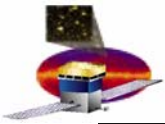


# **GLAST Large Area Telescope: I & T Input to Monthly Technical/Cost/Schedule Review 01/28/04**

**Elliott Bloom  
SU-SLAC  
Subsystem Manager**

**Brian Grist  
SU-SLAC  
Subsystem Engineer**

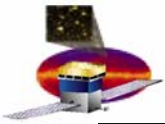
**elliott@slac.stanford.edu, bgrist@slac.stanford.edu  
650-926-2469 650-926-2998**



## **Last Month's Accomplishments**

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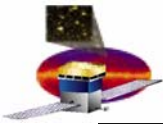
- **I&T EM -2 plan development**
- **Supported Tracker – Grid interface redesign.**
- **Coordinated use of minitower and mini-Cal- Haller/Bloom/Horn**
- **Prepared change request and requisitions to add 5 additional personnel. Have filled one of 10 open positions.**
- **Completed three sets of drawing packages associated with the EM MGSE and the Metrology bay, total of 77 drawings.**
- **Released LATTE version 2.0.0**
- **Released initial draft of "LAT-TD-02834: GLAST LAT I&T Testing Requirements Document" and solicited subsystem input**
- **Set up an web-based Online Issue Tracking System to track problems and requests to change the EGSE Software.**
- **Supported ACD Online development with a trip to GSFC.**
- **Worked on LATTE development to support subsystem (CAL, ACD) requirements for new features**
- **Prepared a Mini-CAL/Mini-Tower stand design**
- **Purchased new vacuum pumps for the rebuilding Van de Graaff generator.**



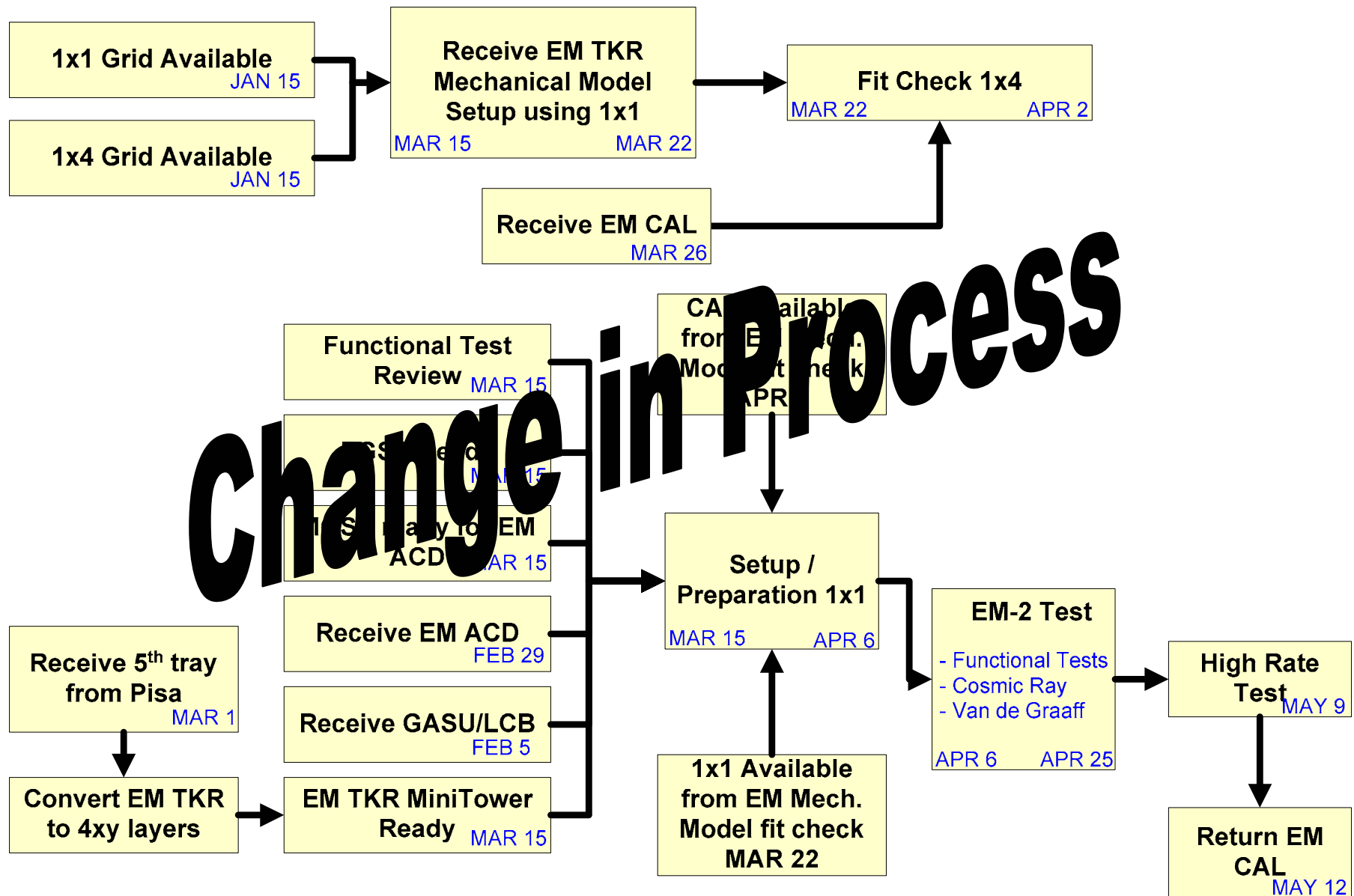
# Issues/Concerns/Suggestions/Risks

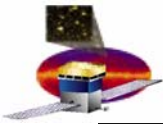
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- Need for electronics technicians and engineer to be under I&T control – currently under electronics and not shown in PMCS.
  - Submitted details and cost information to project controls; change request approved at this morning's CCB. Job Requisitions have been written and are being reviewed.
- Finalization of all LAT test plan requirements is not complete.
  - Discussion with Systems Engineering has occurred to plan recovery and get plans released.
- EGSE definition Document needs to be completed. Cooperative effort between ELX and I&T.
- High rate test methodology needs definition. I&T currently working on very high rate Van de Graaff solution.
- EM-2 plan is in flux due to late or no delivery of EM hardware.



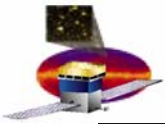
# Draft EM-2 Plan





# Key Milestone for Next 3 Months

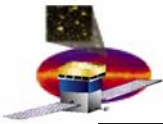
Milestone Description	Original Date	Current Date	Major Requirements to Achieve Milestone	Notes
Bldg 33 Upgrades	09/01/03	01/31/04	Earthquake new cabinets-done, more furniture-done, all phones installed-done, permanent, Clinton flight hardware Stores complete (fire and earthquake)-done. <b>Nitrogen purge System operational except for system integration and testing, final SLAC safety inspection, and use for flight hardware certification.</b>	<i>Van De Graaff Seismic analysis done, and Seismic floor restraint is in place. Nitrogen purge system on schedule for completion.</i>
MGSE conceptual design for transportation container complete	11/30/03	2/5/04	Preliminary design, vibe analysis, impact on LAT in flight in work, essentially complete. Now considering logistics plan for handling LAT.	<i>Present design at MGSE pre-production review.</i>
I&T training mockup complete and ready for use	01/03/04	02/27/04	<ul style="list-style-type: none"> <li>All I&amp;T mechanical &amp; electrical techs on board and ready to train.</li> <li>Requisitions are in the system for new hires.</li> </ul>	<i>See following slide for overview of mockup.</i>
1x4 Grid Available for fit check	01/15/03	02/27/04	Fit check requires: <ul style="list-style-type: none"> <li>Final flight grid EM.</li> <li>Tracker tower (mini, or mechanical, or full) available with final flight tracker-grid interface.</li> </ul>	<i>Fit check strategy is not now clear due to delay in tracker – grid interface definition.</i>
ACD tent work	01/30/04	05/01/04	Design complete, discussion with ACD about final space usage plan.	<i>Need for ACD 10/10/04. Complete tent work before LAT integration begins.</i>
Multi-FREE Board EGSE	01/30/04	02/27/04	GASU & LCB delivered <b>with software</b> to I&T 02/27/04. Complete LATTE multi FREE Board support to ACD. <b>Also delivery of specification, first draft was delivered on 012004.</b>	<i>I&amp;T needs <del>30</del> 10 days after delivery of GASU &amp; LCB with software to deliver FREE board online support to ACD.</i>
<b>MGSE pre-production review</b>	01/27/03	<b>2/5/04</b>	Present MGSE final designs for LAT integration Requires coordination with Mike Menning, Martin Nordby and Mechanical systems.	<i>All MGSE needed for LAT integration. EV test MGSE later. Assembly sequence is in flux which may modify MGSE requirements!</i>
ACD EM Tower Tiles and Electronics and mechanical support	02/17/04	02/29/04	ACD to deliver tiles, photo-tubes, freeboards for use with single tower + GASU . I&T to produce EGSE scripts.	<i>Key delivery to obsolete Calibration unit milestone date</i>



# MOCKUP BENEFITS

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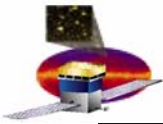
- The main purpose of the mock up hardware will be to exercise and validate to certain extent the integration sequences outlined in LAT-MD-00676
- Additional purposes include and are not limited to:
  - Exercise AI&T documentation (integration procedures, installation logs, etc)
  - Identify issues with the cable integration sequence.
  - Identifying any potential issues with the MGSE hardware
  - Identify floor usage space issues (crane restrictions, cart access space, etc)
  - Train personnel for flight hardware integration.
  - Exercise crane operations for flight hardware integration.
  - Exercise de-integration operations and identify any potential problems



# MOCKUP HARDWARE LIST

## I&T Mock-Up Manufacturing List

Harness/connectors		Grid/ Grid hardware		Elec. Boxes		MGSE	
ITEM	QTY.	ITEM	QTY.	ITEM	QTY.	ITEM	QTY.
PSU box connectors	8	EMI skirt mock-up	1 side	TEM/PSU boxes (for 1 bay)	8	rotation stand frame	1
PSU connector savers	2	Corner bracket mock-up	2 corners	old mock-up boxes	full set	rotation stand attachment hardware	1
PDU box connectors	8	EM Single Bay	1	new mock GASU box	1	EM grid rotation stand	1
PDU connector savers	8	1x4 EM Grid	1	new mock PDU box	1		
mock cables	full set	Menning plates	10				
TEM-GASU cables	8	cable trays	full set				
TEM box connectors	8	baseplate	1				
TEM box connector saver	2	CAL baseplates	8				
GASU box connectors	8						
GASU connector savers	8						
PSU-PDU cables	8						



# Key Milestone for Next 3 Months

Milestone Description	Original Date	Current Date	Major Requirements to Achieve Milestone	Notes
Receive EGSE from Electronics	02/05/04	02/27/04	GASU/LCB system needed for the EM-2 test	
Receive 5th tray from Pisa for EM-2	03/01/04	?	5th tracker tray available. Use GTRC 6 chips.	<i>High rate test requires disabling TOT on EM-2 Tracker. Imperfect GTRC 6 tray exists (bad ladder) in Pisa, and could be shipped very soon.</i>
I&T construct EM TKR Mechanical Model for fit check <b>New I&amp;T effort as of 01/23/04.</b>	03/15/04 From TKR	4/15/04 From I&T	<ul style="list-style-type: none"> <li>Convert old bottom tray to new design. Remove old sidewall flexures and install new design. Drill out corner flexure holes to match new design.</li> <li>Use spare mechanical trays and sidewalls to construct mechanical model.</li> <li>Use flight flex cables.</li> </ul>	<i>Tom Borden, past TKR subsystem engineer, is now working for I&amp;T and will lead this effort. I&amp;T needs this mechanical model to verify the grid interface and to develop the tracker to grid assembly procedures months before flight hardware arrives.</i>
MGSE ready for EM ACD-Now mainly ACD task.	03/15/04	03/15/04	ACD EM-2 available.	<i>ACD has told I&amp;T that they want to build ACD support for EM-2.</i>
EM-2 TKR Mini-Tower Ready	03/15/04	Receipt of 5 <sup>th</sup> tray plus 2 weeks.	Mini Tower here at SLAC converted to 4xy layers	
Receive EM Calorimeter for fit check	03/26/04	03/26/04	EM CAL available	
EM-2 Fit Check complete	04/02/04	05/02/4	Mechanical Model fit check completed with EM TKR mechanical model, EM CAL and 1x4 grid	
EM -2 functional Tower test	04/06/04	04/06/04	Parts availability.	<i>Need 5 tray minitower and CAL EM. This could start earlier than 4/06/04</i>
LAT assembly readiness review	05/06/04	06/06/04	One month before first flight parts arrive (beginning of LAT assembly and integration).	<i>First delivery of flight hardware to I&amp;T sufficient to start assembly is July 13. (TKR A, GRID, TEM/TEMPS)</i>

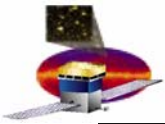




# EGSE Need Milestones

AV	Activity ID	ND	Activity Description	AV: Early Finish	Float	Baseline Finish	Early Finish	FY04	
								Q1	Q2
4.1.7 Electronics									
4.1.9 I&T									
7	1M7941130	9	EGSE TEM/TEM PS/CTS w/ FE Elec #1-Elec to I&T	01/20/04	-23	12/08/03	01/20/04		
7	1M7941150	9	EGSE TEM/TEM PS/CTS w/ FE Elec #2-Elec to I&T	02/12/04	-30	12/22/03	02/12/04		
7	1M7941160	9	EGSE TEM/TEM PS/CTS w/ FE Elec #3-Elec to I&T	02/20/04	-30	01/07/04	02/20/04		
7	1M7941170	9	EGSE TEM/TEM PS/CTS/GASU FE	02/27/04	-30	01/14/04	02/27/04		
7	1M7941180	9	EGSE Development Hrdw/FSW 1st Delivr-Elec	03/05/04	-30	01/22/04	03/05/04		
7	1M7941190	9	EGSE TEM/TEM PS/CTS #1 for Bldg 33-Elec to I&T	03/12/04	-30	01/29/04	03/12/04		
7	1M7941420	9	EGSE TEM/TEM PS/CTS #2 for Bldg 33-Elec to I&T	03/19/04	-30	02/05/04	03/19/04		
7	1M7941430	9	EGSE TEM/TEM PS/CTS w/ GASU for B33-Elec to	03/19/04	-30	02/05/04	03/19/04		

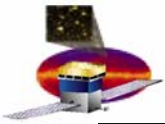
	This item includes an <b>EM-2 TEM</b> , a <b>TEM Power Supply</b> , a <b>Crate Test System</b> with <b>LCB</b> and <b>Front-end Electronics (shared)</b> . It is to be used by Ric Claus for development of Online software.
	This item includes an <b>EM-2 TEM</b> , a <b>TEM Power Supply</b> , a <b>Crate Test System</b> with <b>LCB</b> and <b>Front-end Electronics (shared)</b> . It is to be used by Selim Tuvi for development of Online software.
	This item includes an <b>EM-2 TEM</b> , a <b>TEM Power Supply</b> , a <b>Crate Test System</b> with <b>LCB</b> and <b>Front-end electronics (shared)</b> . It is to be used by Jim Panetta for development of Online software.
	This item includes a <b>Crate Test System</b> , an <b>EM GASU</b> and <b>Front-end Electronics (shared)</b> . It is to be used by Ric Claus for development of Online software.
	This item includes an <b>Early Release of Flight Software</b> and <b>Hardware interfaces</b> . It is to be used by Ric Claus for development of Online software for full LAT testing through SIU.
	This item includes an <b>EM-2 TEM</b> , a <b>TEM Power Supply</b> , a <b>Crate Test System</b> with <b>LCB</b> . It is to be used in the building 33 room 103 Integration Test Facility.
	This item includes an <b>EM-2 TEM</b> , a <b>TEM Power Supply</b> , a <b>Crate Test System</b> with <b>LCB</b> . It is to be used in the building 33 room 103 Integration Test Facility.
	This item includes a <b>Crate Test System</b> with <b>LCB</b> , <b>EM GASU</b> and <b>EM PDU</b> . It is to be used in the building 33 room 104 Integration Test Facility for single and multi-tower tests during integration.



## Status/Closure of action items

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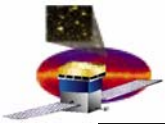
- No action items from last months review meeting
- CDR RFA #13: ACD RFA of detailed dimensions in facility and hook height.
  - I&T response submitted 8/29/03 that included a dimension study and access dimensions. Recent discussions with ACD indicated acceptance of our plan. ACD and I&T working toward accommodating early delivery of ACD at SLAC, and understanding logistics at SLAC in depth.
- CDR RFA #14b: ACD installation MGSE
  - MGSE clearances for ACD installation were discussed in the response to RFA #13. Currently a concept exists for the lift fixture. It has had initial bounding analysis, but the complete design and final analysis is not complete.



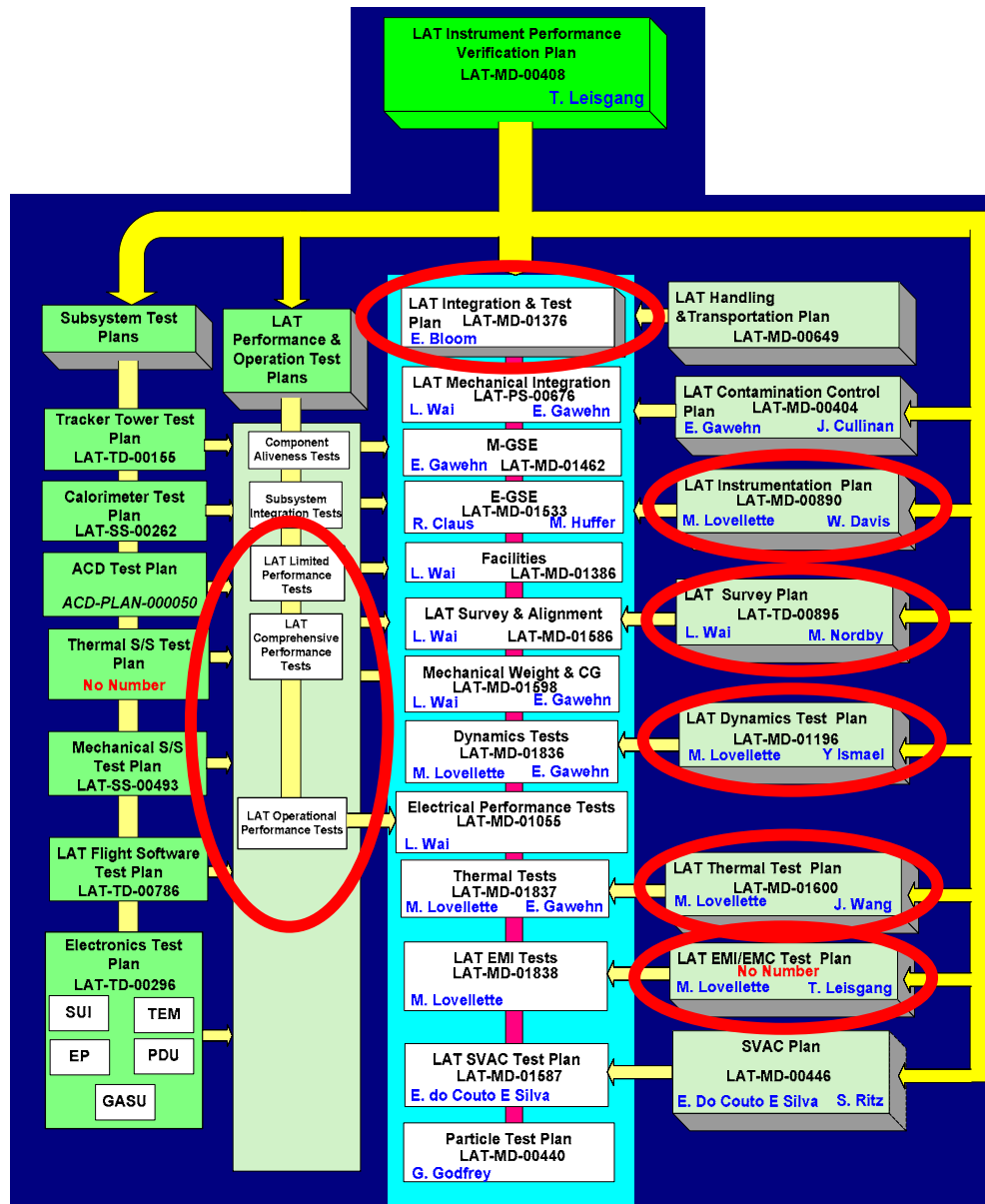
## Open Flight Design Issues Status and Closure Plan

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- Work out sharing of EM CAL between CAL and I&T from October 15, 2003 until flight integration begins on July 13, 2004.
  - We expect I&T will need CAL EM for  $\leq 2$  months in this time period.
  - This is a reduction from 50/50 to 25/75 for I&T/CAL EM sharing in this 8 month time frame.
  - With delivery of tower A, we will require CAL EM to enable “2 tower” checkout. This is in addition to 2 months before integration begins.
- EM-2 plan is now in flux due to delays in delivery of flight like TKR–grid interface. Formulating a new plan that is consistent with integration schedule.
  - I&T is planning to build a full mechanical TKR tower with final flight interface.
  - Define goal of EM fit check. Review plan with Marc C. and Tom B. to understand the 1x4 and 1x1 grid and EM Tracker requirements. - Bloom/Grist
  - Fit check of appropriate TKR Mechanical model needs to be done with CAL EM, new flight interface 1X1 and 1x4 grid as early as possible. Current date has slipped to mid April.
- Identify and implement a work around to G3 delay that implements ACD schedule impact. Haller/Bloom/T. Johnson
  - Gained 20 days by early delivery of initial specification document by Huffer to Claus. Need timely progress towards final specification document to allow full gain of schedule. Date to ACD is now ~ March 12.



# Documentation Plan/Status

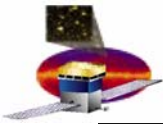


4.1.9 - Integration and Test

## Agreement I&T and System Engineering on completion dates:

- LAT Integration Sequence - 12/03 ✓
- LAT I&T Plan – 4/04
- LAT Comprehensive Performance Plan - 6/04
- LAT Limited Performance Plan - 6/04
- LAT Operational Performance Tests - 3/04
- LAT Instrumentation Plan - Update 1/04
- LAT Survey Plan - 12/03
- LAT Dynamics Test Plan - First Release 12/03, Final 3/04
- LAT Thermal Test Plan - First Release 12/03, Final 3/04
- LAT EMI/EMC Test Plan - First Release 3/04

**Discussion underway to plan recovery**



# Cost and Schedule Status

	WBS	BAC	BCWS	BCWP	ACWP	SV \$	CV \$	% BCWS	% BCWP	% ACWP	SPI Trend	CPI Trend	SPI	CPI	Cpi_Fcst	CpiSpi_Fcst
65	4.1.9	6,384	2,755	2,747	2,676	-8	71	43.16	43.03	41.92	↑	↓	0.997	1.027	6,219	6,229

- **Cumulative Schedule Variance**

- **Work Scheduled: 2755 k\$**
- **Work Performed: 2747 k\$**
- **Schedule Variance: -8k\$ (-0.3%)**
  - 8k\$ is 1x4 lift fixture done in February after MGSE review on February 5. (3 month delay)
- **Threats to Schedule:**
  - Completion of test plans.
  - Delivery of EM parts from subsystems for EM-2 program.

- **Cumulative Cost Variance**

- **Work Performed: 2747 k\$**
- **Actual Cost: 2676 k\$**
- **Cost Variance: +71k\$ (+2.7%)**