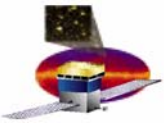**Gamma-ray Large Area Space Telescope**
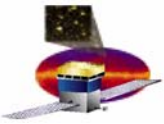
GLAST Large Area Telescope:

LAT System Engineering
LAT Quality Assurance
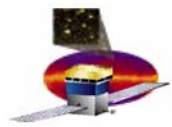
Pat Hascall
Joe Cullinan

Topics

- **NCR Metrics**
- **Significant NCRs**
- **NCR List**
- **LAT Level Verification Status**
- **LAT Power Update**

LAT NCR Metrics 6/26/06

Subsystem	Open NCRs	Closed NCRs last 30 days	NCRs Open 30 days or more	NCRs open 90 days or more	NCRs ready to close (disposition complete; need final QA/MRB review to close)
DAQ	3	0	2	1	0
Tracker	1	0	0	1	0
Mechanical	5	0	1	0	1
CAL	0	0	0	0	0
ACD*	0*	0	0	0	0
I&T	58	13	42	23	6

* All NCRs related to ACD are now categorized as I&T NCRs (including 5 open ACD PRs and PFRs from GSFC)

Open I&T NCR Metrics 3/28/06

| Open I&T NCRs	March	June
	63	67
New NCRs created	22	42
NCRs closed	20	38
NCRs Ready to Close (analysis complete, need final QA/MRB review to close)	11	7
NCRs with Analysis in Progress	46	34
NCRs to remain open to monitor trend or performance	6	6
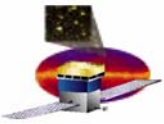
Significant Preship NCR Status

- **NCR 855 – LATC Verify Errors**

  – **None observed at NRL**

- **NCR 880,809,901,881 and 902 - CPU reboots**

  – **None observed at NRL**

- **NCR 897 – FPGA**

  – **Under analysis at Vendor**
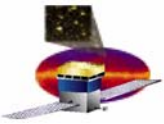
EMI/EMC NCRs

- **NCR 932 – Tracker noise**
  - **Eric Grove to discuss**
- **NCR 939 – RTD interference**
  - **Small disturbances on the RTD sensors was seen during RS testing, but was not sufficient to affect LAT Thermal Control (LTC) operations**
  - **The disturbances were bigger on the CS102 tests (8 degrees peak to peak)**
  - **Working issue with Fred – looking at S/C CE at these points to see how much margin we have**
  - **May do some additional CS testing after we look at all of the data sets**
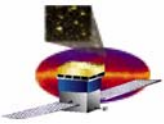
Data Flow During EMI/EMC

- **Several NCRs written on Data Flow during EMI/EMC.**
  - **Many due to the use of a bigger magnifying glass, and are not related to EMI/EMC**
- **NCR 933 1PPS dropout**
 - **2 of 4 happened when no EMI signals were being generated**
  - **1 was CS, the other RS at entirely different frequency ranges**
  - **Larry to research history to get better rate statistics**
- **NCR 936 SIU timeout on CTDB (1553 bus)**
  - **One instance during a startup. No EMI signals were being generated. Also saw 1PPS dropout**
- **NCR 937 Missing datagrams**
  - **6 of 6 instances due to ground processing, last part of a run comes through after LICOS has stopped the run and are allocated to the next run**
- **NCR 938 Missing telemetry packet**
  - **4 instances, none were seen when EMI signals were being generated**
 - **Have seen prior instances when the script checks for telemetry too soon**
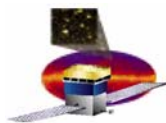
Open I&T NCR List

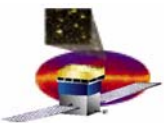| NCR	Date Opened	Affected Hardware	Problem Description	Status
535	06/20/05	TKR	Monitor trend data for TKR 4 thru LAT testing (spin-off NCR)	Monitor
624	08/27/05	ACD	Fluctuations in temperature reading (originally an ACD PR)	Monitor
625	08/27/05	ACD	AcdVetoHitmapPha failed (originally an ACD PR)	Monitor
626	08/27/05	ACD	ACDMonitor script high counts during T/V (originally ACD PR)	Monitor
684	10/03/05	TKR	Noise Occupancy failures due to intermittent hot strips.	Disposition Required
718	10/27/05	ACD	VETO threshold for channel 1123 can't be set below minimum value of 0.45pC (originally an ACD PR)	Monitor
741	11/11/05	Integration	HIB Cables to short or wrong orientation.	QA to Close
743	11/13/05	Integration	EMI shield mechanical tolerances not met.	QA to Close
765	12/05/05	Integration	X-LAT Heat pipe shims bonding fixture cannot be removed.	MRB Required
774	12/08/05	Integration	Cannot mate harness LAT-DS-02092-53.	MRB Required
777	12/13/05	Integration	DAQ-ACD Internal RF shield to GASU cable rework.	MRB Required
788	12/21/05	GASU	GASU AEM temperature alarm	MRB Required
793	12/28/05	ACD	GARC digital 3.3V current is slightly below allowed range	Disposition Required
806	01/17/06	Trigger	CAL is retriggering during SVAC run	Disposition required
809	01/17/06	ELX	EPU Reboot after file upload	Analysis Completed
811	01/23/06	Integration	1553 cables rejected for workmanship	MRB Required
823	02/06/06	ACD	FREE Board 0 failed to initialize during PowerOn using FSW	QA to Close
829	02/10/06	ACD	ACD coherent noise at 1000 system clock ticks after each event collected in flight config.	Disposition Required
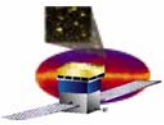
Open I&T NCR List

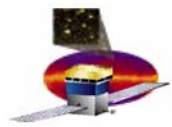| NCR	Date Opened	Affected Hardware	Problem Description	Status
840	03/08/06	DAQ	RunControl software problems observed on spare PDU during T/V test (NCR #794); opened NCR to track FSW updates	Disposition required
843	03/09/06	DAQ	Design change to DAQ-ACD Internal cable	Disposition required
851	03/16/06	DAQ	One or more EPU resets unexpectedly due to large number of events and interaction with end of run activities	Disposition required
852	03/16/06	DAQ	LCB errors observed during muon run	Disposition required
854	03/23/06	FSW	Digi report occasionally shows ACD header parity non-zero	Disposition required
855	03/23/06	FSW	LATC verify occcasionally reports errors in CRC, SPT, ARC	Disposition required
859	03/23/06	FSW	CAL LCI data compression less than expected, results in very large datagrams	Disposition required
879	04/11/06	EGSE	LAT Power On in configuration #2 failed	Disposition Assigned
880	04/12/06	ELX	SIU rebooted.	Analysis In Progress
881	04/12/06	ELX	EPU rebooted.	Analysis In Progress
882	04/12/06	ELX	GLAT2525 power up software crash due to Result FIFO is not empty.	Analysis In Progress
883	04/13/06	EGSE	SIU software crash during power up.	Analysis In Progress
884	04/15/06	EGSE	VSC crate GPS board induced errors.	Analysis In Progress
890	04/19/06	Mechanical	Damaged radiator heaters.	Analysis In Progress
892	04/23/06	Mechanical	XLAT Plate interior screwscalled out are too short.	Analysis In Progress
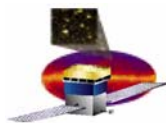
Open I&T NCR List

| NCR	Date Opened	Affected Hardware	Problem Description	Status
894	04/29/06	FSW	LATC dumps have unexpected GTFE masks on LATC Verify Error dumps only.	Analysis In Progress
897	05/03/06	ELX	During GASU performance test, AemEvent test for GARC4 failed.	Analysis In Progress
898	05/04/06	TKR	Tracker Cable 7, Temperature 1 measured 16 degrees lower than expected.	Analysis In Progress
901	05/09/06	ELX	EPU 2 rebooted unexpectedly.	Analysis In Progress
902	05/09/06	ELX	EPU 0 rebooted unexpectedly	Analysis In Progress
903	05/09/06	EGSE	Errors occurred during runs of LAT04x.	Analysis In Progress
904	05/10/06	ACD	ACD Hold delay RMS for GARC 3 exceeds limits.	Analysis In Progress
905	05/10/06	FSW	LAT FSW did not respond to an ARR.	Analysis In Progress
906	05/10/06	EGSE	LAT222 and LAT224 Science Ops Demo Test analysis failed.	Analysis In Progress
907	05/10/06	EGSE	LatScLoadShedInterface script checks Load Shed off state too early.	Analysis In Progress
909	05/10/06	EGSE	EEPROM Block Write Counts appear incorrect.	Analysis In Progress
912	05/23/06	FSW	Unexpected GBM interrupt seed at the beginning of many test scripts.	New
913	05/23/06	EGSE	LCI Error reported during ACD CPT	New
914	05/24/06	Mechanical	Incorrect crimp test performed.	New
915	05/26/06	Integration	Heater installation issues.	New
917	05/30/06	EGSE	ACD Bias Voltage not set properly.	Disposition Assigned
919	06/02/06	Integration	Delete LAT LPT scheduled to be completed between X-axis and Y-axis vibration tests.	Disposition Assigned

Open I&T NCR List

| NCR	Date Opened	Affected Hardware	Problem Description	Status
920	06/02/06	EGSE	During the 1/2 level Y axis Vibe test the system aborted.	Disposition Completed
921	06/05/06	ACD	Intermittent MSE limit failures for LCI: AcdTciRegRange_AcdLongFunctional_23.0C_3.3V.	Analysis In Progress
922	06/05/06	TKR	TkrReadingConfigurationTest_LPT errors.	Analysis In Progress
924	06/08/06	Integration	Radiator panel (+Y) shims dropped.	Analysis In Progress
925	06/08/06	Integration	Nusil Silicone Primer has reached expiration date.	New
926	06/11/06	Mechanical	Heaters were received with multiple waves in the main body and corners are slightly bent.	Analysis In Progress
927	06/12/06	Integration	3M Tape 966 Transfer adhesive material has expired.	Analysis In Progress
928	06/12/06	Integration	Required X-LAT MLI Blanket assy not installed per drawing.	New
929	06/12/06	Mechanical	RAD Mount Screw, Head surfaces and locking patch are fully coated with dicronate DL-5.	Analysis In Progress
930	06/16/06	EGSE	Controller for LAT chiller (GSE) found to be non-functioning.	New
931	06/19/06	ACD	ACD bias was not set correctly.	New
932	06/20/06	TKR	Tracker tower 7 exceeded the noise occupancy spec.	Analysis In Progress
933	06/22/06	EGSE	Reported 1PPS error in the msg log.	Analysis In Progress
935	06/23/06	Integration	Incorrect test configuration for CS06 on DAQ prim.	New
936	06/24/06	EGSE	ScriptEngineCommon.py:682 ERROR - SIU: ISR> SUMT_rtMsgTimeout CTDB EDRVTIMO Bus timeout errors.	New
937	06/26/06	FSW	The number of events in the digi file does not agree with the extended GEM sequence counter! errors reported..	New
938	06/26/06	ACD	AemEnv0 Pkt was not seen by the AcdHvbs script when trying to verify the LAT configuration.	New

LAT Level Verification Status

Category	Verification Method					Requirements		
	Test	**Demonstration**	**Analysis**	**Inspection**	**Children**			
	# Complete	# Complete	# Complete	# Complete	# Complete	# Comp	Total	% Comp
Total VPs	128	72	193	35	26	-	454	-
Requirement Identified	128	72	193	35	26	454	454	100.0%
Flow Down Complete	128	72	193	35	26	454	454	100.0%
Draft Verification Plan	128	72	193	35	26	454	454	100.0%
Final Verification Plan	113	67	192	29	26	427	454	94.1%
Verification Plan Executed	0	0	6	0	26	32	454	7.0%
Requirement Sold	0	0	2	0	26	28	454	6.2%

- **Progress this month**
  - **94% of 454 VPs are Final**
    - **All reqt owner comments have been incorporated**
    - **GRB requirement VPs will remain draft until design finalized**
  - **Audit of 2730 and VCRM complete**
    - **Currently updating both docs to insure their consistency**
  - **11 requirements have been submitted to the customer for sell-off and tentatively approved**
- **Status**
  - **VCRM version 18 released**
  - **Update of 2730 in progress**
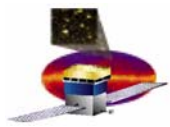
Mass and Power Status Summary

- **Mass**
  - **No Change**

- **Power**
  - **No change**
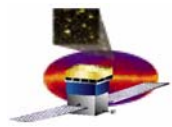
LAT Power Status

LAT Power Consumption Estimate has decreased by 12.9W.

• ACD Estimate no change.
• TKR Estimate no change.
• CAL Estimate no change.
• T&DF Estimate decrease by 12.9 W due to GASU measured data.

30-Mar-06 Item	Estimate (Watts)	PARA (Watts)	CALC (Watts)	MEAS (Watts)	SPEC (Watts)
ACD	11.3	0.0	0.0	11.3	11.5
Tracker	159.2	0.0	0.0	159.2	160.0
Calorimeter	67.8	0.0	0.0	67.8	71.0
Trigger & Data Flow	297.3	0.0	0.0	297.3	327.5
Grid/thermal	20.4	20.4	0.0	0.0	35.0
Instrument Total	556.1	20.4	0.0	535.7	605.0
Instrument Allocation	650.0				
% Reserve	16.9%				

PDR Reserve Was 15.2%
CDR Reserve Was 13.4%

Goal for PSRR Reserve > 5%

PARA - Best Estimate based on conceptual design parameters
CALC - Estimate based on Calculated power from detailed design documentation
MEAS - Actual power measurements of components

Goals estimated using guidelines given in ANSI/AIAA G-020-1992 "Estimating and Budgeting Weight and Power Contingencies for Space Craft Systems"

LAT Power