest Revised Estimate	Variance
	Work Scheduled	Work Performed		Schedule	Cost	Work Scheduled	Work Performed		Schedule	Cost			
Item	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
DG *** GSFC	315	107	336	-208	-229	18,198	17,978	17,814	-220	164	19,128	19,128	0
DH *** HEPL	347	347	364	0	-17	7,206	7,206	7,157	0	49	8,674	8,674	0
DL *** SLAC	2,774	2,474	1,522	-300	952	79,136	78,728	77,434	-408	1,294	90,886	90,886	0
DN *** NRL	626	642	505	16	136	25,301	25,242	24,870	-58	373	27,825	27,825	0
DO *** Financial Plan	0	0	0	0	0	59	59	59	0	0	59	59	0
DS *** SSU	54	48	68	-6	-20	2,205	2,199	1,949	-6	250	2,654	2,654	0
DT *** Texas A&M	0	0	0	0	0	15	15	15	0	0	15	15	0
DU *** UCSC	34	32	3	-2	29	2,348	2,339	2,315	-9	24	2,523	2,523	0
DW *** UW	10	10	2	0	7	225	225	194	0	31	279	279	0
Gen. and Admin.	0	0	0	0	0	0	0	0	0	0	0	0	0
Undist. Budget											0	0	0
Sub Total	4,160	3,659	2,800	-501	858	134,693	133,992	131,807	-702	2,184	152,044	152,044	0
Contingency											3,941	3,941	0
Total	4,160	3,659	2,800	-501	858	134,693	133,992	131,807	-702	2,184	155,985	155,985	0

## Attachment 8 LAT Performance Analysis, March 2005

	WBS	Description	BAC	BCWS	BCWP	ACWP	SV \$	CV \$	%BCWS	%BCWP	%ACWP	SPI	CPI	SPI	CPI	Cpi_Fcst	CpiSpi_Fcst
1	4.1	LAT	152,044	134,694	133,992	131,807	-702	2,184	88.59	88.13	86.69	↓	↑	0.995	1.017	149,565	149,658
2	4.1.1	Instr Mgmt	17,645	15,803	15,803	15,631	0	171	89.56	89.56	88.59	↔	↑	1.000	1.011	17,453	17,453
3	4.1.2	System Engr	7,647	6,704	6,704	6,635	0	69	87.66	87.66	86.76	↔	↑	1.000	1.010	7,568	7,568
4	4.1.4	Tracker	21,316	18,357	18,298	18,134	-59	163	86.12	85.84	85.07	↓	↑	0.997	1.009	21,126	21,135
5	4.1.5	Calorimeter	22,594	21,061	21,012	20,573	-49	439	93.21	93.00	91.05	↑	↑	0.998	1.021	22,122	22,126
6	4.1.6	ACD	17,241	16,534	16,314	16,395	-220	-81	95.90	94.62	95.10	↓	↓	0.987	0.995	17,326	17,339
7	4.1.7	Electronics	28,894	24,997	24,771	24,747	-225	25	86.51	85.73	85.65	↓	↓	0.991	1.001	28,865	28,903
8	4.1.8	Mechanical	15,998	14,525	14,476	13,570	-49	906	90.79	90.49	84.82	↓	↑	0.997	1.067	14,996	15,001
9	4.1.9	I&T	9,451	7,045	6,953	6,923	-93	29	74.54	73.56	73.25	↓	↓	0.987	1.004	9,411	9,445
10	4.1.A	PSA	3,846	3,194	3,194	3,144	0	50	83.05	83.05	81.75	↔	↓	1.000	1.016	3,786	3,786
11	4.1.B	ISOC	334	307	307	304	0	4	91.95	91.95	90.88	↔	↑	1.000	1.012	330	330
12	4.1.C	EPO	2,684	2,230	2,224	1,963	-6	261	83.10	82.86	73.14	↔	↓	0.997	1.133	2,369	2,370
13	4.1.D	SAS	3,069	2,612	2,612	2,465	0	147	85.10	85.10	80.29	↔	↑	1.000	1.060	2,896	2,896
14	4.1.E	Balloon Flight	1,325	1,325	1,325	1,325	0	0	100.00	100.00	99.98	↔	↔	1.000	1.000	1,325	1,325

### LEGEND

BAC: Budget At Complete

BCWS: Budgeted Cost of Work Scheduled (to date)

BCWP: Budgeted Cost of Work Performed (to date)

ACWP: Actual Cost of Work Performed (to date)

SV \$: Schedule Variance = BCWP - BCWS

CV \$: Cost Variance = BCWP - ACWP

SPI: Schedule Performance Index = BCWP/BCWS

CPI: Cost Performance Index = BCWP/ACWP

% BCWS: Percent Scheduled = BCWS/BAC

% BCWP: Percent Complete = BCWP/BAC

% ACWP: Percent Spent = ACWP/BAC

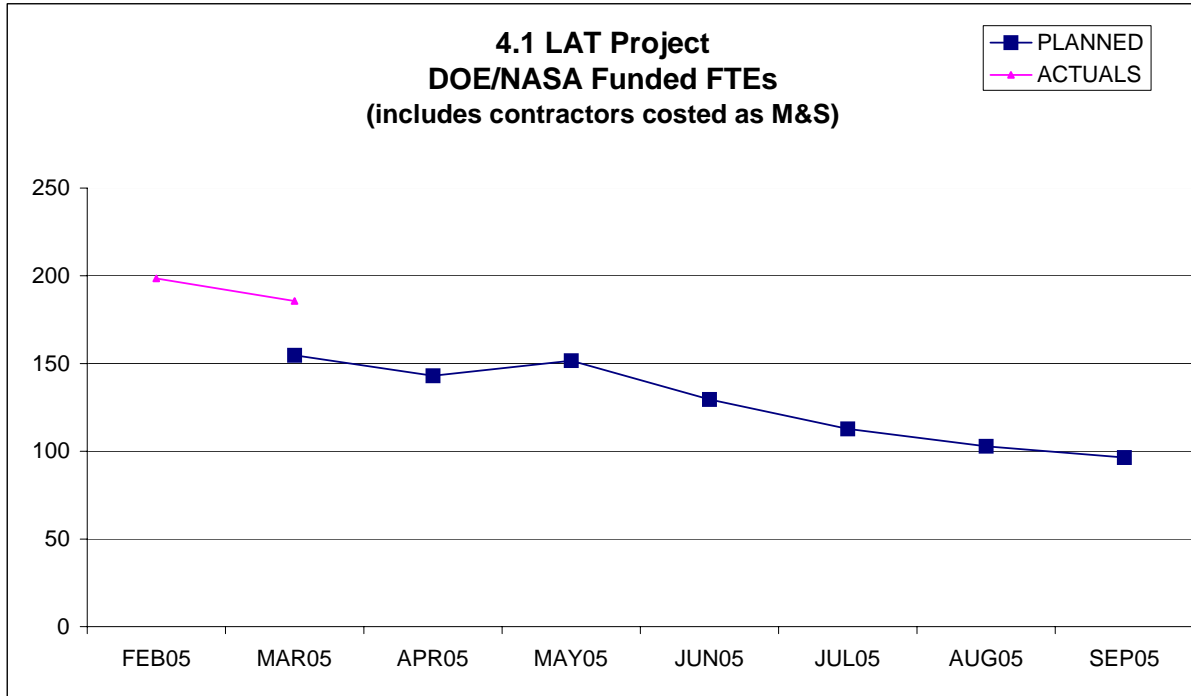
Cpi\_Fcst: CPI (to date) EAC Forecast = BAC / CPI

CpiSpi\_Fcst: Combination CPI and SPI EAC Forecast = ACWP + (BAC - BCWP) / (CPI \* SPI)

	Worse than .85		Between .95 and 1.10
	Between .85 and .95		Better than 1.10

SPI and CPI Change Thresholds

## Attachment 9 LAT Manpower



		FEB05	MAR05	APR05	MAY05	JUN05	JUL05	AUG05	SEP05
4.1.1 INSTRUMENT MANAGEMENT	PLANNED		19.2	19.2	19.2	19.2	19.4	16.0	16.0
	ACTUALS	19.7	23.4						
4.1.2 SYSTEM ENGINEERING	PLANNED		10.2	10.1	10.3	10.3	10.3	9.3	8.3
	ACTUALS	10.5	10.1						
4.1.4 TRACKER	PLANNED		16.8	16.6	14.9	14.0	13.0	12.0	12.0
	ACTUALS	17.0	15.4						
4.1.5 CALORIMETER	PLANNED		18.7	19.6	13.4	9.9	7.6	8.1	7.4
	ACTUALS	23.8	19.8						
4.1.6 ANTICOINCIDENCE DETECTOR	PLANNED		16.4	8.5	20.2	13.8	6.5	5.6	5.6
	ACTUALS	36.2	33.1						
4.1.7 ELECTRONICS	PLANNED		28.8	23.9	26.9	22.4	18.0	15.5	13.5
	ACTUALS	36.7	35.2						
4.1.8 MECHANICAL SYSTEMS	PLANNED		6.0	6.4	9.9	4.9	4.1	3.4	2.5
	ACTUALS	3.7	3.2						
4.1.9 INTEGRATION & TEST	PLANNED		15.3	17.2	16.2	16.3	16.4	16.5	15.9
	ACTUALS	20.5	23.0						
4.1.A PERFORMANCE AND SAFETY ASSURANCE	PLANNED		12.5	10.9	9.9	8.9	7.9	6.9	5.9
	ACTUALS	12.6	12.4						
4.1.B LAT INSTRUMENT SCIENCE OPERATIONS CENTER	PLANNED		4.2	3.2	3.2	2.2	2.2	2.2	2.1
	ACTUALS	4.1	4.1						
4.1.C EDUCATION AND PUBLIC OUTREACH	PLANNED		1.5	2.0	2.3	2.3	2.3	2.4	2.3
	ACTUALS	10.1	3.3						
4.1.D SCIENCE ANALYSIS SOFTWARE	PLANNED		5.3	5.3	5.1	5.2	5.2	5.1	5.1
	ACTUALS	3.8	2.6						
Grand Totals:	PLANNED		154.8	143.1	151.6	129.5	112.8	102.9	96.5
	ACTUALS	198.5	185.6						