

GLAST LAT I&T

*GLAST Monthly
Mission Review
Nov 3, 2005*



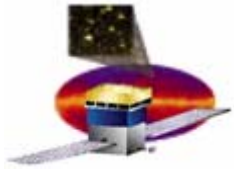
Monthly Mission Review

LAT Environmental Test Planning

November 3, 2005

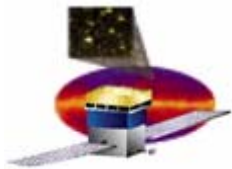
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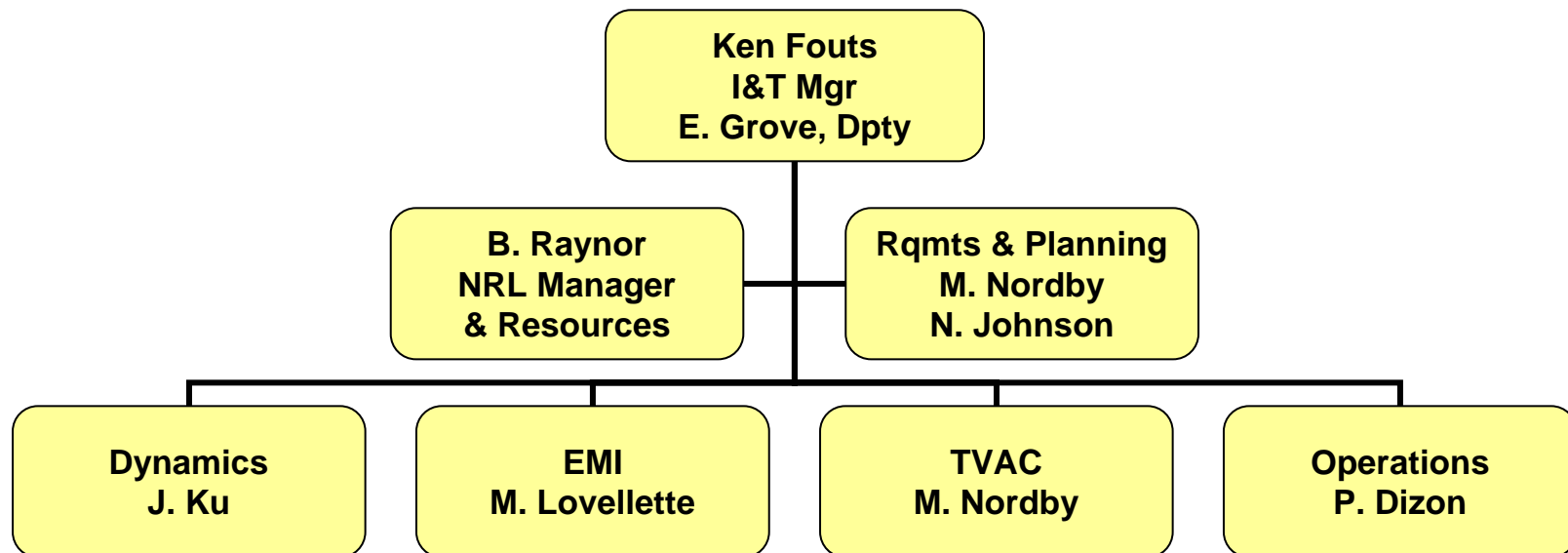


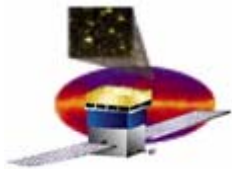
Content

- Organization / Responsibilities**
- Controlling Documents**
- Test Flow**
- Test Preparation / Path finding**
- Facilities and GSE**
- Test Preparation Schedule**
- Issues and Concerns**



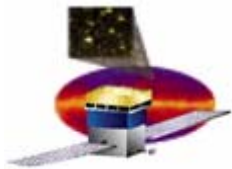
Environmental Test Organization





Controlling Documents

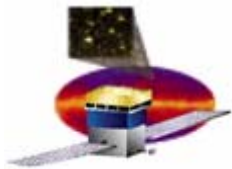
- ❑ **LAT-MD-00408, the “LAT Instrument Performance Verification Plan” delineates the basic content and order of all required LAT environmental tests**
 - **This responds to the requirements put forth in the MAR, GEVS, IRD, and other governing documents**
- ❑ **LAT-MD-02717, the “LAT Environmental Test Sequence” details the order of environmental tests, and the major operational steps**
 - **This is subservient to the LAT-MD-00408, but includes significantly more operational detail**
- ❑ **LAT-PS-06898, the “LAT Environmental Test Implementation Plan” details the roles and responsibilities of the various parties to testing at NRL.**
 - **Identifies facilities and special test equipment responsibilities**
 - **Identifies plan for safety, operations, configuration management, quality assurance and contamination control.**



Environmental Test: Plan-Level Documents and Status

- The following documents (in total) form the technical bases for LAT environmental testing

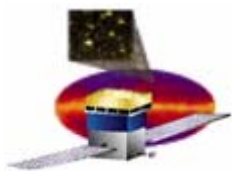
Document	Title	Status	ECD
LAT-MD-02717-01	LAT Environmental Test Sequence		Released
LAT-MD-01196-03	LAT Dynamics Test Plan		Released 10/28
LAT-MD-00276-02	LAT EMI/EMC Test Plan		Released 10/28
LAT-MD-01600-03	LAT Thermal-Vacuum Test Plan		Released 10/28
LAT-SS-06640-01	LAT Environmental Test MGSE/STE Requirements		Released 9/30
LAT-PS-06898-01	LAT Environmental Test Implementation Plan	Final draft in work	
LAT-MD-06560-01	Plan for Integrating and Testing the LAT on the Observatory	In review with Spectrum Need to update this fall	



Environmental Test: Configuration Drawings and Status

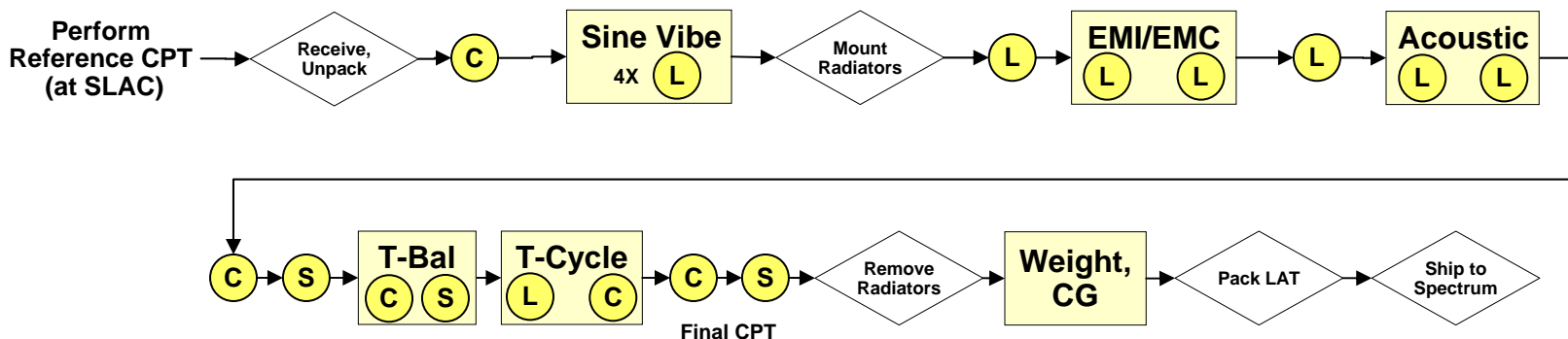
- ❑ **These show flight hardware and MGSE/STE in their test configuration**
 - Includes all information needed to support test set-up procedures
 - Shows all mechanical test and handling equipment that is used for the test
- ❑ **Configuration Assemblies being worked in conjunction with finalizing MGSE designs for the tests**

Drawing	Title	Status	ECD
LAT-DS-06188	Acoustic Test Configuration Assembly	Acoustic STE design completed in Oct 2 nd draft of Config Assy underway (1 st priority)	Early Nov
LAT-DS-06185	Thermal-Vacuum Test Configuration Assembly	Thermal STE design completed in Oct 2 nd draft of Config Assy underway (1 st priority)	Late Nov
LAT-DS-06187	Horizontal Vibration Test Configuration Assembly	Modeling completed in Aug Drafting on hold (2 nd priority)	Early Dec
LAT-DS-06190	Vertical Vibration Test Configuration Assembly	Modeling completed in Aug Drafting on hold (2 nd priority)	Late Nov
LAT-DS-06186	Handling Configuration Assembly	First draft completed in July Draft on hold (3 rd priority)	Early Dec
LAT-DS-06184	Transport Configuration Assembly	Waiting Transport Container final design	Early Dec
LAT-DS-06189	EMI/EMC Test Configuration Assembly	EGSE cable lengths finalized at NRL F2F Drafting on hold (3 rd priority)	Early Jan



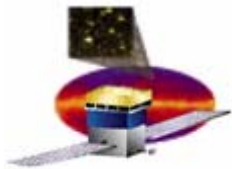
Environmental Test Sequence

LAT-MD-02717-01, "LAT Environmental Test Sequence" Release 9 May 2005



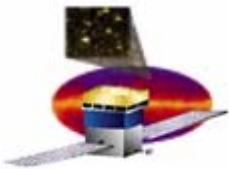
- (L)** Limited Performance
- (C)** Comprehensive Performance
- (S)** SVAC Test

Updated LAT Environmental Test Sequence



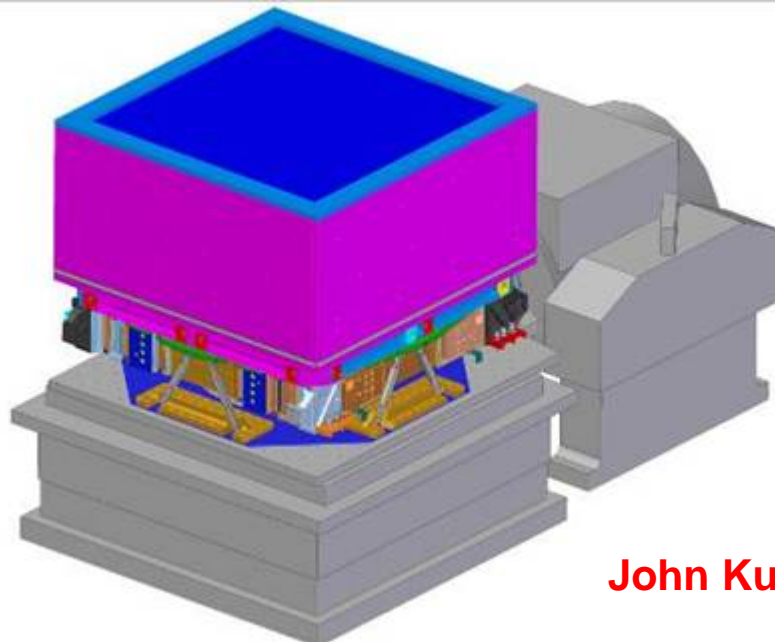
Test Schedule

ID	Task Name	Duration	Start	Finish	Qtr 1, 2006			Qtr 2, 2006		
					Jan	Feb	Mar	Apr	May	Jun
115	Environmental Test	93 days	Mon 1/23/06	Wed 5/31/06						
116	Deliver LAT/Offload/Set-up	5 days	Mon 1/23/06	Fri 1/27/06						
117	CPT	5 days	Mon 1/30/06	Fri 2/3/06						
118	Vibe Test Prep/Check-out	3 days	Mon 2/6/06	Wed 2/8/06						
119	Sine Vibe Test	6 days	Thu 2/9/06	Thu 2/16/06						
120	Install Radiators	2 days	Fri 2/17/06	Mon 2/20/06						
121	LPT	3 days	Tue 2/21/06	Thu 2/23/06						
122	EMI/EMC Test	5 days	Fri 2/24/06	Thu 3/2/06						
123	Acoustic Test Prep/Checkou	3 days	Fri 3/3/06	Tue 3/7/06						
124	Acoustic Test	4 days	Wed 3/8/06	Mon 3/13/06						
125	TVAC Prep/Check-out	5 days	Tue 3/14/06	Mon 3/20/06						
126	TVAC Open Door Test	3 days	Tue 3/21/06	Thu 3/23/06						
127	TVAC	40 days	Fri 3/24/06	Thu 5/18/06						
128	CPT	3 days	Fri 5/19/06	Tue 5/23/06						
129	Remove Radiators	2 days	Wed 5/24/06	Thu 5/25/06						
130	Weight & CG	2 days	Fri 5/26/06	Mon 5/29/06						
131	Pack and Ship	2 days	Tue 5/30/06	Wed 5/31/06						

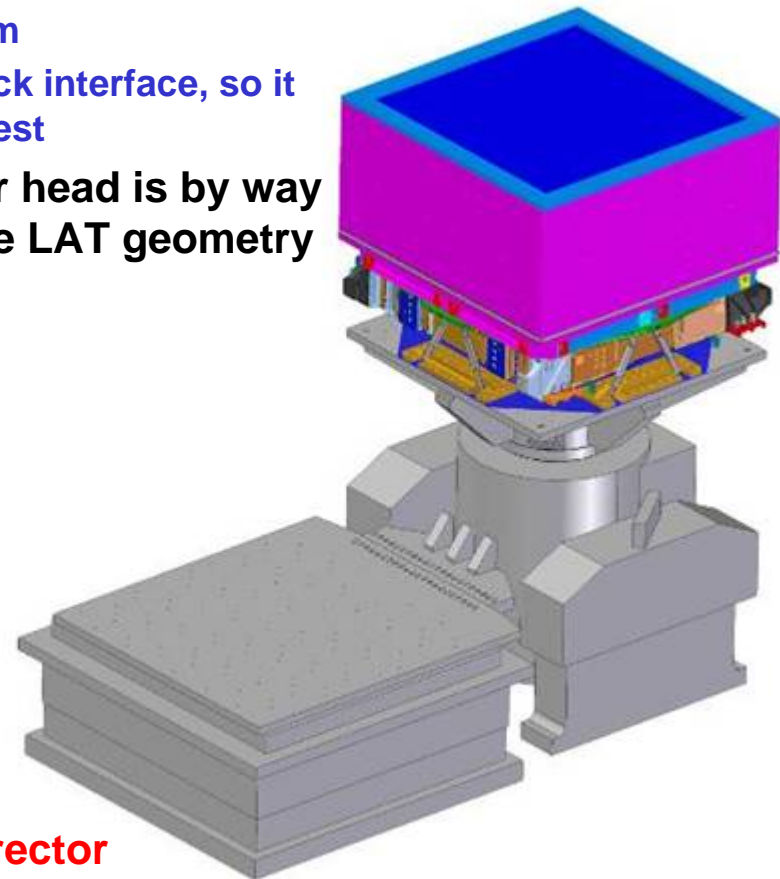


Sine Vibration Test Configuration

- The LAT is transported and supported on the TIP
 - TIP is already installed for all handling before and after test
 - TIP assembly uses SC flexures from Spectrum
 - TIP is designed to simulate SC flexure/top deck interface, so it provides a nearly flight-like interface for the test
- Interface to both the slip table and expander head is by way of a simple bolt pattern that fits well with the LAT geometry

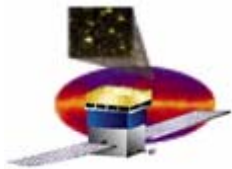


X/Y-Axis Vibration Configuration



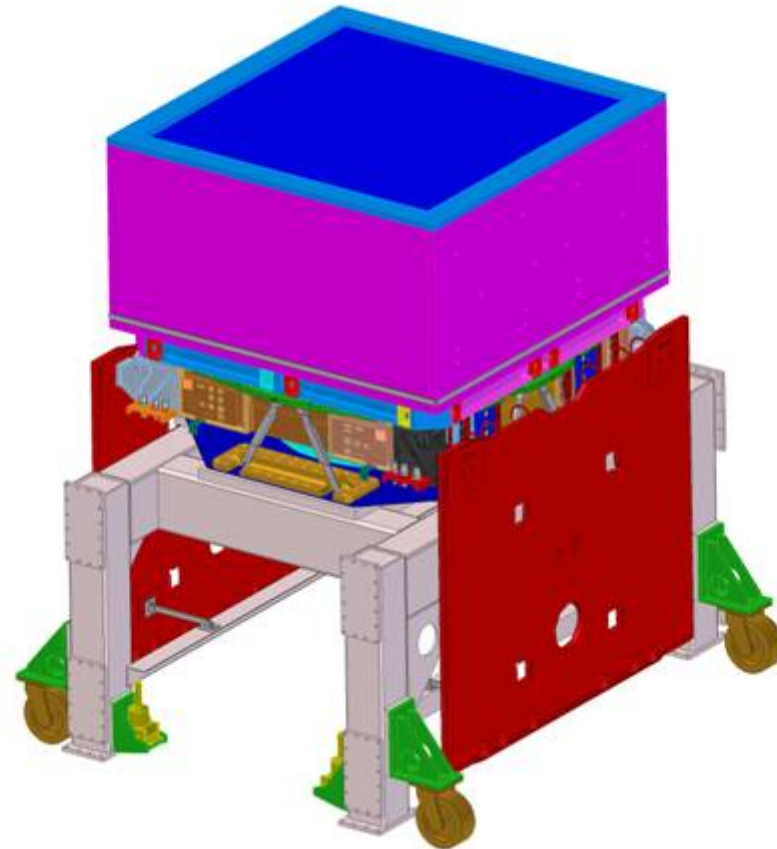
Z-Axis Vibration Configuration

John Ku, Director



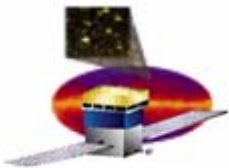
EMI/EMC Test Configuration

- LAT (on the TIP) is mounted on the Test Stand for EMI/EMC testing
 - LAT + TIP mounts to Test Stand
 - LAT is rolled into the anechoic chamber
 - Dust bag remains over the LAT for the entire operation, including during testing
- Auxiliary cooling is needed during the test, since the LAT will be on for the entire test duration

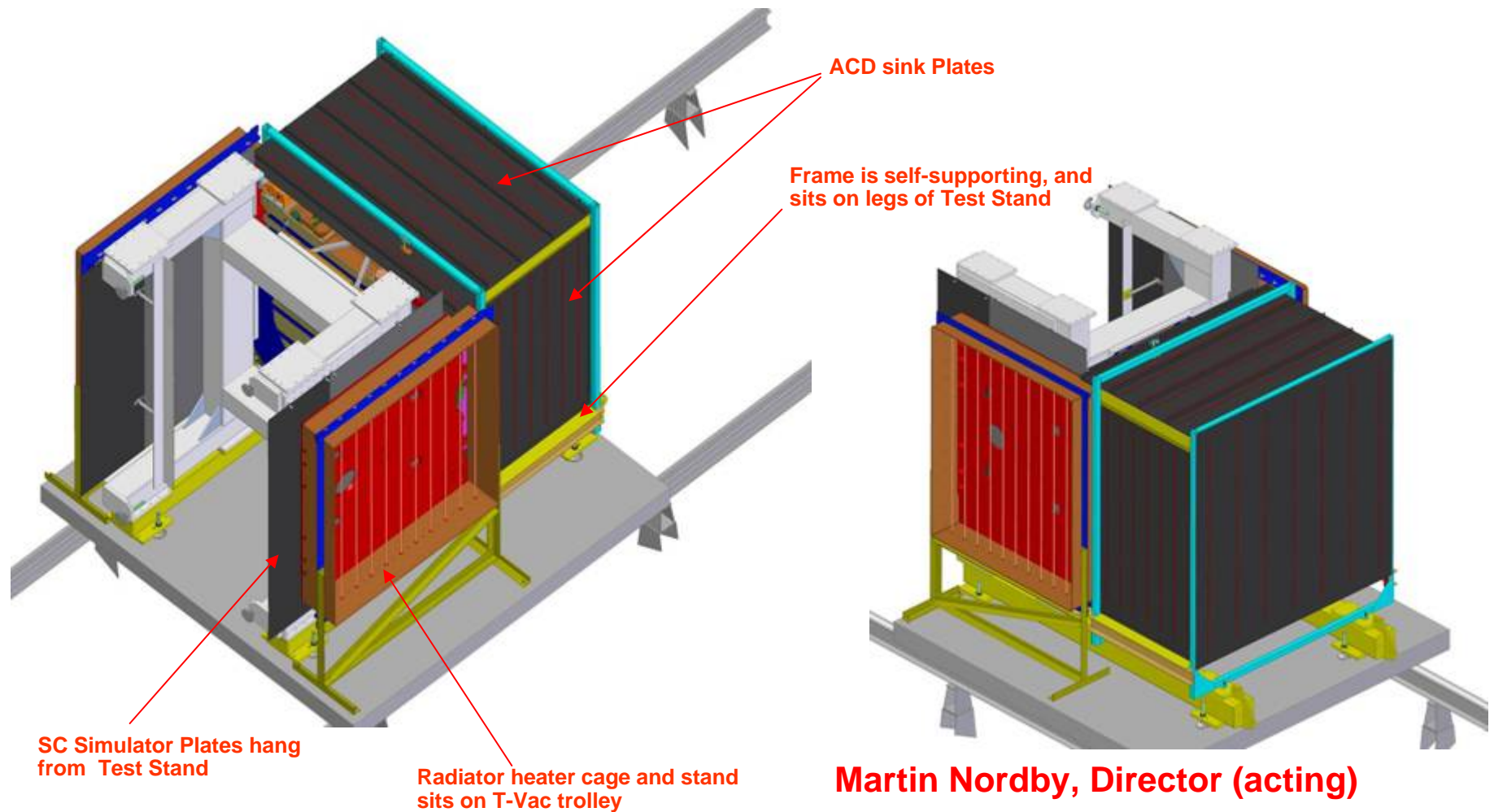


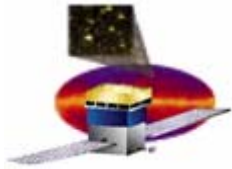
EMI/EMC Test Configuration

Michael Lovellette, Director



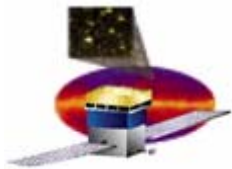
Thermal-Vacuum Configuration Assembly





Environmental Test MGSE/STE

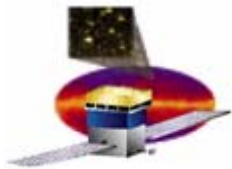
- ❑ **Transport Container**
 - Second-round design review held in mid-October
 - Final analysis review waiting completion of all analysis and design work
 - Long lead components in manufacture
- ❑ **Test Interface Plate**
 - Complete
- ❑ **Test Stand/Spreader Bars**
 - Contract placed with Allied Engineering—ECD: 12/26
 - Drawings updated based on agreements made at MRR in mid October
- ❑ **T-Vac Sink Plates and Cal-Rod Cage**
 - Radiator Heater Cage Assembly: drawings completed and released in October; in fabrication at NRL
 - ACD Sink Plate Assembly: drawings and assembly completed; being checked at SLAC and NRL
 - SC Simulator Plate: drawings and assembly completed; being checked at SLAC and NRL
- ❑ **Acoustic Simulator**
 - Drawings completed; in check at SLAC
- ❑ **Mass Properties Plate**
 - Not started



Pathfinding Activities

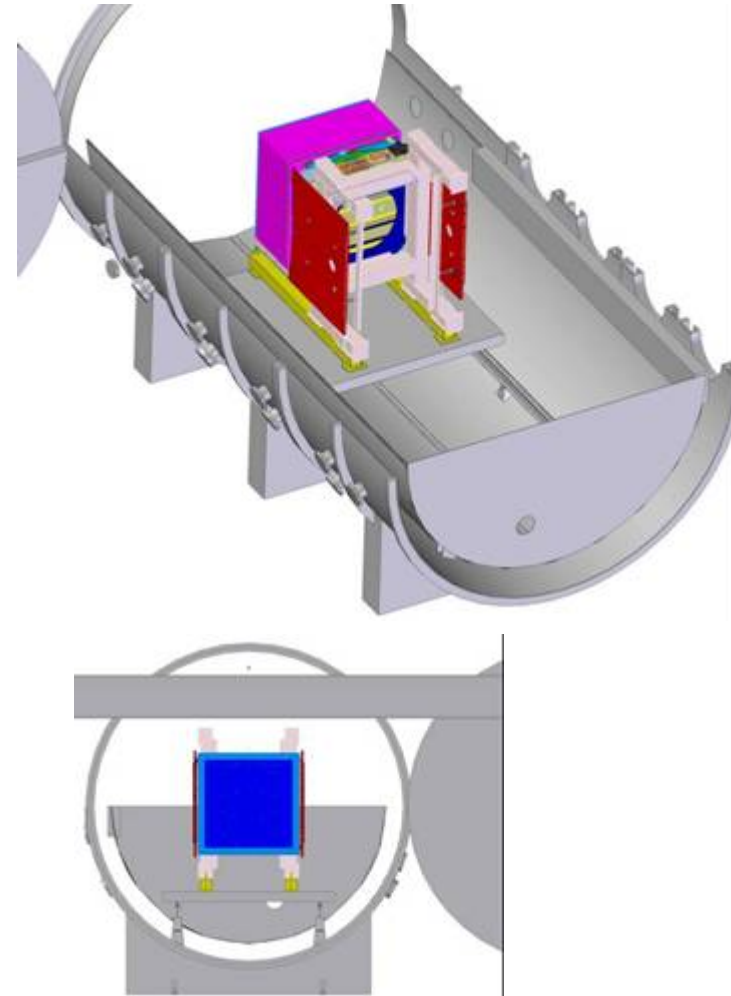
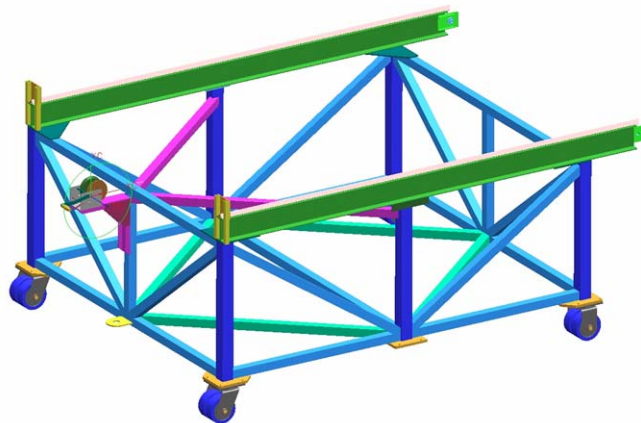
Objectives:

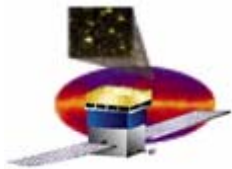
- Dry run all critical moves and lifts of LAT prior to flight hardware delivery to NRL.
- Verify paths and clearances in moves.
- Check required MGSE and other equipment to complete operations
- ❑ **Sine Vibe**
 - Verify there is space in the Sine Vibe room to stage the 4x4 lift fixture, GPR, and test stand.
 - Check handling clearances (horizontal and height) in the room
- ❑ **EMI**
 - Verify the move of the LAT to, into and out of, and positioning in the EMI chamber.
- ❑ **Acoustic**
 - Verify the move of the LAT into and out of, and positioning in the acoustic chamber.
- ❑ **TVAC**
 - Demonstrate the lift of the Test Stand and Mass Simulator Assy with two cranes, doing the pirouette, setting the test Stand on the TVAC cart/table, and removing lifting and excess hardware not used in the TVAC chamber.
 - Check the move of the test hardware to the TVAC chamber and installation in the chamber. Verify fit-up of chill plates, heaters, cable harness, etc.



Facilities

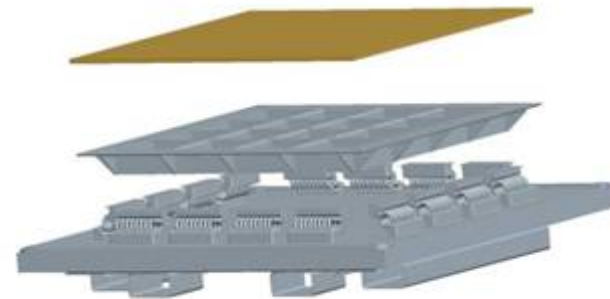
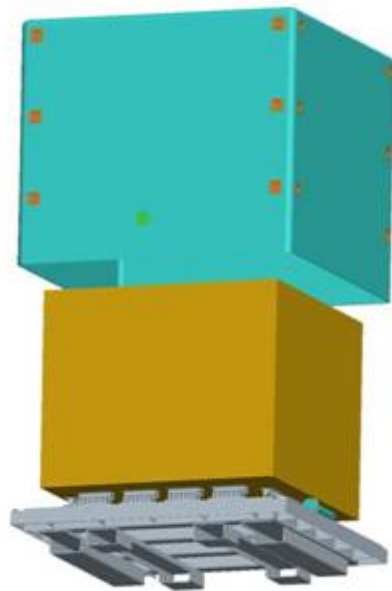
- **NRL T-VAC Chamber and Transport Trolley Upgrades**
 - **Current TVAC rail system can not handle 13,000 lb design load**
 - Replace rail system in Big Blue chamber
 - **Transport Trolley can not handle 13,000 lb design load**
 - Build new trolley.



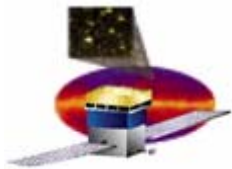


Transport Container

- Refurb of existing NRL Shipping container, has morph'ed into complete redesign and manufacture of the base structure to handle the loads



- Sealed volume w/ ground ops N2/air purge
- LAT is double bagged
- Desiccant humidity abatement via Cclass 100 cleanroom filter bags
- Over/under pressure value vents thru HEPA filters (and charcoal filter?)



Transport Container Issues

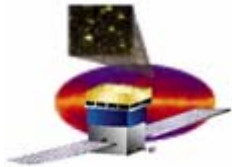
- ❑ **Compatible with air transport (Fed Ex) shipping capability**
 - Constrains container size (DC10 cargo door)
 - Air transport without cost of dedicated aircraft - safety
 - Escort permitted
 - Requires stop in Nashville
 - Cost - \$50K
- ❑ **Contamination Issues – Chris Lorentson, GSFC**
 - No active purge (can't be done on commercial air)
 - No helium monitoring (required sensitivity can't be flown)
 - In air transport, container could repressurize with unknown air quality

11/02/05 Teleconf (Henegar, Lorentson, et al.) resolved all issues:

He monitoring desired, not required

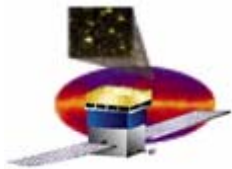
Repressurization via HEPA and charcoal filters

Desiccant OK for humidity control



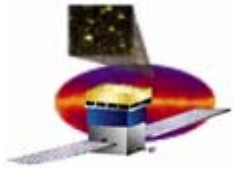
NRL Facility Status

- **Facility Prep Tasks**
 - Vibe expander head modifications
 - Acoustic and EMI door ramps
 - TVAC trolley and table mods
 - TVAC rail system upgrade
 - TVAC Port Plates and Thermal STE
 - Transport Container – load frame and sub-floor
- **Drawings - 47 total**
 - **25 Released**
 - 12 in manufacture
 - 11 out for bid
 - 2 manuf complete
 - **8 in review cycle**
 - **11 in process / update – in house manuf, assembly**
 - **3 not started – assembly drawings**



Preparation Schedule

ID	Task Name	Duration	Start	Finish	Qtr 4, 2005			Qtr 1, 2006			Qtr 2, 2006	
					Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
2	Environmental Test Plans	0 days	Mon 5/2/05	Mon 5/2/05								
4	LAT Implementation Plan	65 days?	Mon 8/1/05	Fri 10/28/05	█							
5	LAT Environmental Test Pathfinding Plan	4.2 wks	Fri 10/7/05	Fri 11/4/05	█							
6	Environmental Test Procedures	30 days	Tue 11/1/05	Mon 12/12/05		█	█					
17	Environmental Test MGSE	304 days?	Fri 4/1/05	Wed 5/31/06				█	█	█	█	█
18	MGSE	275 days?	Tue 4/26/05	Tue 5/16/06				█	█	█	█	█
19	Test Configuration Dwgs	123 days	Fri 5/27/05	Tue 11/15/05	█	█						
26	SHIPPING CONTAINER	128 days	Mon 7/18/05	Wed 1/11/06	█	█	█					
27	Container Modifications	128 days	Mon 7/18/05	Wed 1/11/06	█	█	█					
34	Test Interface Plate (TIP)	102 days?	Tue 4/26/05	Wed 9/14/05	█	█						
40	LAT Test Stand & Extn beams	161 days	Fri 5/13/05	Mon 12/26/05	█	█	█					
46	LAT Mass Simulator	130 days	Mon 6/27/05	Mon 12/26/05	█	█	█					
51	LAT Dust Tent	50 days	Tue 7/26/05	Mon 10/3/05	█	█						
54	LAT Test Stand Tow Bar	55 days	Fri 9/16/05	Thu 12/1/05	█	█						
57	Radiator Test Struts	132 days	Tue 8/23/05	Thu 2/23/06	█	█	█					
61	S/C Top Deck Simulator	89 days?	Tue 8/23/05	Mon 12/26/05	█	█	█					
66	TVAC TEST	173 days?	Fri 5/13/05	Tue 1/10/06	█	█	█					
67	Facility Preparations & Modifications	173 days?	Fri 5/13/05	Tue 1/10/06	█	█	█					
68	Cables & Port Plates	109 days?	Fri 5/13/05	Wed 10/12/05	█							
71	Trolley (Cart)	110 days?	Mon 7/18/05	Fri 12/16/05	█	█	█					
72	Deck	110 days?	Mon 7/18/05	Fri 12/16/05	█	█	█					
73	Deck Rail Supports	111 days?	Mon 7/18/05	Mon 12/19/05	█	█	█					
74	Deck Winching System	78 days?	Mon 8/15/05	Wed 11/30/05	█	█	█					
75	Chamber Modifications	10 days	Tue 12/27/05	Mon 1/9/06				█				
76	Proof Load	1 day	Tue 1/10/06	Tue 1/10/06					█			
77	Sink Plate	100 days?	Tue 8/23/05	Mon 1/9/06	█	█	█					
78	Cal-Rod Assembly	92 days?	Fri 9/2/05	Mon 1/9/06	█	█	█					
79	S/C Top Deck Sim-Sink Plate	60 days	Mon 10/17/05	Mon 1/9/06	█	█	█					
84	Mass Properties Mount Plate	157 days	Fri 10/7/05	Tue 5/16/06	█	█	█	█	█	█	█	█
89	Environmental Test EGSE	202 days?	Fri 4/1/05	Mon 1/9/06	█	█	█					
94	Pathfinder OPS	16 days?	Mon 12/26/05	Mon 1/16/06				█	█			
102	NRL Activities	89.5 days?	Mon 8/15/05	Fri 12/16/05	█	█	█					
109	LAT TCS Checkout	15 days	Tue 1/10/06	Mon 1/30/06					█	█		
112	Env Test Readiness Review	0 days	Tue 1/17/06	Tue 1/17/06							█	█
113	LAT PSR at SLAC/OK to ship	0 days	Tue 1/17/06	Tue 1/17/06							█	█



Issues and Concerns

- ❑ **Schedule compression – path finding, TCS checkout, LAT delivery**
- ❑ **Potential use of GSFC-provided Vertical Lift Fixture**
 - **Baseline plan uses GPR and 4x4 lift ring.**