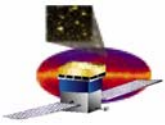


## GLAST Large Area Telescope:

### Electronics, Data Acquisition & Flight Software W.B.S 4.1.7

### April Monthly Review

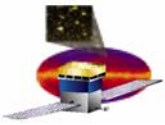
Gunther Haller  
haller@slac.stanford.edu  
(650) 926-4257



# TEM/TPS Status & Schedule

---

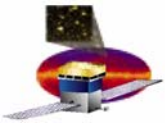
- **Status**
  - Qual unit at NRL used for FM CAL testing in TV
  - A & B at I&T on tower A and B
  - 1 & 2 to SLAC 5/9, to I&T 5/19
    - MOSFET's were not tinned before assembly on TPS, devices were replaced
    - Conformal Coating materail had expired, after tests extended expiration date
  - Rest of module: 2/week thereafter
    - 6/27 last delivery to SLAC per schedule
  - Probably will exchange TPS on Tower A/B once sufficient TEM/TPS are at SLAC
  - Changed from original design
    - Low voltage: some resistors were changed and one cap added per supply circuit to eliminate oscillation: fixed problem
    - Bias voltage: caps were exchanged to improve phase-margin and stabilize supply. Resulted in large phase-margin
    - Unrelated to that, have seen low-level ripple of supply at specific loads and specific voltages. Cause is time-constant of charge redistribution on series pumping capacitors. No plan to change, is a feature.



# PDU Status and Schedule

---

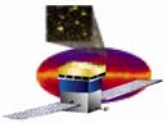
- **Schedule for proto-flight**
  - Delay at vendor
  - Now 5/4/05: unit assembled, pre-coat, to be sent to SLAC for testing
  - Back to Aeroflex on 5/11 for coating/staking
  - Back to SLAC 6/6 for environmental testing (Vib/TV/EMI)
  - Ready 6/20
- **Schedule for Flight Unit**
  - 6/10/05 Precoat PDU assembly ready for electrical test
  - 7/10/05 Complete assembly ready for environmental test
  - 7/20/05 Flight PDU to I&T
  - If that is too late, use proto-flight
- **Tester**
  - Analog mux card for TV test, fabricated, assembled
  - Vacuum feed-thru plate received, installed, in leak-testing
  - Vibration fixture fabricated



# GASU Status and Schedule

---

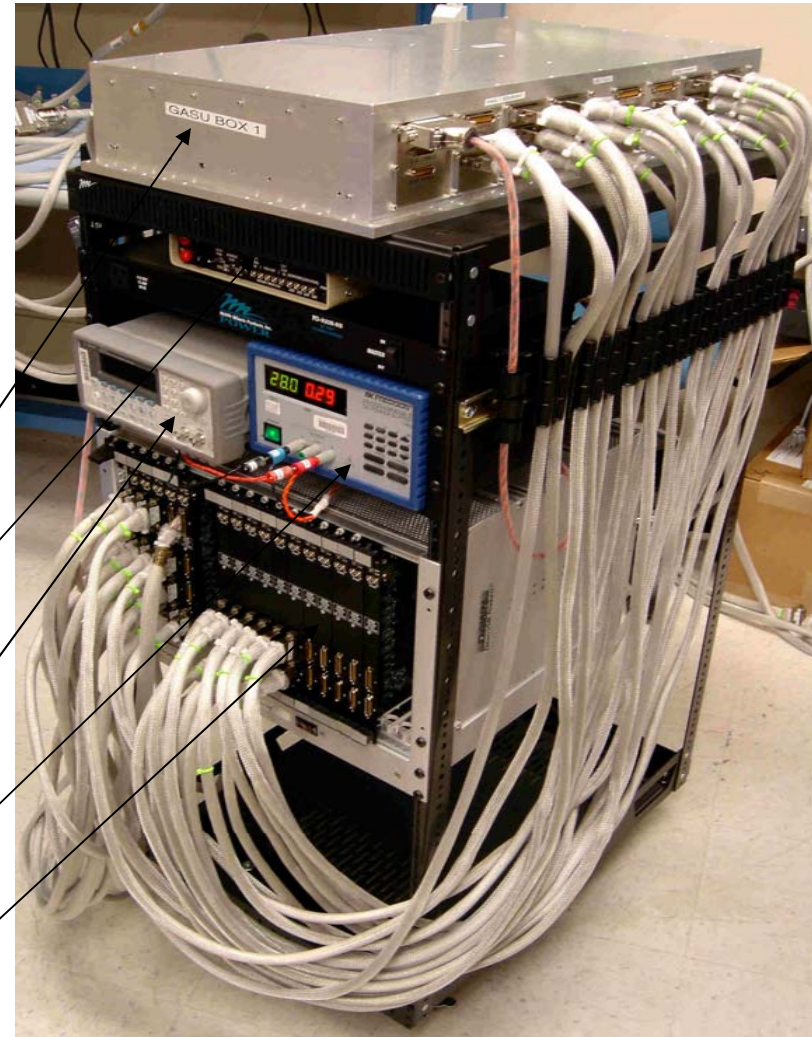
- **Status**
  - First delay from parts kitting
  - Then delay at vendor (bottle-neck with PDU/GASU/PCI connector assembly tests)
- **Schedule for proto-flight**
  - 5/31: unit assembled, pre-coat, ready for test at SLAC
  - 6/7: back to Aeroflex for coat/stake
  - 6/29: unit fully assembled, ready for environmental test
- **Schedule for Flight Unit**
  - 7/10/05 Precoat GASU assembly ready for electrical test
  - 8/1/05 Complete assembly ready for environmental test
  - 8/10/05 Flight GASU to I&T
- **Tester**
  - Tester in design/debug
  - Harness for TV in assembly
  - Received TV IO vacuum feed-thru



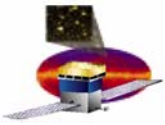
# GASU testing support

- Automated stray voltage and S/T/M (not shown)
- GASU firmware signed off
- Functional tests
- Trigger Pattern Generator
  - Simulates *all* trigger signals (primary and redundant)
  - Arbitrary time simulation
  - Interfaces to LATTE

- GASU tester...



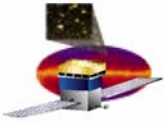
GASU  
External test-box  
Function generator  
P/S  
TPG



# SIU/EPU Status and Schedule

---

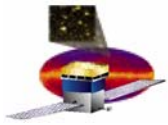
- **Status**
  - Parts kitted
  - Board had to be refabricated due to coupon failures (fab now at DDI and Tyco for risk/schedule mitigation)
  - Send 5 SIB boards and connectors to Aeroflex 10 days ago
  - Will send 5 back-plane boards this week
  - Then next round of connector assembly will be done.
- **Schedule**
  - Delay from original schedule because of above
  - **Estimate 2 weeks delay from dates below**
  - 6/1/05 Precoat cCPI boards ready for electrical test
  - 7/28/05 Complete assembly ready for environmental test
  - 8/19/05 First Flight SIU/EPU to I&T
  - 8/24/05 Second flight SIU/EPU to I&T
  - 8/27/05 Third flight SIU/EPU to I&T
  - 8/30/05 Fourth flight SIU/EPU to I&T
  - 9/2/05 Last flight SIU/EPU to I&T
- **Tester**
  - In design



# Harness

---

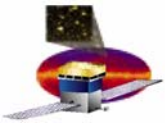
- **Harness in assembly**
- **Received several types of cable assemblies**
  - **Bottle-neck is TEM-GASU cable since potting needed to be added. Vendor is waiting for material and supplemental PO. (Latter was just placed)**
- [http://www-glast.slac.stanford.edu/Elec\\_DAQ/DAQ-Hardware/LAT-Harness/lat-harness.htm](http://www-glast.slac.stanford.edu/Elec_DAQ/DAQ-Hardware/LAT-Harness/lat-harness.htm)



# EGSE

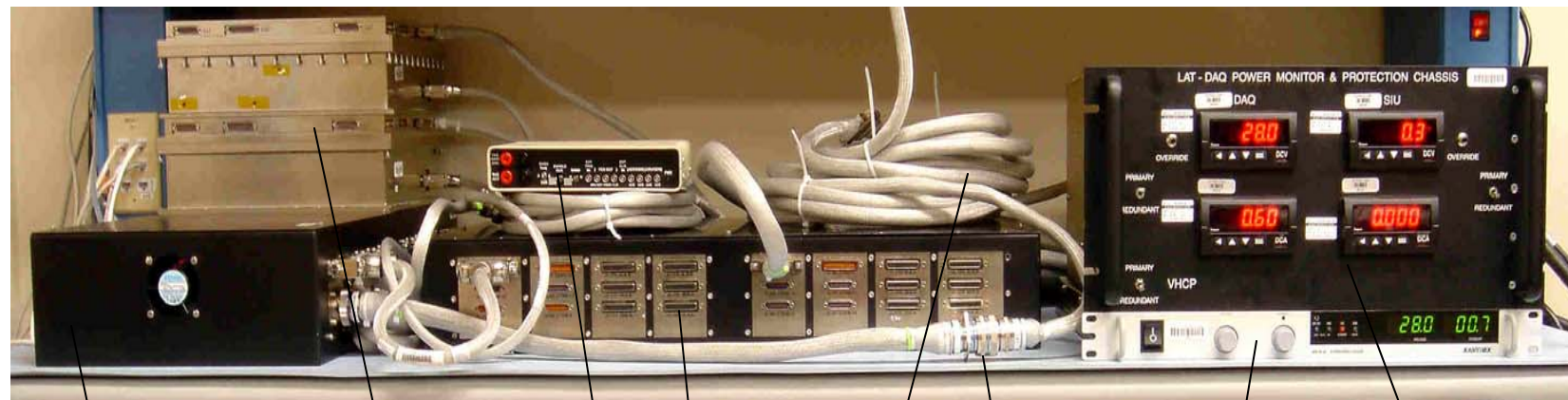
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# 2-Tower Support

- Flight-like architecture with EM parts
- Complete (accepted by I & T)



PDU

TEMs

External  
Test Box

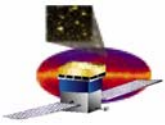
GASU

To External  
Crate

Shield penetration

P/S  
(Supplied  
by I & T)

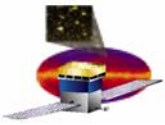
BPU



# Thermo-testing support

---

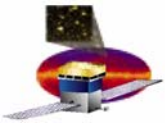
- **Electronics provides:**
  - **Feedback code**
  - **Platform to execute feedback code**
  - **LAT thermo-related monitoring**
  - **Power management (conditioning, monitoring and cabling)**
- **Architecture is basically same as 2-tower test...**
  - **Except... Power management**
  - **PDU, GASU and SIU in hand**
    - **Test-stand being assembled (cables, Rack etc...)**
  - **Feed-back code written (and somewhat debugged)**
- **Ad hoc committee formed to coordinate this test...**
  - **Rich Baun (chairman)**
  - **Marc Campell**
  - **Jana Thayer (for electronics)**



## VSC (status)

---

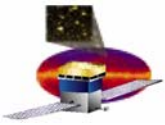
- **Client Interfacing**
- **Hardware**
- **LAT functional hardware interfaces**
- **Software**
- **LAT/VSC Cable Interface**
- **Summary**



## Client Interfaces (status)

---

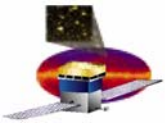
- Design has been “reviewed” by all relevant clients:
  - FSW and FSW/test
  - I & T
  - ISOC
- New revision of documentation...
  - Additional, *concrete* detail
    - Moving from a design document to reference document
  - FSW/test is now actually coding against *committed* code
  - FSW/test schedule is not *currently* impacted by complete (prototype) VSC delivery



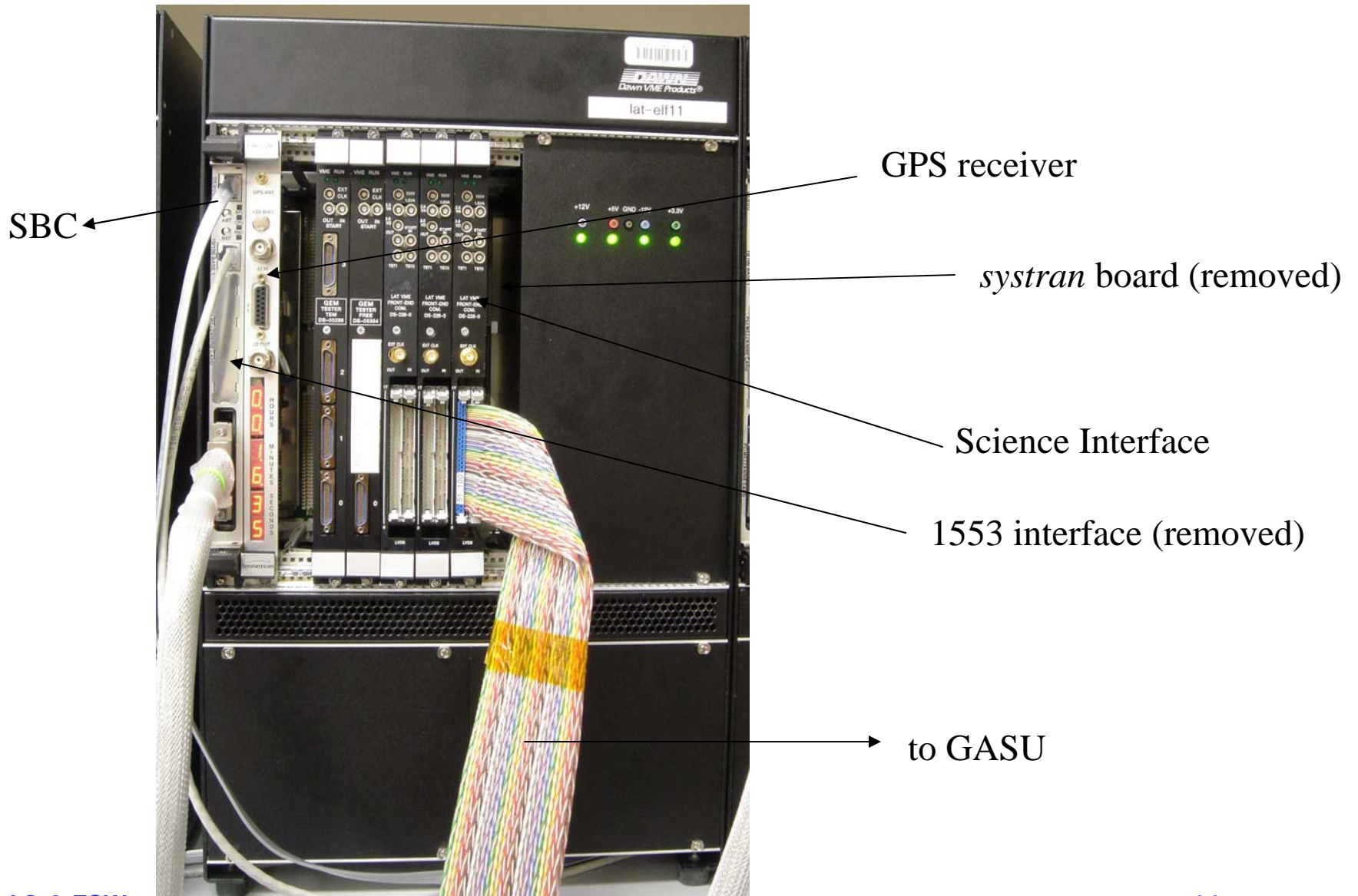
## Hardware status

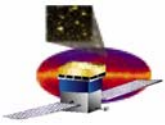
---

- All hardware delivered and on hand for four (4 ) VSCs
  - Subject to these caveats...
- S/C telemetry monitoring required more *systran* boards than initially envisioned (ordered, off-the-shelf delivery)
  - Have enough on hand to put together prototype
  - Will talk about more below...
- VSC/LAT Cable Interface
  - Will talk about more below...
- Neither of these shortages affect prototype use by FSW/Test
- Cabling for test-bed
  - defined
  - connectors delivered
  - queued for construction



# Prototype VSC under construction...

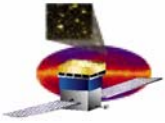




# LAT functional hardware interface (status)

---

- Status includes hardware/firmware and driver software
  - 1553 (done)
  - Discretes (done)
  - Science Interface (done)
- Remains to wrap for C++ interface (see package status)

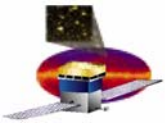


## Package (software status)

---

- CCSDS (**complete, committed**)
- Handlers (**complete committed**)
- Network (**complete, committed**)
- Thread (**complete, committed**)
- Queues (**complete**)
- Scheduler (**complete**)
- List (**complete**)
- Proxy (**50% complete, +1 week to completion**)
- Drivers (**00% complete, +2 weeks to completion**)

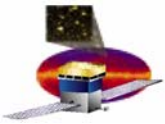




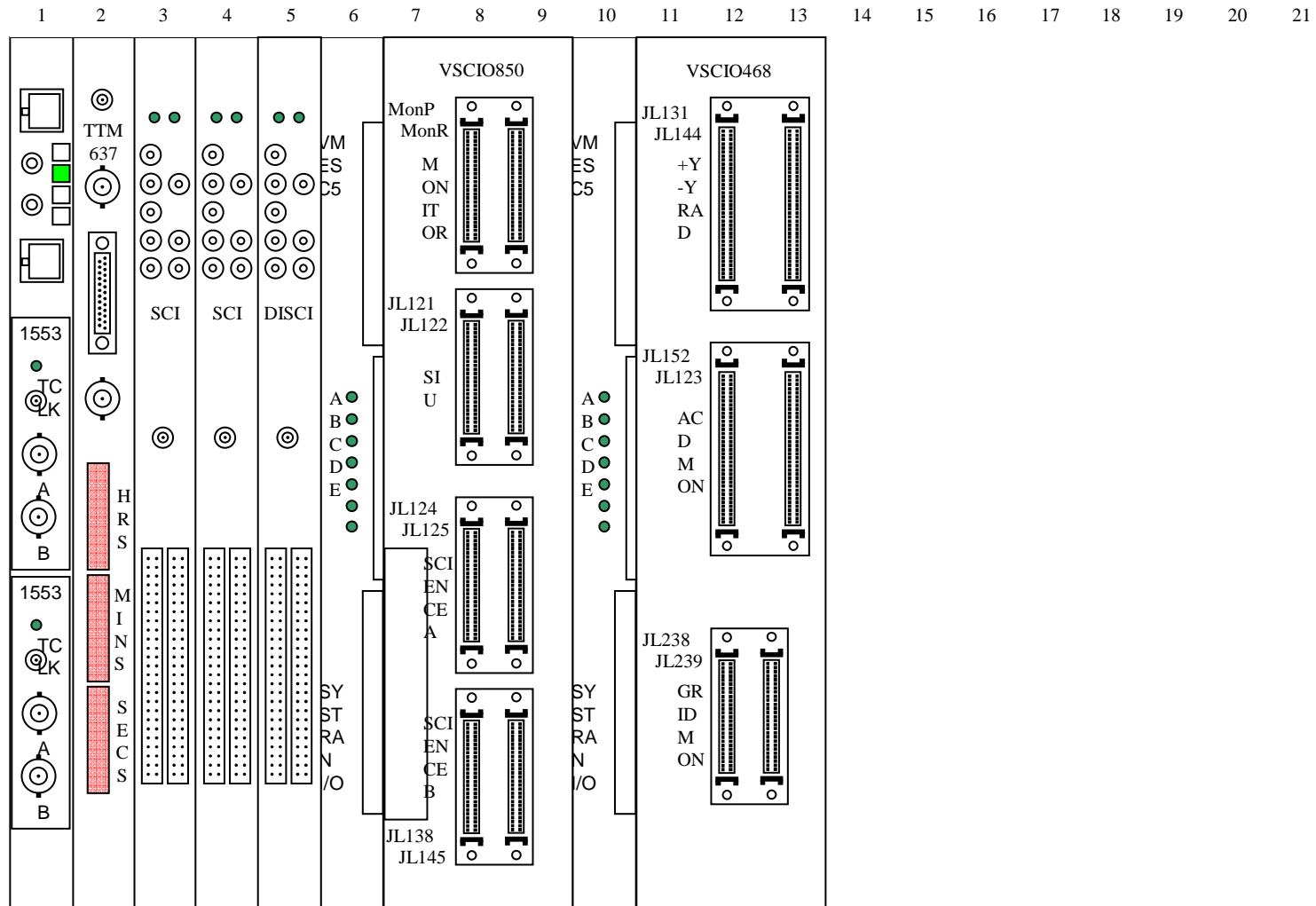
## VSC/LAT cable Interface

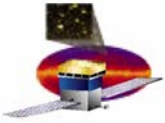
---

- Adapts LAT cables to VSC (VME) from factor
- Provides signal conditioning for temperature sensors
  - LAT originated, S/C telemetry
  - Implementation is VSC PART II
- Consists of two boards:
  - Inside board (LAT signals within the shield)
  - Outside board (LAT signals outside the shield)
- *Grossly* underestimated degree that adding S/C telemetry would affect design of this interface
  - +4 weeks design effort (done), allocated zero
- Status:
  - Inside board
    - Designed, out of layout at the end of week
    - 1 week fabrication and load
    - 1 week commission
  - Outside board one week behind inside board
- Prototype requires *only* inside board



# Mechanical Interface

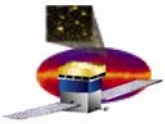




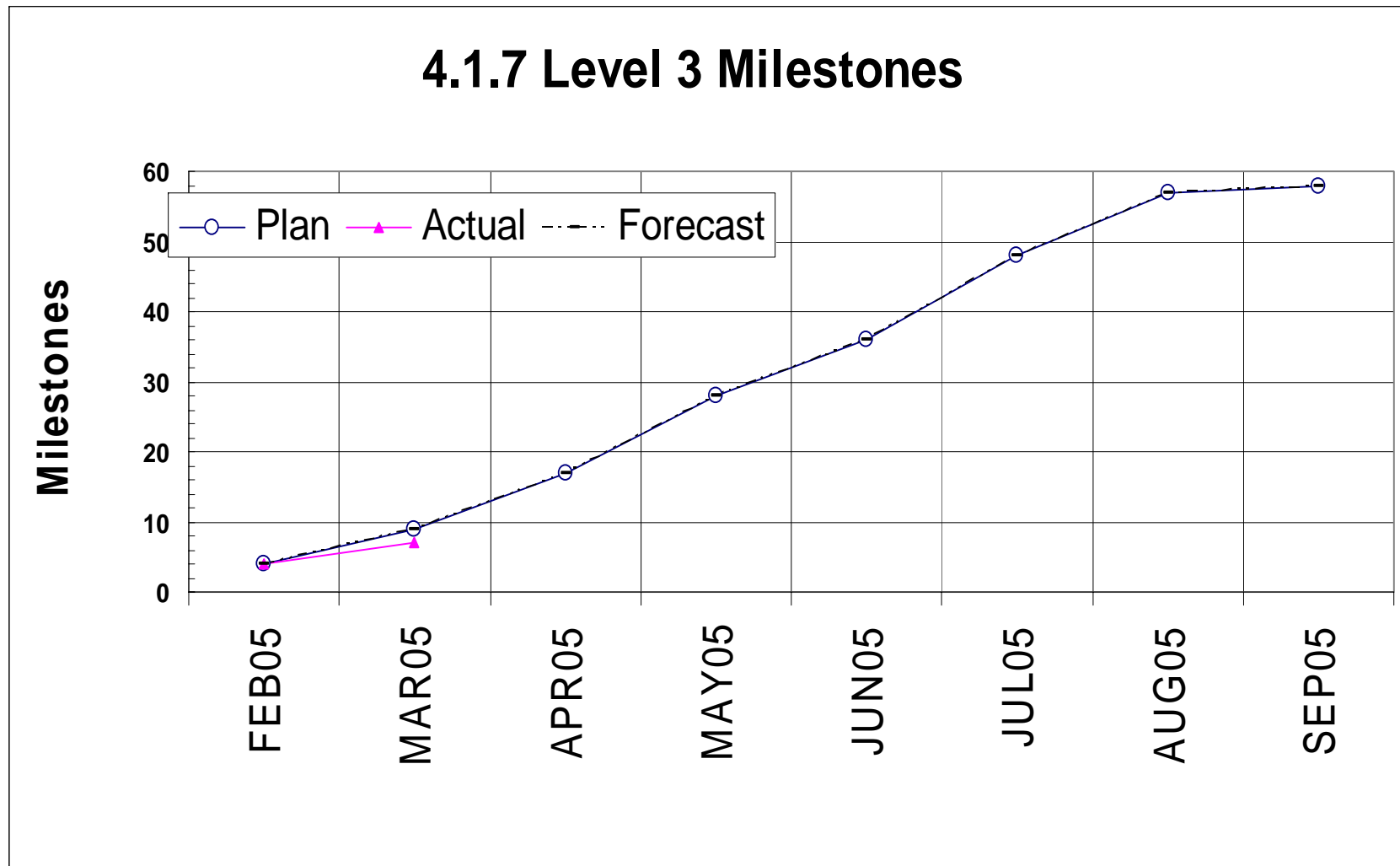
# Issues

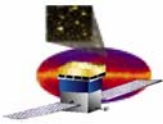
---

- Larger TPS ripple issue resolved, potentially have small ripple at certain loads/voltage settings
- AUSTIN EEPROM DPA problems
  - New lot delivery date 6/10, but no CSI yet, so not clear
- Qualification of cCPI press-fit connector assembly using solder process
- Need to work on closing open FPGA review items



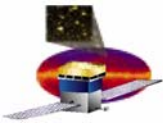
# Level 3 Milestone Count





# Level 3 Milestone List

Activity Description	Baseline Finish	-1m Var	Bsln Var	Early Finish	FY05					
					FEB	MAR	APR	MAY	JUN	
<b>4.1.7 Electronics</b>										
Elex Ground Support Equipment										
Final EGSE incl S/C Sim, FSW-Elec to I&T	04/01/05	-15	-20	04/29/05				▽		
TEM/PS A										
Flight TEM Assy A: Elec to I&T	02/17/05	0	0	02/17/05A	▼					
Flight TEM PS Assy A: Elec to I&T	02/17/05	0	0	02/17/05A	▼					
TEM/PS B										
Flight TEM Assy B: Elec to I&T	03/07/05*	0	-2	03/09/05A		▼				
Flight TEM PS Assy B: Elec to I&T	03/07/05*	0	-2	03/09/05A		▼				
TEM/PS 1										
Flight TEM Assy 1: Elec to I&T	04/22/05	0	0	04/22/05				▽		
Flight TEM PS Assy 1: Elec to I&T	04/22/05	0	0	04/22/05				▽		
TEM/PS 2										
Flight TEM Assy 2: Elec to I&T	04/29/05	0	0	04/29/05				▽		
Flight TEM PS Assy 2: Elec to I&T	04/29/05	0	0	04/29/05				▽		
TEM/PS 3										
Flight TEM Assy 3: Elec to I&T	05/06/05	0	0	05/06/05				▽		
Flight TEM PS Assy 3: Elec to I&T	05/06/05	0	0	05/06/05				▽		
TEM/PS 4										
Flight TEM Assy 4: Elec to I&T	05/13/05	0	0	05/13/05				▽		
Flight TEM PS Assy 4: Elec to I&T	05/13/05	0	0	05/13/05				▽		
Run Date	04/21/05 14:54	<b>GLAST LAT PROJECT</b>			LT-DZ: Baseline Variance		Report #10			
Data Date	04/01/05	<b>Level 3 Milestones</b>			FL-D4: AV: Level 3 Milestones		Sheet 6			
© Primavera Systems, Inc.		<b>Baseline Variance (Organized by Subsystem)</b>								



# Level 3 Milestone List

Activity Description	Baseline Finish	-1m Var	Bsln Var	Early Finish	FY05				
					FEB	MAR	APR	MAY	JUN
TEM/PS 5									
Flight TEM Assy 5: Elec to I&T	05/20/05	0	0	05/20/05				▽	
Flight TEM PS Assy 5: Elec to I&T	05/20/05	0	0	05/20/05				▽	
TEM/PS 6									
Flight TEM Assy 6: Elec to I&T	05/27/05	0	0	05/27/05				▽	
Flight TEM PS Assy 6: Elec to I&T	05/27/05	0	0	05/27/05				▽	
TEM/PS 7									
Flight TEM Assy 7: Elec to I&T	06/06/05	0	0	06/06/05				▽	
Flight TEM PS Assy 7: Elec to I&T	06/06/05	0	0	06/06/05				▽	
TEM/PS 8									
Flight TEM Assy 8: Elec to I&T	06/13/05	0	0	06/13/05				▽	
Flight TEM PS Assy 8: Elec to I&T	06/13/05	0	0	06/13/05				▽	
TEM/PS 9									
Flight TEM Assy 9: Elec to I&T	06/20/05	0	0	06/20/05				▽	
Flight TEM PS Assy 9: Elec to I&T	06/20/05	0	0	06/20/05				▽	
TEM/PS 10									
Flight TEM Assy 10: Elec to I&T	06/27/05	0	0	06/27/05				▽	
Flight TEM PS Assy 10: Elec to I&T	06/27/05	0	0	06/27/05				▽	
TEM/PS 11									
Flight TEM Assy 11: Elec to I&T	07/05/05	0	0	07/05/05					
Flight TEM PS Assy 11: Elec to I&T	07/05/05	0	0	07/05/05					

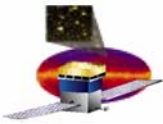
Run Date 04/21/05 14:54  
 Data Date 04/01/05

**GLAST LAT PROJECT**  
**Level 3 Milestones**  
**Baseline Variance (Organized by Subsystem)**

LT-DZ: Baseline Variance  
 FL-D4: AV: Level 3 Milestones

Report #10  
 Sheet 7

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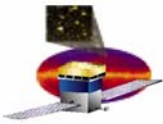
# Level 3 Milestone List

Activity Description	Baseline Finish	-1m Var	Bsln Var	Early Finish	FY05				
					FEB	MAR	APR	MAY	JUN
TEM/PS 12									
Flight TEM Assy 12: Elec to I&T	07/12/05	0	0	07/12/05					
Flight TEM PS Assy 12: Elec to I&T	07/12/05	0	0	07/12/05					
TEM/PS 13									
Flight TEM Assy 13: Elec to I&T	07/19/05	0	0	07/19/05					
Flight TEM PS Assy 13: Elec to I&T	07/19/05	0	0	07/19/05					
TEM/PS 14									
Flight TEM Assy 14: Elec to I&T	07/26/05	0	0	07/26/05					
Flight TEM PS Assy 14: Elec to I&T	07/26/05	0	0	07/26/05					
TEM/PS 15									
Flight TEM Assy 15: Elec to I&T	08/02/05	0	0	08/02/05					
Flight TEM PS Assy 15: Elec to I&T	08/02/05	0	0	08/02/05					
TEM/PS 16									
Flight TEM Assy 16: Elec to I&T	08/09/05	0	0	08/09/05					
Flight TEM PS Assy 16: Elec to I&T	08/09/05	0	0	08/09/05					
Elex Global Items									
Flight PDU Box-Elec to I&T	07/01/05	0	-13	07/21/05					
Flight Harness-Elec to I&T	07/05/05	0	0	07/05/05					
Flight GASU Box-Elec to I&T	07/19/05	3	-19	08/15/05					
LCB Flight Units - Elec to Elec	07/20/05	0	-16	08/11/05					
Flight Event Processor Units-Elec to I&T	08/19/05	0	-16	09/13/05					

Run Date 04/21/05 14:54  
 Data Date 04/01/05  
 © Primavera Systems, Inc.

**GLAST LAT PROJECT**  
**Level 3 Milestones**  
**Baseline Variance (Organized by Subsystem)**

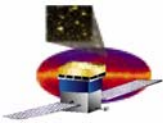
LT-DZ: Baseline Variance  
 FL-D4: AV: Level 3 Milestones  
 Report #10  
 Sheet 8



# Level 3 Milestone List

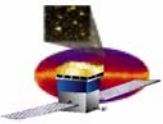
Activity Description	Baseline Finish	-1m Var	Bsln Var	Early Finish	FY05														
					FEB	MAR	APR	MAY	JUN										
Elex Global Items																			
1st Flight EPU/SIU-Elec to I&T	08/19/05	0	-16	09/13/05															
2nd Flight EPU/SIU-Elec to I&T	08/24/05	0	-16	09/16/05															
3rd Flight EPU/SIU-Elec to I&T	08/26/05	0	-15	09/19/05															
4th Flight EPU/SIU-Elec to I&T	08/30/05	0	-16	09/22/05															
5th Flight EPU/SIU-Elec to I&T	09/02/05	0	-14	09/23/05															
Flight Software																			
Demo: Spacecraft Interfaces	02/14/05	0	0	02/14/05A	▼														
Demo: Thermal Control	02/16/05	0	0	02/16/05A	▼														
Demo: Inter-task Communications	03/11/05	0	-25	04/15/05		▼	▽												
Demo: Housekeeping	03/18/05	0	-30	04/29/05		▼		▽											
Demo: Event Filtering	03/23/05	0	9	03/10/05A		▼	▼												
Demo: Watchdog	04/15/05	0	-5	04/22/05			▼	▽											
Demo: Mode Control	04/22/05	0	-20	05/20/05			▼		▽										
Demo: Charge Injection Calibration	04/29/05	0	-20	05/27/05			▼		▽										
Demo: Event Integrity and Delivery	05/06/05	0	-19	06/03/05				▼	▽										
Demo: Diagnostics	05/06/05	0	-19	06/03/05				▼	▽										
Demo: GRB Detection and Response	05/20/05	0	-14	06/10/05					▼										
Run Date: 04/21/05 14:54					GLAST LAT PROJECT					LT-DZ: Baseline Variance					Report #10				
Data Date: 04/01/05					Level 3 Milestones					FL-D4: AV: Level 3 Milestones					Sheet 9				
© Primavera Systems, Inc.					Baseline Variance (Organized by Subsystem)														



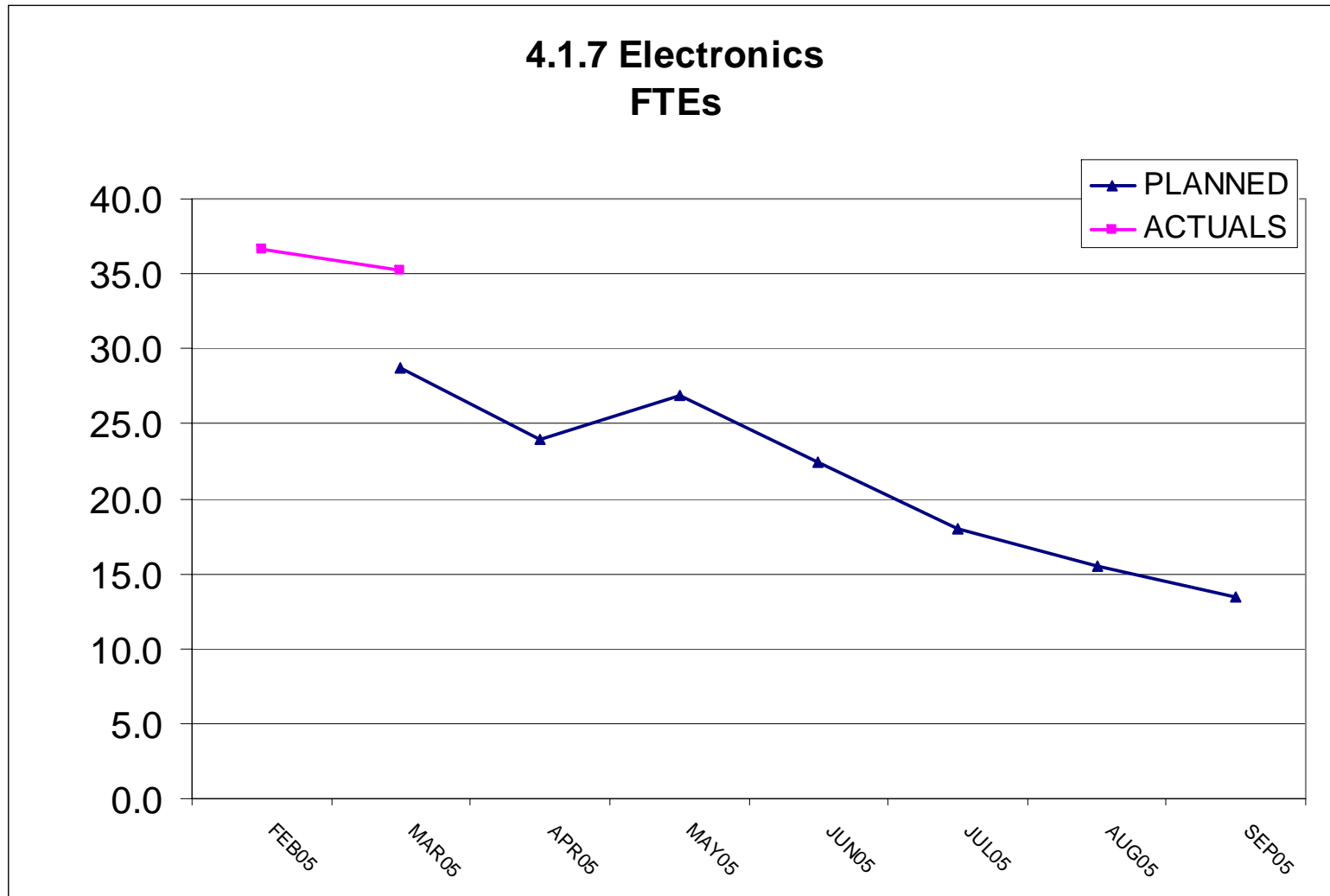


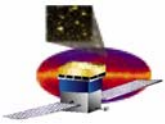
# Cost Report

Reporting Category	Cost Incurred				Estimated Cost			Estimated Final Cost		Unfilled Orders Outstanding
	During Month		Cum. to Date		Detail		Balance of Contract	Contractor Estimate	Contract Value	
	Actual	Planned	Actual	Planned	APR05	MAY05				
<b>4.1.7 ELECTRONICS</b>										
4.1.7 ELECTRONICS			353	354			1	354	354	
4.1.7.1 ELECTRONICS MANAGEMENT	70	51	1,842	1,786	46	46	134	2,069	2,069	4
4.1.7.2 RELIABILITY & QUALITY ASSURANCE			223	220			-3	220	220	
4.1.7.3 ELECTRONICS SYSTEM DESIGN			733	733				733	733	
4.1.7.4 DATAFLOW ELECTRONICS (TEMs + PROCESSOR	407	469	9,544	9,636	290	338	625	10,797	10,797	317
4.1.7.5 SPACECRAFT INTERFACE UNIT	60	20	1,603	1,537	110	286	257	2,256	2,256	188
4.1.7.6 POWER CONDITIONING	31	81	1,923	1,983	179	126	146	2,375	2,375	187
4.1.7.7 ENCLOSURES	19		654	643			-11	643	643	7
4.1.7.8 CABLE HARNESS	2	91	272	345	143	106	128	649	649	281
4.1.7.9 FLIGHT SOFTWARE	280	183	5,038	5,080	144	188	464	5,835	5,835	
4.1.7.A EGSE & OPERATIONS	2	37	2,491	2,572	1		80	2,573	2,573	17
4.1.7.C INSTRUMENT INTEGRATION & TEST	46	51	72	109	46	46	227	392	392	15
<b>CAPW[3]Totals:</b>	<b>918</b>	<b>981</b>	<b>24,747</b>	<b>24,997</b>	<b>961</b>	<b>1,137</b>	<b>2,050</b>	<b>28,894</b>	<b>28,894</b>	<b>1,016</b>



# FTE Report (DOE/NASA-funded only)





## Comment to FTE

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- **Not budgeted**
  - **Amalia Russell 18 hrs**
    - **Needed since Lupe (tech) went to more NASA certification classes**
  - **John Wray 35 hrs**
    - **Added to help TEM/TPS safe-to-mate and CPT testing**
  - **Van Allen Clark 166 hrs**
    - **Tech writer, still docs to modify (e.g. 2-TEM/TPS TV testing, etc**
  - **Shop Labor-Var. 352 hrs**
    - **24/7 need to watch TV chamber, night-shift/weekend**