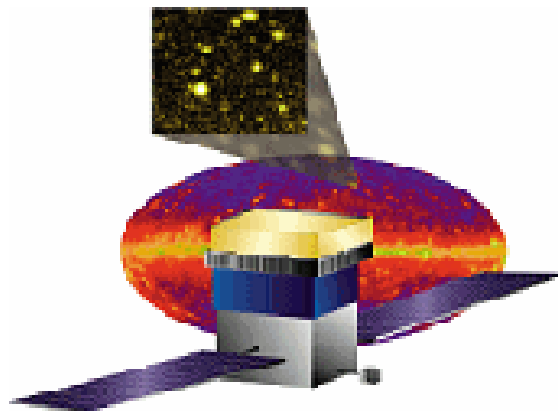


# **Monthly Progress Report**

**(Month Ending January 2004)**

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



LAT-MR-03194-01

March 3, 2004

## 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 January, 2004.

## 2.0 Recent Progress and Status

### 4.1.4 Tracker

Production of the readout controller ASIC (version 7) was completed on schedule. The first wafers were probe-tested; the chip functions and passes all test vectors. The first wafer was sent out for grinding, dicing, and inspection. Multichip module (MCM) preproduction is nearing completion. Thermal-cycle acceptance tests and burn-in procedure executed. Start of the production run is expected in early February. Flex-circuit cable drawings are being rechecked. Sidewall coupon tests results are being analyzed. The mid-tray drawings are being reviewed, and documentation and procedure issues are being closed. Bottom tray closeout production is well advanced. New assembly fixtures are being designed and fabricated. A report of the Engineering Model (EM) vibration test conducted in November was produced, but analysis is still required to close out the test. Further vibration of the EM has been postponed until after the thermal-vacuum testing, due to complications associated with finalizing the interface design and retrofitting it to the EM bottom tray. Detailed engineering and design work on an improved Tracker/grid interface is in progress, with conceptual design agreed upon by all parties.

### 4.1.5 Calorimeter

Over 750 fully-tested CsI crystals have been delivered to NRL. Approximately 3,150 (of 4800) dual PIN photodiodes have been received from Hamamatsu, and 850 flight PIN photodiode assemblies have been manufactured and tested. Over 340 crystal detector elements (CDEs) have been bonded. Of these, 25 have been wrapped and capped. Completion of the CDEs has been limited by availability of end caps, but production is on schedule. Composite structure manufacture commenced. A flaw was noted in several of the prepreg plies; investigation is underway and additional material will be ordered. Machining of structured machined parts commenced; an error in the closeout plate required design modification. Radiation testing of ASICs, ADCs and DACs was performed at Brookhaven, resulting in no outstanding issues. Prototypes of the flight analog front-end electronics boards have been received, assembled, and are undergoing testing. ASIC delivery has been delayed, due to vendor delay; this is critical path for the project. The Calorimeter EM is now supporting flight test script development. The Calorimeter mini-EM (two active layers with full electronics) has been assembled, tested, and shipped to SLAC. A clean room dedicated to Calorimeter integration & test is complete; a contract for improved humidity control is being written.

### 4.1.6 Anticoincidence Detector

Functional testing of the engineering model electronics chassis for the ACD was successful, and the vibration test completed. All front-end electronics parts (except ASICs) have been received and are ready for assembly. Flexures were installed on the

composite shell's side panels. The top panels were damaged in shipment; after inspection it was determined that they can be used after repair. Fabrication of the tile detector assembly flexures is near completion. Fifty percent of the clear fiber cables have been bonded into connectors and are being polished. Front-end ASICs were received and screening has commenced. Plating of electroless nickel onto the base frame was completed. Base frame assembly tooling is ready for use. The high-voltage bias supply printed circuit boards are being fabricated. A dozen more Tile Detector Assemblies were received from Fermilab, and they are being tested. The test results look good and all performance requirements are being met.

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

The full power distribution unit (PDU) and GASU boxes were assembled, and communication from the LAT communication board (LCB) through the GASU to the PDU and Tower Electronics Model (TEM) using flight software was demonstrated. Flight production ASICs were received and testing commenced. The majority of capacitors for the tower power supply were ordered. The first spacecraft interface board was fabricated, loaded, and debugged. The crate power supply module was debugged and tested with the backplane and LCB. All cables for the test bed were ordered. The layout of the front-end simulator was completed, and boards fabricated. The first board has been loaded and is being tested. Parts for all 60 electronics ground support equipment (EGSE) test stands have been ordered.

Progress was made on development of the command and telemetry database tool. The front-end simulator code is now included in the code management package. Filter code has been retro-fitted for the science software group. The primary boot has finished coding and is being tested - it is able to parse a full set of commands and output the housekeeping telemetry package. The file upload works in both the primary boot and regular running environments. A web page, linking to all the flight software documentation, has been developed. A configuration control board for flight software is being formed. Monthly functional demonstrations have been established; the first was held, and plans for the next two are in progress.

#### 4.1.8 Mechanical Systems

Final machining of the first grid has commenced, including minor revisions to the electromagnetic interference shields. Approval was given to the vendor to begin rough machining the second grid billet. The mechanical systems drawing tree is being aligned with the integration plan. Fabrication of the variable conductance heat pipes has begun.

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

The LAT Test Executive (LATTE), version 2.0.0, was released. Work continues on LATTE development to support subsystem requirements. A web-based online issue tracking system was developed. A stand was designed for the mini-Calorimeter and mini-tower. New vacuum pumps were purchased for the rebuilding of the Van de Graaff generator. The I&T testing requirements document was drafted, and subsystem input solicited.

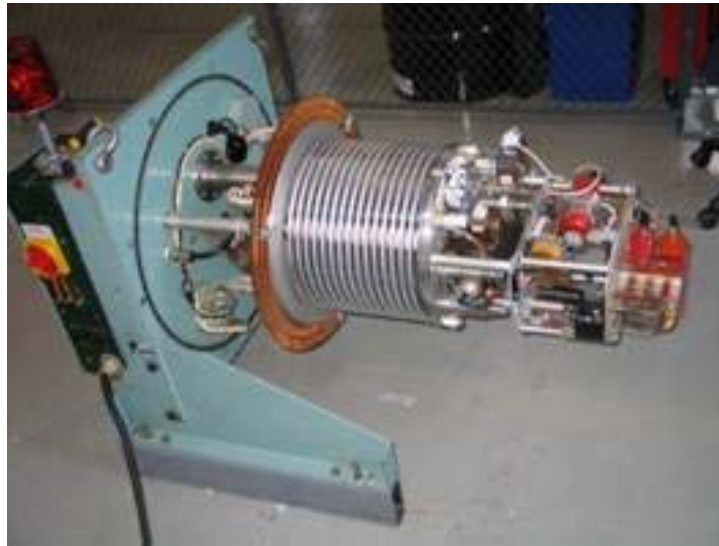


Figure 1: Van de Graaff generator in its opened state.

### 3.0 Schedule Status

The critical path for the project is driven by the Tracker multichip module production, and leads to a reduction in schedule float for the “ready for CD-4 review” milestone, from nine weeks to five weeks. (Note: As of publication of this report, this delay was incorporated into the baseline schedule via change request approved by the Configuration Control Board.)

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. Attachment 2 shows the status of the Level 3 milestones planned to occur during the six months preceding and following the current month. Unfavorable variance projections greater than one week to the future milestones are discussed below.

#### Tracker Engineering Model (1M1001430)

Baseline/Target Finish: 01/02/04 Projected Finish: 03/01/04 Variance: -39 days

The delivery of the full Tracker EM has been delayed by the issues discovered with the interface during the EM vibration test. A workaround plan is underway, enabling integration planning to continue by supplying other hardware and drawings in the interim. Thermal vacuum testing is expected to be completed in March, and vibration testing will be repeated, further delaying this milestone’s delivery.

Variances to the Tracker delivery milestones (1M1000200, 1M1000201, and 1M1000220) are due to delays in multichip module production, receipt of bottom tray parts, and assembly of flight trays. Workaround is not possible, and the Configuration Control Board has approved the projected finish dates as baseline in February.

Variances to the following milestones are due to delayed receipt of Calorimeter ASICs. Much of the schedule was recovered by using parts before completion of screening and qualification; however, the ASIC receipt drives the critical path to the start of installation of Tower A.

- Calorimeter Module A through 1 RFI (1M1000210, 1M1500, and 1M1000230)
- EM2 TEM/PS for FM9 and FM10 (return FMA and FMB) from I&T to Calorimeter (1M1001790 and 1M1001800)

Variances to the following milestones are due to delays in drawing release driving procurement placement. The drawing release process has been improved, and additional staff has been hired.

- Flight TEM PS Assemblies A through 5 to I&T (1M79002010 through 1M79002070)
- Flight TEM Assemblies A and B to I&T (1M79001010 and 1M79001020)

Variances to the following electronics ground support equipment (EGSE) milestones are due to delayed receipt and quality problems with connectors. These milestones are expected to be delayed even further, and a plan is being developed to recover the schedule.

- Updated EGSE Systems (#1-10) to Tracker (1M74000010 through 1M740000100)
- EGSE TEM/TEM PS/CTS w/ FE Electronics #1-3 to I&T (1M7941130, 1M7941150, and 1M7941160)
- G3 Test Stands to ACD (1M76000020 and 1M76000030)
- Test Stations (5) for AFEE to Calorimeter (1M1001900)
- EGSE TEM/TEM PS/CTS/GASU FE Electronics to I&T (1M7941170)
- EGSE Development H/W/FSW 1<sup>st</sup> Delivery to I&T (1M7941180)
- EGSE TEM/TEM PS/CTS #1-2 for Bldg. 33 to I&T (1M7941190 and 1M7941420)
- EGSE TEM/TEM PS/CTS w/ GASU for Bldg. 33 to I&T (1M7941430)
- ACD Test Scripts from ACD to I&T (1M1001000)
- EM2 TEM: Elec to Tracker (1M1000920)
- 5 EM2 TEM/PS for AFEE board assy & test: Elec to Cal (1M1001870)

Variances to the following milestones are due to a delay in completion of the Tracker/Calorimeter tower electronics module (TEM) ASIC qualification and screening plan. This is not considered critical path at this time.

- EM2 TEM/PS/CTS for Flight Models A-8 to Calorimeter (1M1001220, 1M1001600, 1M1001660, 1M1001680, 1M1001720, 1M1001760, 1M1001770, 1M1001780)

#### Delivery of 1x4 Grid to I&T/MGSE (1M1001380)

Baseline/Target Finish: 12/19/03      Projected Finish: 02/27/04      Variance: -41 days

The delivery of the 1x4 grid from Mechanical Systems to I&T has been delayed for the resolution of the Tracker/grid interface design modifications. This can be accommodated with little impact to the I&T schedule, by using other equipment. The requirements for the 1x4 are being reevaluated in light of the redesign of the Tracker/grid interface.

#### Flight Grid RFI (1M1000240)

Baseline/Target Finish: 06/11/04      Projected Finish: 07/07/04      Variance: -17 days

The delivery of the flight grid to I&T has been delayed, to include new machining requirements, a new grid tolerance scheme and several new parts in the drawing package to the vendor, as well as the option for a second grid and grid box assembly machining. The Configuration Control Board has approved the projected finish date as baseline in February.

## **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.A Performance & Safety Assurance

The favorable cost variance is due to delayed subcontractor invoice payments, and is not a concern at this time.

#### 4.1.C Education & Public Outreach

The favorable cost variance is due to delayed subcontractor invoice payments, and is not a concern at this time.

### 6.0 Change Control and Contingency Analysis

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

Change Request No.	Description	Submitted By	Current Status	Contingency Impact
LAT-XR-02806-01	Additional I&T Manpower	E. Bloom	Approved	N/A <sup>1</sup>
LAT-XR-02835-02	Tracker/INFN Manpower Augmentation	R. Johnson	Approved	N/A <sup>2</sup>
LAT-XR-02862-01	ACD BEA Changes	P. Hascall	Approved	\$98K
LAT-XR-02867-01	Science Prep Manpower	P. Michelson	Approved	\$115K
LAT-XR-02898-01	Additional QA Support	D. Marsh	Approved	N/A <sup>3</sup>
LAT-XR-02899-01	Electronics budget reallocation	G. Haller	Approved	\$0K
LAT-XR-02900-01	Electronics Spacecraft Interface Unit Cost Variance	G. Haller	Approved	\$258K
LAT-XR-02901-01	Add'l Electronics Ground Support Equipment	G. Haller	Approved	\$457K
LAT-XR-02902-01	Additional Flight Software Manpower	T. Schalk	Approved	N/A <sup>4</sup>
LAT-XR-02915-01	ACD Electronics Ground Support Equipment SW Support	D. Thompson	Approved	\$52K

The fabrication phase cost baseline is \$123.4M. Funding applicable to that baseline is \$136.8M; the resulting contingency is \$13.4M.

<sup>1</sup> Budget increase of \$523K is directly offset by corresponding NASA funding increase.

<sup>2</sup> Budget increase of \$738K is directly offset by corresponding NASA funding increase.

<sup>3</sup> Budget increase of \$973K is directly offset by corresponding NASA funding increase.

<sup>4</sup> Budget increase of \$747K is directly offset by corresponding NASA funding increase.

## **7.0 Staffing**

Attachments 9-10 demonstrate the staffing plan, and reports of actual manpower received. Note from Attachment 10 that not all participating organizations are providing manpower data.

The monthly planned FTEs reflect adjustments made so that the cumulative-to-date manpower plan corresponds to the approved changes in that month.



## 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	09/15/04*	0	09/15/04*					▼															
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	08/24/04*	0	08/24/04*				▼																
1M1000700	Pre Environmental Testing Review	07/14/05*	0	07/14/05*					▼															
1M1000120	PSR-(Instrument Pre-Ship Review)	12/01/05*	0	12/01/05*						▼														
Run Date					02/23/04 13:25					GLAST LAT PROJECT Project Milestones (Level 1 and 2)					0220 LT_MS1-2					Sheet 1 of 1				
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**Attachment 2**  
**Level 3 Milestones (One-Year View)**  
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Activity ID	Activity Description	Target Finish Date	Variance	Scheduled Finish Date	FY03		FY04			FY05
					Q3	Q4	Q1	Q2	Q3	Q4
<b>Instrument Project Office (Level 3)</b>										
1M59000000	EM from CAL to I&T	08/07/03A	0	08/07/03A			▼			
1M1000910	(36) MCM's for EM2 from Tracker to Elec	09/15/03A	0	09/15/03A			▼			
1M1001520	EM CAL Returned to NRL (arrives on dock)	10/16/03	-1	10/17/03A			▼			
1M74000010	Updated EGSE System 1: Elec to TKR	12/08/03	-42	02/17/04			▼			
1M76000010	3rd G2 Test Stand: Elec to ACD	12/08/03	0	12/08/03A			▼			
1M7941130	EGSE TEM/TEM PS/CTS w/ FE Elec #1-Elec to I&T	12/08/03	-42	02/17/04			▼			
1M76000020	G3 Test Stand (test 2 FREE Cards): Elec to ACD	12/15/03	-41	02/23/04			▼			
1M1001380	Delivery of EM (1X4) Grid to I&T/MSGE	12/19/03	-41	02/27/04			▼			
1M74000020	Updated EGSE System 2: Elec to TKR	12/22/03	-41	03/01/04			▼			
1M7941150	EGSE TEM/TEM PS/CTS w/ FE Elec #2-Elec to I&T	12/22/03	-41	03/01/04			▼			
1M1001430	Delv of TKR EM to SLAC I&T/MGSE	01/02/04	-39	03/01/04			▼			
1M74000030	Updated EGSE System 3: Elec to TKR	01/07/04	-41	03/08/04			▼			
1M7941160	EGSE TEM/TEM PS/CTS w/ FE Elec #3-Elec to I&T	01/07/04	-41	03/08/04			▼			
1M1000920	EM2 TEM: Elec to Tracker	01/12/04	-14	02/02/04*			▼			
1M1001900	Test Stations (5) for AFEE: Elec to CAL	01/14/04	-41	03/15/04			▼			
1M74000040	EGSE System 4: Elec to TKR	01/14/04	-46	03/22/04			▼			
1M7941170	EGSE TEM/TEM PS/CTS/GASU FE Elec-Elec to I&T	01/14/04	-41	03/15/04			▼			
1M1001870	5 EM2 TEM/PS for AFEE brd ass & tst: Elec to CAL	01/15/04	-21	02/17/04			▼			
1M1001220	EM2 TEM/PS/CTS for FMA from Elec to CAL	01/22/04	-41	03/22/04			▼			
1M74000050	EGSE System 5: Elec to TKR	01/22/04	-41	03/22/04			▼			
1M7941180	EGSE Development Hrdw/FSW 1st Delivr-Elec to I&T	01/22/04	-36	03/15/04			▼			
1M1001260	EM2 TEM/PS/CTS for FMB from Elec to CAL	01/29/04	-41	03/29/04			▼			
1M74000060	EGSE System 6: Elec to TKR	01/29/04	-41	03/29/04			▼			
Run Date					02/23/04 13:26	<b>GLAST LAT PROJECT</b> Project Milestones (Level 3) 1 Year View (+/- 6mo)				0220 LTX1 - MS (L3) FLX1- MS (L3)
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**Attachment 2**  
**Level 3 Milestones (One-Year View)**  
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Activity ID	Activity Description	Target Finish Date	Variance	Scheduled Finish Date	FY03		FY04			FY05
					Q3	Q4	Q1	Q2	Q3	Q4
<b>Instrument Project Office (Level 3)</b>										
1M7941190	EGSE TEM/TEM PS/CTS #1 for Bldg 33-Elec to I&T	01/29/04	-41	03/29/04				•	▽	
1M1001600	EM2 TEM/PS/CTS for FM1 from Elec to CAL	02/05/04	-41	04/05/04				•	▽	
1M7941420	EGSE TEM/TEM PS/CTS #2 for Bldg 33-Elec to I&T	02/05/04	-41	04/05/04				•	▽	
1M7941430	EGSE TEM/TEM PS/CTS w/ GASU for B33-Elec to	02/05/04	-41	04/05/04				•	▽	
1M1001650	EM2 TEM/PS/CTS for FM2 from Elec to CAL	02/12/04	-41	04/12/04				•	▽	
1M74000070	EGSE System 7: Elec to TKR	02/12/04	-41	04/12/04				•	▽	
1M74000080	EGSE System 8: Elec to TKR	02/12/04	-41	04/12/04				•	▽	
1M74000090	EGSE System 9: Elec to TKR	02/20/04	-41	04/19/04				•	▽	
1M74000100	EGSE System 10: Elec to TKR	02/20/04	-41	04/19/04				•	▽	
1M76000030	G3 Test Stand (Fit-like I/F): Elec to ACD	02/20/04	-41	04/19/04				•	▽	
1M1001660	EM2 TEM/PS/CTS for FM3 from Elec to CAL	02/27/04	-41	04/26/04				•	▽	
1M1001680	EM2 TEM/PS/CTS for FM4 from Elec to CAL	02/27/04	-41	04/26/04				•	▽	
1M1001720	EM2 TEM/PS/CTS for FM5 from Elec to CAL	02/27/04	-41	04/26/04				•	▽	
1M1001760	EM2 TEM/PS/CTS for FM6 from Elec to CAL	03/05/04	-41	05/03/04				•	▽	
1M1001770	EM2 TEM/PS/CTS for FM7 from Elec to CAL	03/05/04	-41	05/03/04				•	▽	
1M1001780	EM2 TEM/PS/CTS for FM8 from Elec to CAL	03/05/04	-41	05/03/04				•	▽	
1M005480	IOC CDR	03/12/04	0	03/12/04				•	▽	
1M79003010	Flight Cables Assy A: Elec to I&T	05/10/04	0	05/10/04				•	▽	
1M79003020	Flight Cables Assy B: Elec to I&T	05/10/04	0	05/10/04				•	▽	
1M79002010	Flight TEM PS Assy A: Elec to I&T	05/12/04	-21	06/11/04				•	▽	
1M79002020	Flight TEM PS Assy B: Elec to I&T	05/19/04	-21	06/18/04				•	▽	
1M79001010	Flight TEM Assy A: Elec to I&T	06/07/04	-19	07/02/04				•	▽	
1M79003030	Flight Cables Assy 1: Elec to I&T	06/10/04	0	06/10/04				•	▽	
Run Date	02/23/04 13:26	<b>GLAST LAT PROJECT</b> Project Milestones (Level 3) 1 Year View (+/- 6mo)			0220 LTX1 - MS (L3) FLX1 - MS (L3)	Sheet 2 of 4				
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**Attachment 2**  
**Level 3 Milestones (One-Year View)**  
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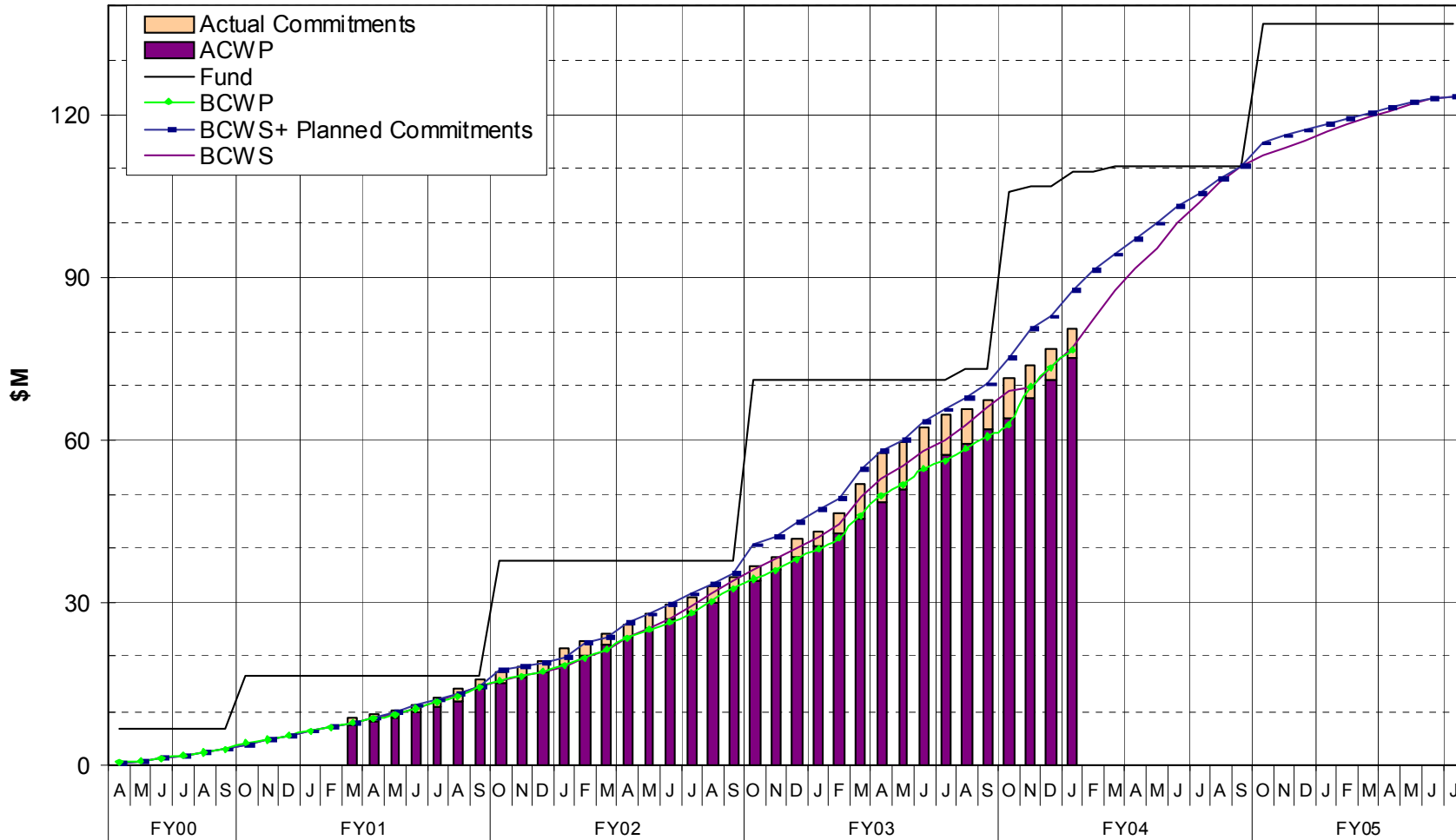
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					Q3	Q4	Q1	Q2	Q3
<b>Instrument Project Office (Level 3)</b>									
1M79003040	Flight Cables Assy 2: Elec to I&T	06/10/04	0	06/10/04					▼
1M79003050	Flight Cables Assy 3: Elec to I&T	06/10/04	0	06/10/04					▼
1M79003060	Flight Cables Assy 4: Elec to I&T	06/10/04	0	06/10/04					▼
1M1000240	Flight Grid RFI-Mech to I&T	06/11/04	-17	07/07/04					▼
1M79001020	Flight TEM Assy B: Elec to I&T	06/14/04	-19	07/12/04					▼
1M79003070	Flight Cables Assy 5: Elec to I&T	06/28/04	0	06/28/04					▼
1M79003080	Flight Cables Assy 6: Elec to I&T	06/28/04	0	06/28/04					▼
1M79003090	Flight Cables Assy 7: Elec to I&T	06/28/04	0	06/28/04					▼
1M79003100	Flight Cables Assy 8: Elec to I&T	06/28/04	0	06/28/04					▼
1M79003110	Flight Cables Assy 9: Elec to I&T	06/28/04	0	06/28/04					▼
1M79003120	Flight Cables Assy 10: Elec to I&T	06/28/04	0	06/28/04					▼
1M1001000	ACD Test Scripts (from ACD to I&T)	07/01/04	-58	09/23/04					▼
1M79002030	Flight TEM PS Assy 1: Elec to I&T	07/01/04	-21	08/02/04					▼
1M1000200	Tracker Modules A RFI	07/02/04	-17	07/28/04					▼
1M1000210	Calorimeter Modules A RFI	07/09/04	-15	07/30/04					▼
1M1500	Calorimeter Modules B RFI	07/09/04	-15	07/30/04					▼
1M79002040	Flight TEM PS Assy 2: Elec to I&T	07/09/04	-21	08/09/04					▼
1M79003130	Flight Cables Assy 11: Elec to I&T	07/15/04	0	07/15/04					▼
1M79003140	Flight Cables Assy 12: Elec to I&T	07/15/04	0	07/15/04					▼
1M79003150	Flight Cables Assy 13: Elec to I&T	07/15/04	0	07/15/04					▼
1M79003160	Flight Cables Assy 14: Elec to I&T	07/15/04	0	07/15/04					▼
1M79003170	Flight Cables Assy 15: Elec to I&T	07/15/04	0	07/15/04					▼
1M79003180	Flight Cables Assy 16: Elec to I&T	07/15/04	0	07/15/04					▼
Run Date	02/23/04 13:26	<b>GLAST LAT PROJECT Project Milestones (Level 3) 1 Year View (+/- 6mo)</b>			0220 LTX1 - MS (L3) FLX1 - MS (L3)	Sheet 3 of 4			
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**Attachment 2**  
**Level 3 Milestones (One-Year View)**  
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Activity ID	Activity Description	Target Finish Date	Variance	Scheduled Finish Date	FY03		FY04				FY05	
					Q3	Q4	Q1	Q2	Q3	Q4	Q1	
<b>Instrument Project Office (Level 3)</b>												
1M79002050	Flight TEM PS Assy 3: Elec to I&T	07/16/04	-21	08/16/04								▼
1M1000201	Tracker Modules B RFI	07/23/04	-18	08/18/04								▼
1M1000220	Tracker Modules 1 RFI	07/23/04	-18	08/18/04								▼
1M1001790	EM2 TEM/PS for FM9 (return FMA) from I&T to CAL	07/23/04	-15	08/13/04								▼
1M1001800	EM2 TEM/PS for FM10 (return FMB)from Elec to CAL	07/23/04	-15	08/13/04								▼
1M79002060	Flight TEM PS Assy 4: Elec to I&T	07/23/04	-21	08/23/04								▼
1M1000230	Calorimeter Modules 1 RFI	07/30/04	-14	08/19/04								▼
1M79002070	Flight TEM PS Assy 5: Elec to I&T	07/30/04	-21	08/30/04								▼
Run Date					02/23/04 13:26		<b>GLAST LAT PROJECT</b>					Sheet 4 of 4
					<b>Project Milestones (Level 3)</b>					0220		
					<b>1 Year View (+/- 6mo)</b>					LTX1 - MS (L3)		
										FLX1- MS (L3)		
© Primavera Systems, Inc.												

### Attachment 3

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



**Attachment 4  
LAT Costs, through January 2004, by WBS**

Monthly Contractor Financial Management Report								Report for Month Ending: 1/31/2004		
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		Type:						Fund Limitation:		
GLAST LAT Project								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	FEB04	MAR04		Project Estimate	Budget Value	
4.1.1 INSTRUMENT MANAGEMENT	278	347	10,526	10,578	295	358	5,744	15,617	15,617	
4.1.2 SYSTEM ENGINEERING	85	25	4,248	4,393	136	169	2,645	6,588	6,588	
4.1.4 TRACKER	388	391	10,865	10,870	533	739	4,740	14,333	14,333	
4.1.5 CALORIMETER	837	685	12,778	14,537	641	798	11,309	22,648	22,648	
4.1.6 ANTICOINCIDENCE DETECTOR	952	663	10,477	11,403	364	443	4,350	14,020	14,020	
4.1.7 ELECTRONICS	670	982	10,595	9,399	1,891	1,666	13,157	20,195	20,195	
4.1.8 MECHANICAL SYSTEMS	281	384	7,045	7,229	546	642	7,505	13,362	13,362	
4.1.9 INTEGRATION & TEST	151	130	2,827	2,885	239	332	4,651	6,907	6,907	
4.1.A PERFORMANCE AND SAFETY ASSURANCE	55	209	1,068	1,314	131	160	1,682	2,459	2,459	
4.1.B LAT INSTRUMENT OPERATIONS CENTER	0	3	278	269	3	4	54	326	326	
4.1.C EDUCATION AND PUBLIC OUTREACH	98	70	1,199	1,374	64	87	1,401	2,448	2,448	
4.1.D SCIENCE ANALYSIS SOFTWARE	113	73	1,760	1,821	65	79	1,604	3,220	3,220	
4.1.E SUBORBITAL FLIGHT TEST	0	0	1,325	1,321	0	0	-4	1,321	1,321	
Gen. and Admin.	0	0	0	0	0	0	0	0	0	
<b>Total</b>	<b>3,908</b>	<b>3,961</b>	<b>74,989</b>	<b>77,394</b>	<b>4,908</b>	<b>5,477</b>	<b>38,070</b>	<b>123,444</b>	<b>123,444</b>	

**Attachment 5  
LAT Costs, through January 2004, by Organization and Cost Code**

Monthly Contractor Financial Management Report								Report for Month Ending: 1/31/2004		
To: Kevin Grady, GLAST Project Manager (NASA) Ev Valle, LAT Project Manager (DOE)				From: Tanya Boysen, LAT Project Controls Manager				Budget Value		
LAT3				Type:				Cost: 0	Fee: 0	
GLAST LAT Project								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	FEB04	MAR04		Project Estimate	Budget Value	
DG *** GSFC	957	726	11,466	12,809	425	501	3,884	16,276	16,276	
DH *** HEPL	247	7	4,565	4,593	206	229	2,097	7,096	7,096	
DL *** SLAC	1,625	2,790	40,154	39,001	3,427	3,711	20,193	67,484	67,484	
DN *** NRL	942	284	15,491	17,410	716	897	10,027	27,131	27,131	
DO *** Financial Plan Transfer/Sub Ou	0	8	38	46	8	0	8	54	54	
DS *** SSU	98	68	1,194	1,358	62	84	1,061	2,401	2,401	
DT *** Texas A&M	0	0	15	16	0	0	0	16	16	
DU *** UCSC	39	71	1,976	2,054	57	46	647	2,726	2,726	
DW *** UW	0	8	91	108	8	9	152	260	260	
<b>Total</b>	<b>3,908</b>	<b>3,961</b>	<b>74,989</b>	<b>77,394</b>	<b>4,908</b>	<b>5,477</b>	<b>38,070</b>	<b>123,444</b>	<b>123,444</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	FEB04	MAR04		Project Estimate	Budget Value	
RL LABOR	1,687	1,460	39,428	39,925	1,383	1,707	19,824	62,343	62,343	
<i>FTE (DOE/NASA)</i>	<i>174.8</i>	<i>177.5</i>	<i>3,512.1</i>	<i>3,427.8</i>	<i>132.0</i>	<i>139.0</i>	<i>1,672.0</i>	<i>5,455.1</i>	<i>5,455.1</i>	
<i>HOURS (DOE/NASA)</i>	<i>27,963</i>	<i>28,401</i>	<i>583,282</i>	<i>564,623</i>	<i>20,106</i>	<i>25,558</i>	<i>275,320.6</i>	<i>904,267</i>	<i>904,267</i>	
RT TRAVEL	15	65	1,033	1,640	51	65	1,561	2,710	2,710	
RM MATERIAL & SERVICES	1,705	2,309	32,036	33,132	3,386	3,595	15,696	54,712	54,712	
RX MPS & LAB TAX	502	128	2,493	2,697	88	110	989	3,680	3,680	
<b>Total (not incl FTE/Hours)</b>	<b>3,908</b>	<b>3,961</b>	<b>74,989</b>	<b>77,394</b>	<b>4,908</b>	<b>5,477</b>	<b>38,070</b>	<b>123,444</b>	<b>123,444</b>	



**Attachment 6**  
**LAT Performance, through January 2004, by WBS**

Cost Performance Report - Work Breakdown Structure													
Contractor: Location:				Contract Type/No:			Project Name/No: GLAST LAT Project			Report Period: 12/31/2003 1/31/2004			
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 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)
4.1.1 INSTRUMENT MANAGEMENT	347	347	278	0	68	10,578	10,578	10,526	0	53	15,617	15,617	0
4.1.2 SYSTEM ENGINEERING	25	25	85	0	-60	4,393	4,393	4,248	0	145	6,588	6,588	0
4.1.4 TRACKER	391	94	388	-297	-294	10,870	10,548	10,865	-322	-317	14,333	14,333	0
4.1.5 CALORIMETER	685	504	837	-181	-334	14,537	14,040	12,778	-497	1,262	22,648	22,648	0
4.1.6 ANTICOINCIDENCE DETECTOR	663	542	952	-122	-410	11,403	11,026	10,477	-376	549	14,020	14,020	0
4.1.7 ELECTRONICS	982	887	670	-94	218	9,399	9,997	10,595	598	-598	20,195	20,195	0
4.1.8 MECHANICAL SYSTEMS	384	400	281	16	118	7,229	7,014	7,045	-215	-31	13,362	13,362	0
4.1.9 INTEGRATION & TEST	130	129	151	-1	-21	2,885	2,876	2,827	-9	50	6,907	6,907	0
4.1.A PERFORMANCE AND SAFETY AS	209	209	55	0	153	1,314	1,314	1,068	0	246	2,459	2,459	0
4.1.B LAT INSTRUMENT OPERATIONS C	3	3	0	0	3	269	269	278	0	-10	326	326	0
4.1.C EDUCATION AND PUBLIC OUTRE	70	10	98	-61	-88	1,374	1,377	1,199	3	178	2,448	2,448	0
4.1.D SCIENCE ANALYSIS SOFTWARE	73	73	113	0	-39	1,821	1,821	1,760	0	61	3,220	3,220	0
4.1.E SUBORBITAL FLIGHT TEST	0	0	0	0	0	1,321	1,321	1,325	0	-4	1,321	1,321	0
Gen. and Admin.	0	0	0	0	0	0	0	0	0	0	0	0	0
Undist. Budget											0	0	0
Sub Total	3,961	3,222	3,908	-740	-686	77,394	76,574	74,989	-820	1,585	123,444	123,444	0
Contingency											13,386	13,386	0
Total	3,961	3,222	3,908	-740	-686	77,394	76,574	74,989	-820	1,585	136,830	136,830	0

**Attachment 7**  
**LAT Performance, through January 2004, by Organization**

Cost Performance Report - Work Breakdown Structure													
Contractor: Location:				Contract Type/No:				Project Name/No: GLAST LAT Project		Report Period: 12/31/2003                      1/31/2004			
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]  Item	Current Period					Cumulative to Date					At Completion		
	Budgeted Cost		Actual Cost Work Performed	Variance		Budgeted Cost		Actual Cost Work Performed	Variance		Budgeted	Latest Revised Estimate	Variance
	Work Scheduled	Work Performed		Schedule	Cost	Work Scheduled	Work Performed		Schedule	Cost			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
DG *** GSFC	726	600	957	-126	-357	12,809	12,415	11,466	-394	950	16,276	16,276	0
DH *** HEPL	7	14	247	7	-234	4,593	4,583	4,565	-9	18	7,096	7,096	0
DL *** SLAC	2,790	2,462	1,625	-328	838	39,001	39,138	40,154	137	-1,016	67,484	67,484	0
DN *** NRL	284	54	942	-230	-888	17,410	16,855	15,491	-555	1,363	27,131	27,131	0
DO *** Financial Plan	8	8	0	0	8	46	46	38	0	8	54	54	0
DS *** SSU	68	7	98	-61	-91	1,358	1,361	1,194	3	167	2,401	2,401	0
DT *** Texas A&M	0	0	0	0	0	16	16	15	0	0	16	16	0
DU *** UCSC	71	69	39	-2	29	2,054	2,053	1,976	-1	77	2,726	2,726	0
DW *** UW	8	8	0	0	8	108	108	91	0	17	260	260	0
Gen. and Admin.	0	0	0	0	0	0	0	0	0	0	0	0	0
Undist. Budget											0	0	0
Sub Total	3,961	3,222	3,908	-740	-686	77,394	76,574	74,989	-820	1,585	123,444	123,444	0
Management Resrv.											13,386	13,386	0
Total	3,961	3,222	3,908	-740	-686	77,394	76,574	74,989	-820	1,585	136,830	136,830	0

## Attachment 8 LAT Performance Analysis, January 2004

	WBS	BAC	BCWS	BCWP	ACWP	SV \$	CV \$	% BCWS	% BCWP	% ACWP	SPI Trend	CPI Trend	SPI	CPI	Cpi_Fcst	CpiSpi_Fcst
1	4.1	123,444	77,394	76,575	74,989	-820	1,585	62.70	62.03	60.75	↓	↓	0.989	1.021	120,889	121,380
2	4.1.1	15,617	10,578	10,578	10,526	0	53	67.73	67.73	67.40	↔	↑	1.000	1.005	15,540	15,540
3	4.1.2	6,588	4,393	4,393	4,248	0	145	66.69	66.69	64.48	↔	↓	1.000	1.034	6,370	6,370
4	4.1.4	14,333	10,870	10,548	10,865	-322	-317	75.84	73.59	75.80	↓	↓	0.970	0.971	14,763	14,883
5	4.1.5	22,648	14,537	14,040	12,778	-497	1,262	64.19	61.99	56.42	↓	↓	0.966	1.099	20,613	20,891
6	4.1.6	14,020	11,403	11,026	10,477	-376	549	81.33	78.64	74.73	↓	↓	0.967	1.052	13,322	13,419
7	4.1.7	20,195	9,399	9,997	10,595	598	-598	46.54	49.50	52.46	↓	↑	1.064	0.944	21,402	20,756
8	4.1.8	13,362	7,229	7,014	7,045	-215	-31	54.10	52.49	52.72	↑	↑	0.970	0.996	13,421	13,616
9	4.1.9	6,907	2,885	2,876	2,827	-9	50	41.77	41.65	40.93	↔	↓	0.997	1.018	6,788	6,800
10	4.1.A	2,459	1,314	1,314	1,068	0	246	53.44	53.44	43.42	↔	↑	1.000	1.231	1,998	1,998
11	4.1.B	326	269	269	278	0	-10	82.54	82.54	85.53	↔	↑	1.000	0.965	337	337
12	4.1.C	2,448	1,374	1,377	1,199	3	178	56.13	56.23	48.96	↓	↓	1.002	1.149	2,132	2,130
13	4.1.D	3,220	1,821	1,821	1,760	0	61	56.56	56.56	54.66	↔	↓	1.000	1.035	3,111	3,111
14	4.1.E	1,321	1,321	1,321	1,325	0	-4	100.00	100.00	100.29	↔	↔	1.000	0.997	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

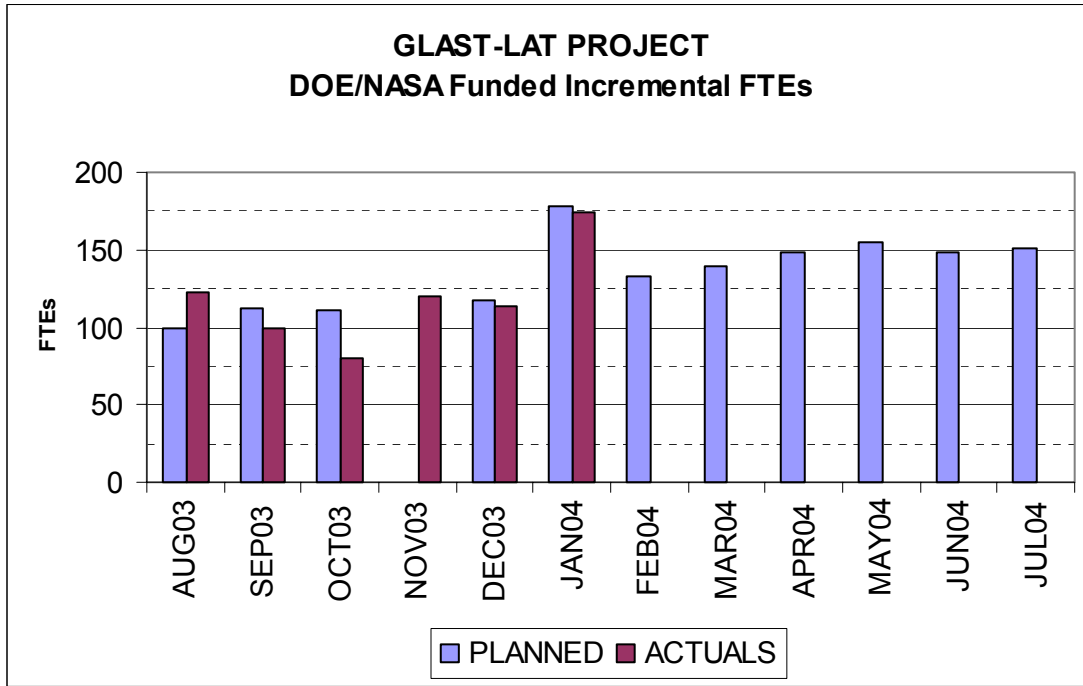
CpiSpi\_Fcst: Combination CPI and SPI EAC Forecast = ACWP + (BAC - BCWP) / (CPI \* SPI)

■ Worse than .85      ■ Between .95 and 1.10

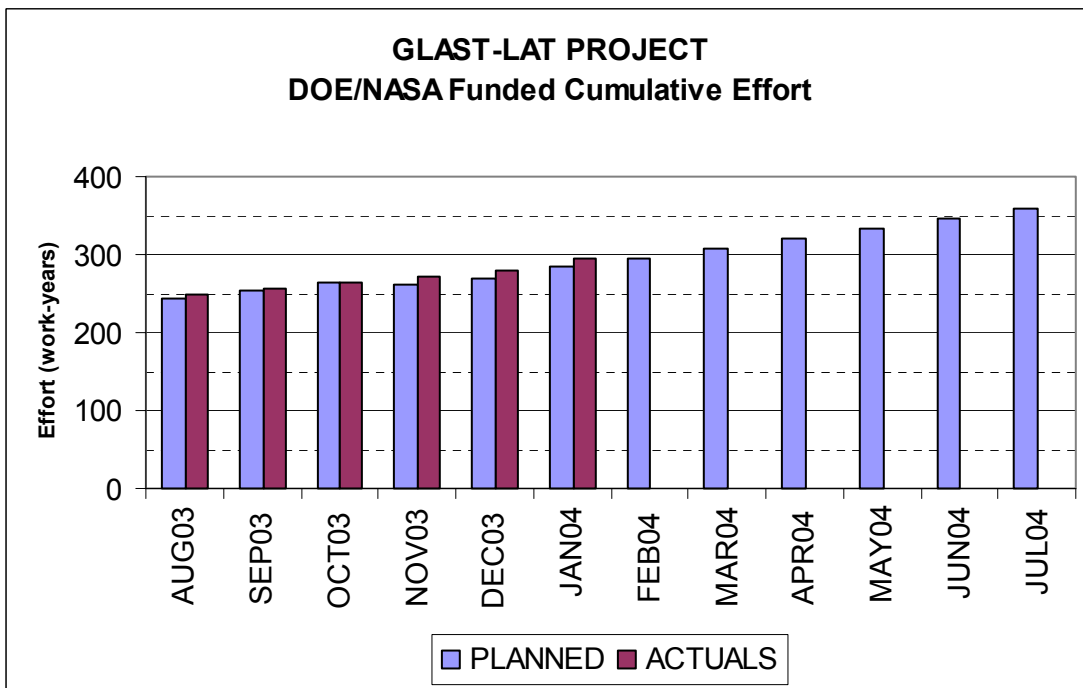
■ Between .85 and .95      ■ Better than 1.10

SPI and CPI Change Thresholds

**Attachment 9  
LAT Manpower (DOE/NASA-Funded)**



*Note: Monthly planned manpower reflects adjustments so that the cumulative-to-date plan corresponds to the approved changes for that month.*



**Attachment 10**  
**LAT Manpower Data, through January 2004, by Organization**

Program: LAT3		Description: GLAST LAT Project		Approval: Program Manager Functional Manager Cost Account Manager											
Run Date: 2/23/2004		Status Date: 1/31/2004													
		PRIOR	AUG03	SEP03	OCT03	NOV03	DEC03	JAN04	Cum-to- Date	FEB04	MAR04	APR04	MAY04	JUN04	JUL04
OBS															
DG *** GSFC															
FTE	PLANNED	642.0	18.6	22.0	22.2	-8.1	21.2	27.8	745.5	28.8	33.8	28.2	28.9	21.4	23.6
	ACTUALS	631.9	39.3	23.6	0.0	0.0	0.0	65.6	760.5	0.0	0.0	0.0	0.0	0.0	0.0
DH *** HEPL															
FTE	PLANNED	280.9	6.6	8.8	7.2	-56.1	5.3	0.0	252.7	3.2	3.2	3.2	3.4	4.5	4.9
	ACTUALS	218.8	4.5	0.0	0.0	6.1	13.6	11.7	254.8	0.0	0.0	0.0	0.0	0.0	0.0
DL *** SLAC															
FTE	PLANNED	1396.7	62.4	64.7	62.7	23.1	64.2	117.4	1791.3	77.5	77.5	88.4	91.8	89.4	88.4
	ACTUALS	1305.2	52.2	55.0	64.3	66.4	63.0	69.1	1675.2	0.0	0.0	0.0	0.0	0.0	0.0
DN *** NRL															
FTE	PLANNED	638.2	21.9	25.8	32.5	37.9	36.5	37.6	830.4	29.4	36.9	46.6	49.4	51.0	44.3
	ACTUALS	652.0	25.7	30.1	20.7	35.4	38.3	30.1	832.3	0.0	0.0	0.0	0.0	0.0	0.0
DS *** SSU															
FTE	PLANNED	65.8	2.9	2.9	2.3	2.7	2.4	4.8	83.8	3.2	3.2	3.2	3.2	3.2	3.2
	ACTUALS	75.7	4.4	3.7	2.4	4.0	3.5	5.1	98.7	0.0	0.0	0.0	0.0	0.0	0.0
DU *** UCSC															
FTE	PLANNED	198.7	4.5	4.5	4.5	10.0	4.6	6.3	233.0	6.9	4.7	4.4	4.4	4.4	4.4
	ACTUALS	250.2	6.4	-5.2	4.3	19.4	5.8	4.7	285.5	0.0	0.0	0.0	0.0	0.0	0.0
DW *** UW															
FTE	PLANNED	36.1	0.4	0.4	0.4	0.4	0.4	0.4	38.5	0.4	0.4	0.4	0.4	0.4	0.4
	ACTUALS	7.0	0.0	2.0	0.0	0.6	1.0	0.0	10.6	0.0	0.0	0.0	0.0	0.0	0.0
FF *** France															
FTE	PLANNED	973.9	31.0	31.0	31.4	-15.5	10.9	14.8	1077.5	15.2	15.2	15.2	15.2	15.2	15.2
	ACTUALS								0.0						
FI *** Italy															
FTE	PLANNED	391.2	12.0	14.1	14.8	-69.7	9.1	9.1	380.7	10.9	15.4	14.5	13.5	11.7	16.4
	ACTUALS	278.1	10.9	10.9	10.9	10.9	10.9	10.9	343.2	0.0	0.0	0.0	0.0	0.0	0.0
FJ *** Japan															
FTE	PLANNED	91.3	1.0	1.0	1.0	0.9	1.2	1.0	97.4	1.0	0.9	0.5	0.5	0.5	0.5
	ACTUALS	66.7	1.8	1.8	1.8	1.8	1.8	1.8	77.2	0.0	0.0	0.0	0.0	0.0	0.0
FK *** Sweden															
FTE	PLANNED	89.3	5.1	5.1	5.1	5.1	3.8	3.5	117.0	3.6	3.6	3.6	3.6	3.6	3.6
	ACTUALS								0.0						
Grand Totals:															
	PLANNED	4804.2	166.3	180.1	184.2	-69.4	159.7	222.6	5647.7	180.0	194.7	208.1	214.1	205.2	204.7
	ACTUALS	3485.7	145.1	121.9	104.2	144.5	137.8	198.9	4337.9	0.0	0.0	0.0	0.0	0.0	0.0
4.1 GLAST LAT															
Contributed	PLANNED	1984.5	66.8	67.7	73.0	-59.5	42.4	45.1	2219.9	47.7	55.8	59.6	59.5	57.1	53.9
	ACTUALS	684.0	22.5	22.8	24.3	24.4	23.8	24.1	825.8	0.0	0.0	0.0	0.0	0.0	0.0
Funded	PLANNED	2819.8	99.4	112.4	111.2	-9.9	117.4	177.5	3427.8	132.3	138.9	148.4	154.7	148.1	150.9
	ACTUALS	2801.6	122.7	99.1	80.0	120.1	114.0	174.8	3512.1	0.0	0.0	0.0	0.0	0.0	0.0
Grand Totals:															
	PLANNED	4804.2	166.3	180.1	184.1	-69.4	159.7	222.6	5647.7	179.9	194.7	208.1	214.1	205.1	204.7
	ACTUALS	3485.7	145.1	121.9	104.2	144.4	137.8	198.9	4337.9	0.0	0.0	0.0	0.0	0.0	0.0