

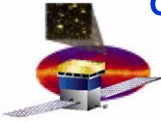
GLAST Large Area Telescope

Systems Engineering

NCRs and Waivers Verification Status

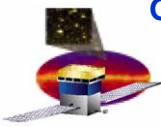
Pat Hascall
Systems Engineering
Joe Cullinan
Quality

Stanford Linear Accelerator Center



NCR Presentation Approach

- Presentation is adapted from the PER and is a draft for the PSR
- Showing details on only the more significant NCRs
 - This cut includes more detail than we probably want for the PSR
- Will present the newer NCRs or NCRs with significant changes first
- Older NCRs with no change at the back, not planning on presenting
- Overall metrics shown on next chart

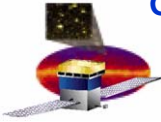


LAT NCR Metrics 8/24/06

Subsystem	Open NCRs	New NCRs created in month	NCRs closed in month	NCRs Open 30 days or more	NCRs open 90 days or more
DAQ	2	0	1	2	2
Tracker	1	0	0	1	1
Mechanical	2	0	0	2	0
CAL	0	0	0	0	0
ACD*	0*	0	0	0	0
I&T	57	16	17	42	27
TOTAL (August)	62	16	18	47	30

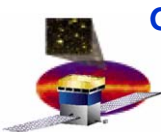
TOTAL (July)	65	15	20	47	25
---------------------	-----------	-----------	-----------	-----------	-----------

* All NCRs related to ACD are now categorized as I&T NCRs
NCRs and Waivers



NCR Introduction

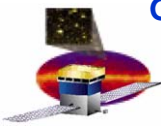
- **Presentation focus is on the main hardware related NCRs that remain open**
 - **Open NCRs continue to be worked towards closure**
 - **Several NCRs were left open for Environmental Testing at NRL and will be closed when final data review is completed after TV**
 - **Impact assessment for those NCRs identified as “Can Not Duplicate” (CND) will be discussed.**
- **NCRs are classified into categories for discussion purposes**
- **NCR Summary List of all open NCRs is presented for reference**



NCR Category Definitions

Open NCR's classified into categories for discussion purposes:

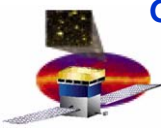
Category	Definition	Count
Hardware Discrepancy	H/W Issue that does not meet design specification or intent	17
FSW Discrepancy	Identified FSW bug, FSW JIRA in work or completed	5
Monitor for Verification	Likely test issue, trending for repeat	2
Known Feature	Specification not violated, but trending or changes required to accommodate behavior	8
EGSE/Data Processing	NCR has been isolated to EGSE/Data Processing	15
Under Investigation	Cause of the anomaly is under investigation	3
CND	Could not duplicate	12
No Defect	No hardware or software defect	1



NCR Resolution Definitions

Open NCR's classified into categories for discussion purposes:

Closure Plan	Definition	Count
Bxxx	Resolved with FSW release Bx.x.x	5
Close after TV	Monitor during TV and close if no issues are seen or minor rework scheduled after TV	9
Closure deferred	EGSE issues, low priority to fix or hold open to track repeats	5
Closure near	Expect closure before end of TV	18
In process	NCR has been isolated to EGSE/Data Processing	11
Open for PSR	CND or other issue expected to be open at PSR	14
Waiver	Waiver needed	1

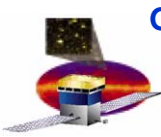


Reboot Summary

NCR	Unit affected	Type of reboot	LAT activity	Run	When	Likely Cause/Resolution
809	EPU tbd	unknown	During conversion from SIU to EPU			
880	SIU redundant	VXWorks reboot	TkrTotGain_SVC_500hz		15:40 UTC. 4/10/2006	
881	EPU 2	Boootype = 2, Watchdog	TkrTotGain_SVC_500hz		21:34 UTC 4/10/2006	
901	EPU 2	boootype = 1	During LatPowerOnTurbo, concurrent with power up of ACD DC/DC converter in GASU	77004374	5/7/2006 14:00:59 PST	Noise induced in reset line Moved ACD DC/DC converter power up before EPU power up
902	EPU 0	boootype = 4, CPU exception	During LatReinit, concurrent with main feed on command	77004380	5/7/2006 2:15:53 PM PST	EPU 2 was in primary boot and transmitting boot telemetry when script rebooted the SIU. These messages interfered with reconnecting SIU and EPU 0 and induced the reboot.
948	EPU 1	Boootype = 2, Watchdog	LPA: tackscan-6_0.55hr	77007053	7/19/2006 19:12	LCB errors indicating backup of event data in the VSC, causing event fabric to flood then stall, thus reboot was induced by the VSC
949	SIU primary	Boootype = 2, Watchdog	e2e_LAT-22xGammafilterNoPer_0.17hr	77007086	7/20/2006 22:08	1pps/timetone errors from all 3 processors, and timehack table entry errors from the SIU indicate induced reboot due to incorrect sequence 1PPS and timetone messages from the VSC

Based on latest information, NCR 880 and 881 are being rereviewed. Some timetone timing variations were seen and are being analyzed, but nothing definitive yet

FSW is adding code to provide information that can be recovered after a reboot about which processes are running



NCR 948

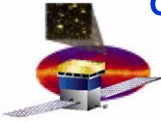
EPU 1 Reboot

- **Issue**
 - EPU 1 rebooted during a tackscan-6_0.55h test
- **Analysis**
 - Watchdog timer caused the reboot
 - LCB errors indicating backup of event data in the VSC, causing event fabric to flood then stall, thus reboot was induced by the VSC
- **Resolution Plan**
 - FSW to add code to provide additional information about which tasks are executing
- **Impacts on On-orbit performance**
 - Loss of $\frac{1}{2}$ of the event data until the EPU operations are recovered

NCR 949

SIU Reboot

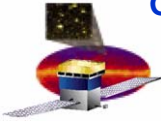
- **Issue**
 - Primary SIU reboot during LAT22xGammafilterNoPer_0.17hr test
- **Analysis**
 - Reboot was due to watchdog timer
 - Abnormal timing signal sequence generated by VSC is the likely cause of the reboot
- **Resolution Plan**
 - FSW to add code to provide additional information about which tasks are executing
- **Impacts on On-orbit performance**
 - Loss of data and LAT housekeeping telemetry until SIU is rebooted



NCR 897

Possible FPGA failure

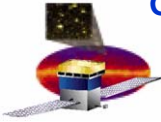
- **Issue:**
 - During the flight-acceptance testing of the spare GASU, one FPGA appeared to stop working properly
- **Analysis:**
 - Analysis and preliminary measurements point to an anti-fuse inside the FPGA which opened up.
 - ACTEL failure analysis points to a programming problem that causes random part failures
- **Resolution:**
 - Replace FPGA and restart flight-acceptance testing of spare
- **Impact to on-orbit performance:**
 - None expected



NCR 684

Tracker Noise Flares

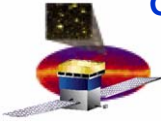
- **Issue**
 - 8 (of 612) layers in 17 Trackers have shown infrequent, sporadic flares of increased noise occupancy. The 8 layers are uncorrelated.
 - The flares are correlated across channels in a given ladder, with many or all channels in the ladder firing at once.
 - There is no evidence that the problem was statistically worse in T/V than in atmosphere, but we cannot rule out a small effect.
- **Analysis**
 - Monitor in cosmic-ray data in FM-8 and in 16 towers.
 - The affected regions are fully ON and sensitive immediately before and after a flare. This ruled out intermittent bias connections as a cause.
 - *Even during flares, all recent runs still satisfy all noise specifications.*
 - Study in FM-8 versus HV level and humidity:
 - Unfortunately, we could not get the problem to recur at all in FM-8, so we did not reach any conclusion.
 - **Test at lower bias voltage (80 volts instead of 100 volts) still showed flares**
- **Resolution Plan**
 - Continue to monitor the effects in 16-tower cosmic-ray data, especially in T/V testing.
- **Impacts on On-orbit performance**
 - The observed noise is very far from a level that would have any impact at all on performance. An increase by much more than an order of magnitude, including spreading to other trays, would have to occur to begin to see impacts. (Overall, the TKR noise performance is phenomenally good!)



NCR 898

Bay 7 Tracker Cable 7 Temps

- **Issue:**
 - TkrTemp: TEM7, TKR Cable 7, Temperature 1 measured 16 degrees lower than expected.
- **Analysis:**
 - Review of historical data shows that this sensor looks normal at power up, but deviates later
 - Review of tracker level test data showed the same behavior
 - Potential causes include high resistance short
- **Resolution Plan:**
 - Monitor during TV for changes in performance
 - Use as is
- **Impacts on On-Orbit performance:**
 - None since there is adequate thermal sensor coverage on other cables in this tower



NCR 905

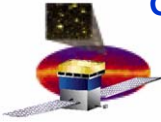
Dropped Command

- **Issue:**
 - **GBM test step failed due to a dropped Slew-Request-Reply**
- **Analysis:**
 - **LICOS message log indicates the command was given to the VSC for transmission to the LAT**
 - **LAT diagnostic log has no indication that the command was received**
- **Resolution Plan:**
 - **ELX providing potential causes**
- **Impacts on On-Orbit performance:**
 - **Impact assessment in process**

NCR 922

LHK Terminated

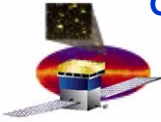
- **Issue:**
 - During a charge injection test, LAT housekeeping process (LHK) emitted an error and subsequently did not create telemetry packets successfully
- **Analysis:**
 - Review by FSW indicates a possible cause that the LHK process was memory starved
 - Problem has not repeated on the testbed
 - Was during a LCI run which is a heavy CPU user
- **Resolution Plan:**
 - In review
- **Impacts on On-Orbit performance:**
 - Would require restart of LHK



NCR 932

Tracker EMI susceptibility

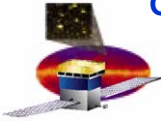
- **Issue:**
 - Tracker noise occupancy exceeded layer limit during RS 103 Sweeps from 30MHz to 200MHz
- **Analysis:**
 - Frequency range is due to ground radar, so limited exposure during in-orbit operations is expected
 - Full LAT level noise occupancy computed for the trackers, which reduces the effect of the susceptibility, but the spec is still exceeded
- **Resolution Plan:**
 - Waiver
- **Impacts on On-Orbit performance:**
 - No significant impacts expected



NCR 939

RTD EMI/EMC susceptibility

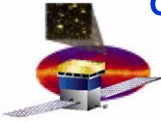
- **Issue:**
 - RTD susceptibility in RS103 from 30MHz to 200MHz and in CS102 from 150KHz to 350KHz and from 1MHz to 10MHz
- **Analysis:**
 - Variations from nominal of up to 4 degrees seen (8 degree range)
 - RTD telemetry circuitry does not have the same level of filtering as the thermistors
 - LTC does use the RTDs and has the capability to filter out the noise
- **Resolution Plan:**
 - Update LATC filters to reduce the effective noise level
- **Impacts on On-Orbit performance:**
 - No significant impacts expected



NCR 946

ACD Free 5 Power Up

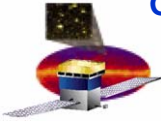
- **Issue:**
 - ACD Free Board 5 was not responsive to commands after power up
- **Analysis:**
 - Other power up parameters (voltages and currents) reviewed with no abnormalities seen
 - Occurred once in over 100 power ups
 - Two possible causes
 - Look-at-me from redundant GASU was dropped so the Free board would only respond to commands from the primary (unpowered) GASU
 - Custom power up sequence (compensates for bug in ASIC primary/redundant switching code) does not always result in successful power up in redundant mode
- **Resolution Plan:**
 - ELX working on definition of possible causes
 - Monitor during TV for repeats
- **Impacts on On-Orbit performance:**
 - Extend power up sequence timeline slightly



NCR 957

EPU 0 CPU Junction Temperature

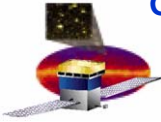
- **Issue:**
 - EPU 0 CPU junction temperature was higher than the other CPUs by approximately 30 degrees and approached 110 degrees during bakeout
- **Analysis:**
 - Not observed at unit test or ambient level LAT testing
 - Possible causes
 - Thermal strap debonded
 - Sensor defective
 - Increased heat dissipation elsewhere on the board
 - Loss of thermal strap matches the observed characteristics the best
- **Resolution Plan:**
 - Monitor for rest of TV
 - Use as is
- **Impacts on On-Orbit performance:**
 - None



NCR 971

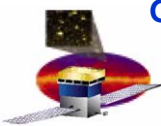
GTFE Tower 0, Layer -x6, 20 LATC Verify Error

- **Issue:**
 - During cold temperature testing there have been 6 LATC verify errors on tower 0, layer -x6, chip 20
- **Analysis:**
 - The error is a mask bit that intermittently reads 0 instead of 1
 - The rate is about 1 in 75 readouts
 - Not observed during Tracker level testing
- **Resolution Plan:**
 - Monitor through the rest of TV
 - Two options for long term
 - Put on exceptions list so that intermittent readback errors would not interfere with start of physics run
 - LATC verify retries

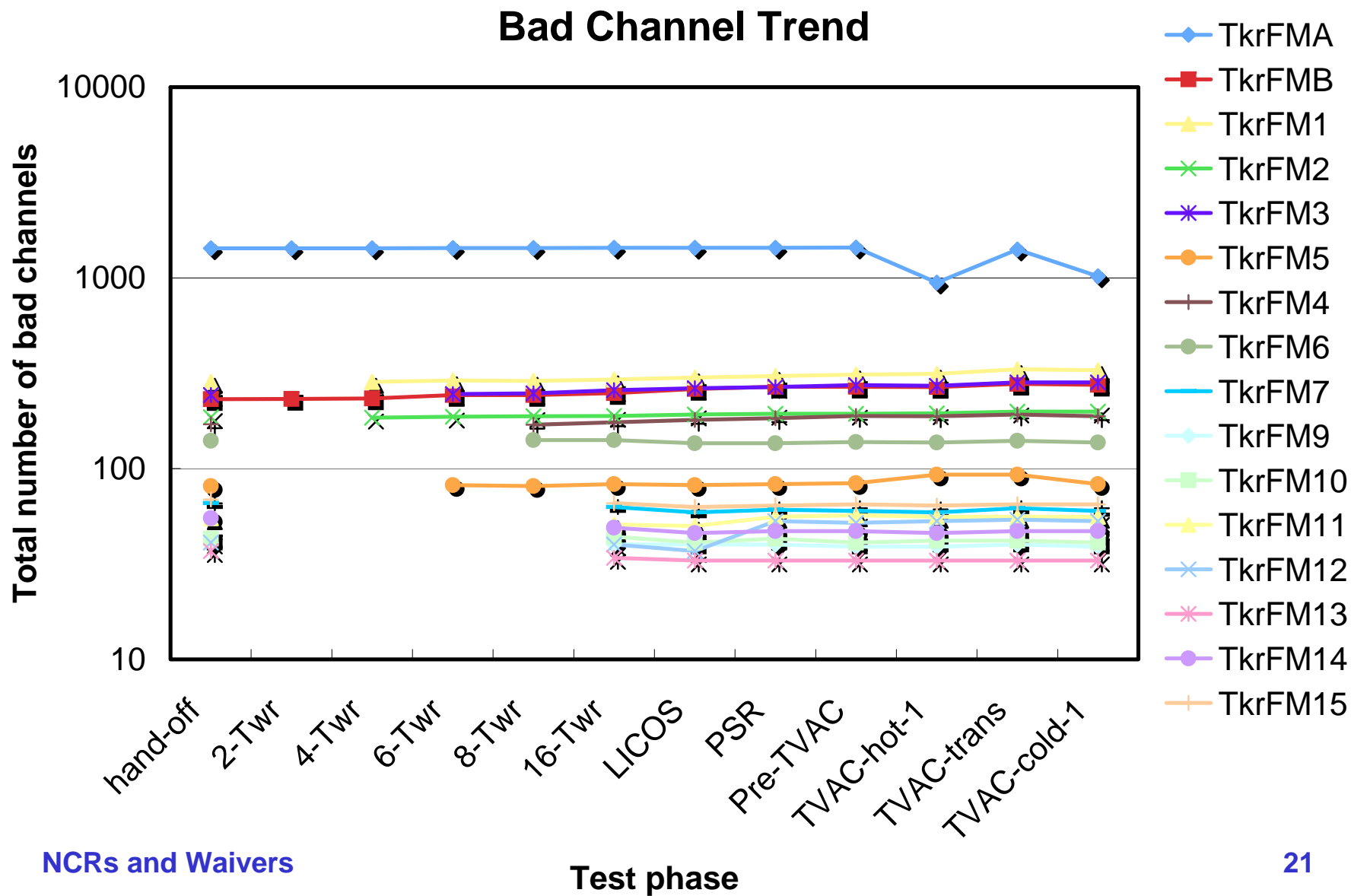


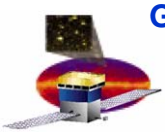
TKR Bad Strips

- Three major categories:
 1. Hot strips:
 - Historically anything $>10^{-4}$ occupancy, but strips well above this level can still be useful and should not be masked unnecessarily!
 - Small numbers, with no trending issues.
 2. Dead strips: do not respond to internal charge injection.
 - Either a dead amplifier or a broken SSD strip connected to the amplifier (usually the latter).
 - Very small numbers, with no trending issues.
 3. Disconnected strips: broken wire bond or trace
 - between ladder and amplifier, mostly due to MCM encapsulation debonding from silicone contamination.
 - or between SSDs within a ladder, due to Nusil encapsulation debonding in thermal cycles.
 - The majority of the bad strips are in early towers, and the delamination definitely propagates somewhat with time.

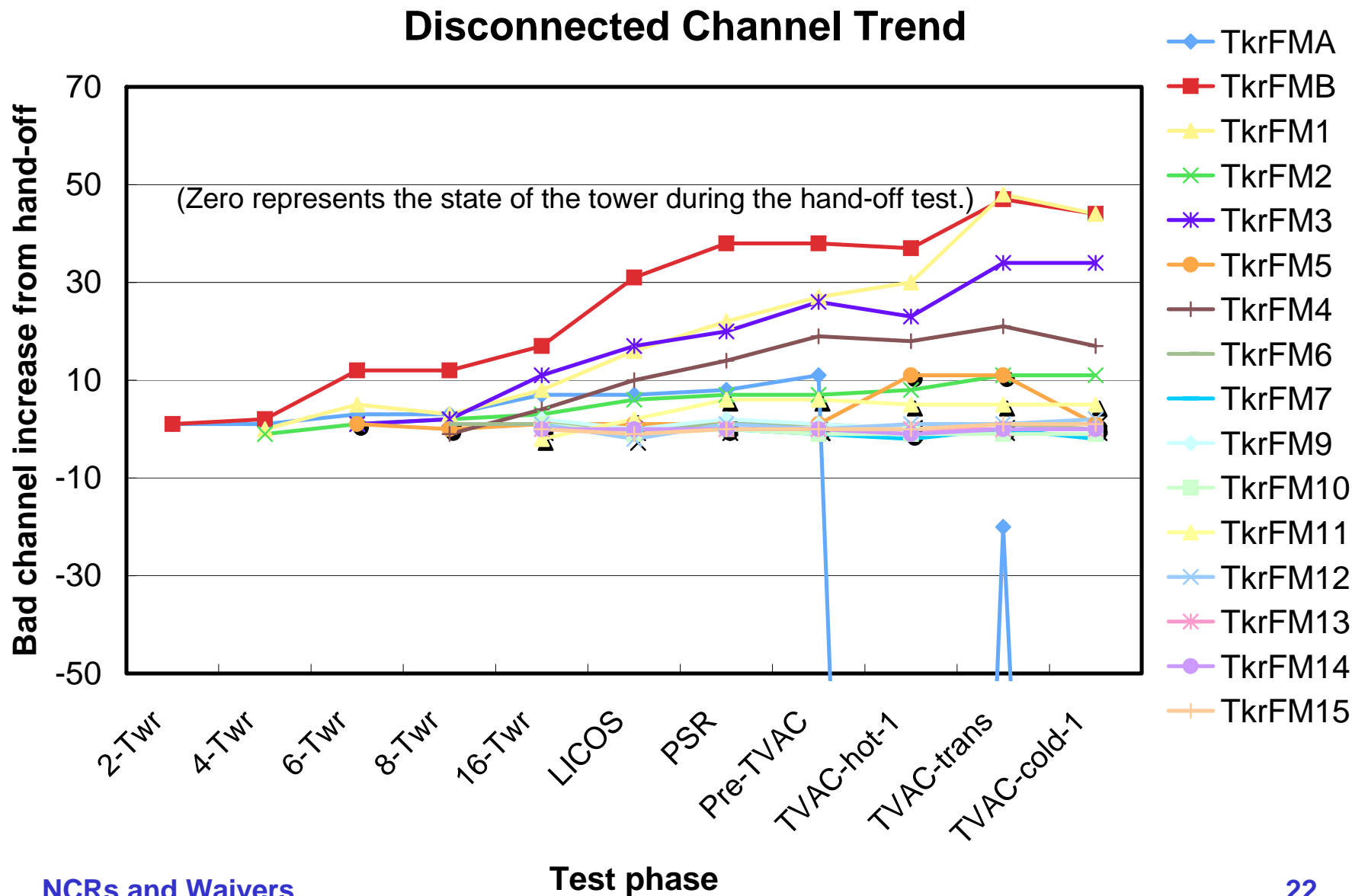


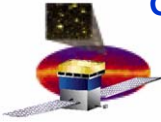
TKR Bad Strips - SLAC Trending, All Towers





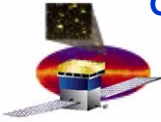
TKR Bad Strips - SLAC Trending





TKR Bad Strips - Summary

- The problem of encapsulation delamination has been well known and discussed for a long time, including the increase during Tracker T/V testing, but the project elected to use the affected MCMs as-is because of
 1. the adverse schedule and cost impact of redoing 1/3 of the MCM production
 2. and the belief that future degradation would never reach a level at which the science would be compromised.
- Nothing is different today:
 - There is some evidence that the problem areas have expanded very slightly during LAT integration, but
 - It is impossible to be sure at any time what channels are really disconnected, because the wires in delamination regions often make electrical contact even when the mechanical bond is gone. Many channels of the channels that appeared to be new disconnects at SLAC, were observed to be disconnected during TKR TV testing.
 - No disconnected channels have appeared in previously unaffected regions of MCMs.
 - We can expect that the problem regions will expand during LAT environmental testing, but if comparable to the Tracker environmental testing, the degradation will not be significant with respect to science performance.



LAT Level Verification Status

Category	Verification Method					Requirements		
	Test	Demo	Analysis	Inspection	Children	# Comp	Total	% Comp
	# Complete	# Complete	# Complete	# Complete	# Complete			
Total VPs	125	76	199	36	22	-	458	-
Requirement Identified	125	76	199	36	22	458	458	100.0%
Flow Down Complete	125	76	199	36	22	458	458	100.0%
Draft Verification Plan	125	76	199	36	22	458	458	100.0%
Final Verification Plan	111	73	197	35	20	436	458	95.2%
Verification Plan Executed	69	58	142	24	16	309	458	67.5%
Verification Report Submitted	39	46	61	12	10	168	458	36.7%
Requirement Sold	10	11	11	3	5	40	458	8.7%

- **Progress this month**
 - 95% of 458 VPs are Final
 - GRB requirement VPs will remain draft until FSW Delta FQT
 - Verification status has been updated in the VCRM
 - 309 VPs have been executed to date (55% of these have been submitted)
 - 139 additional requirements have been submitted to the customer for sell-off and 35 more approved in the last month
- **Status**
 - VCRM version 21 released
 - LAT-MD-02730 released

NCR 901 EPU Reboot

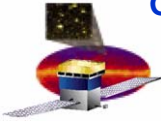
CND

- **Issue**
 - EPU reboot at time ACD DC/DC converter is powered up in GASU
 - Single occurrence
- **Analysis**
 - Occurred concurrent with GASU ACD power supply power up
 - Likely cause is interference (noise) into EPU command line within GASU when GASU ACD supply is powered up
- **Resolution Plan**
 - EPU and TEM's must be powered after ACD DC/DC converter in GASU is enabled, per design as originally planned (note that this is independent of power being applied to FREE cards)
 - Simple change in power-up script to be implemented via JIRA LS-89
- **Impacts on On-orbit performance**
 - None

NCR 880 SIU Reboot

CND

-
- **Issue**
 - **SIU reboot during TKR time-over-threshold gain calibration run**
 - **Single occurrence**
 - **Analysis**
 - **Appears to be SIU reboot requested by the VxWorks operating system itself (was not external reset, watch-dog, or commanded)**
 - **Resolution Plan**
 - **Plan in place to gather additional data if another reboot should occur**
 - **Impacts on On-orbit performance**
 - **Loss of data and LAT housekeeping telemetry until SIU is rebooted**

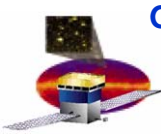


NCR 809

EPU Reboot During File-Upload

CND

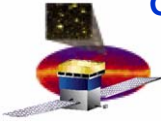
- **Issue**
 - Reboot when secondary boot files were uploaded first time to first EPU
 - At that time EPU was connected to EGSE, not yet assembled on LAT
- **Analysis**
 - Cause is believed to be (EGSE or FSW) software related, but diagnostics data was not available yet at that time
 - Reloading missing files was successful
 - Single occurrence, numerous file uploads were performed on all SIU/EPU boxes without issues
- **Resolution Plan**
 - Plan in place to gather additional data if another reboot should occur
- **Impacts on On-orbit performance**
 - Extension of file upload time until the EPU is rebooted



NCR 881/902 EPU Reboot

CND

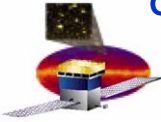
- **Issue**
 - EPU rebooted subsequent to a SIU reboot
 - In 881 SIU had rebooted as explained in NCR 880
 - In 902 SIU was rebooted intentionally in LAT reboot test script
- **Analysis**
 - In both cases the communications between the processor farm was restored after the SIU reboot using a main feed on command. That process is now suspect.
 - NCR 881 EPU watch-dog timeout likely due to system not in known nominal operating state
 - NCR 902 EPU reboot due to a software exception that occurred concurrent with the main feed on command
- **Resolution Plan**
 - EPU's should always be rebooted following a SIU reboot
- **Impacts on On-orbit performance**
 - None



NCR 535

Tower FM-4, Layer Y4 Margins

- **Issue**
 - 1 of 2 GTRCs in layer Y4 of FM-4 failed margin tests:
 - IS: worked up to 53% clock duty; SB: up to 55%
 - IS: worked down to $V_{dd}=2.51$ V; SB: down to 2.50 V
- **Analysis**
 - The GTRC is known to have weak timing margins in its memory access. The clock termination on the cables was changed from 100 ohms to 75 ohms to alleviate this, and MCMs were screened for clock duty cycle. Nevertheless, this 1 out of 1152 GTRCs slipped through and doesn't quite meet our spec when installed in the final system.
 - No failure has been seen to date at the nominal operating points (2.65V and 50%), including during Rome T/V testing.
- **Resolution Plan**
 - Paired with a TEM/TPS with a relatively high measured V_{dd} (2.70 V) resulting in + 0.19 V margin
 - Keep the NCR open to monitor at high T in T/V tests
- **Impacts on On-orbit performance**
 - None expected. Even in the worst case, if this GTRC gives repeated errors, the MCM could be read from the other cable, with no loss of channels.

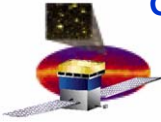


NCR 624

ACD Temperature Sensor

CND

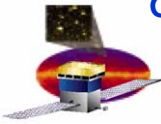
- **Issue**
 - NCR opened to track GSFC PR ACD-02334-004 for LAT TV testing
 - ACD Thermal Monitoring system readout for Yp_Inshell_S initially read 23 deg C at startup and started fluctuating between +5 deg C and -50 deg C
- **Analysis**
 - Thermistor operated properly after pump-down and anomaly was not observed throughout T/V test nor during ambient pressure checkout post-T/V
 - Not indicative of a thermistor failure
 - Likely cause is connection between the ACD and the readout outside the T/V chamber
- **Resolution Plan**
 - Monitor during LAT TV
- **Impacts on On-orbit performance**
 - Thermal shell is well instrumented and can easily accommodate the loss of this thermistor



NCR 626

ACD Rates During Transitions

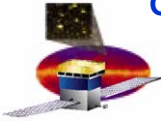
- **Issue**
 - NCR opened to track GSFC PR ACD-02334-016 for LAT TV testing
 - Observed high count rates exceeding 1000 Hz in the ACDMonitor script during two of the four transitions from hot to cold during the ACD TV
- **Analysis**
 - Temperature range was -10 C to -15 C
 - Because hardware counters were used, we only know that it was one of the data channels from phototubes attached to tile 320 - i.e. GARC 6, GAFF 16 or GARC 7, GAFF 17
 - By the time the temperature had stabilized at -25 C, the rates had returned to their normal values of less than 100 Hz
 - No problems have been seen with either phototube signal in any functional test at any temperature.
- **Resolution Plan**
 - Monitor during LAT TV
- **Impacts on On-orbit performance**
 - Potential need to mask inputs from a phototube for tile 320
 - Tile 320 is located near the base of the ACD on the +X side and thus is not significant
 - ACD performance is acceptable even if one signal is lost



NCR 855

LATC Verify Error in Calorimeter GCRC (1) CND

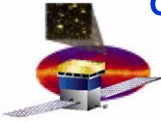
- **Issue**
 - After power-up, first write to the first register in calorimeter readout controller (GCRC) register may not succeed.
- **Analysis**
 - Frequency: Occurred in 2 power-up runs out of >80. Only one GCRC of 96 was affected in each of those 2 runs, but not the same one.
 - By design there is no power-up circuit on the calorimeter front-end board, so it relies on a hardwired reset being asserted from the TEM after power-up. Currently there is no such reset issued by FSW.
- **Resolution Plan**
 - Add reset command after power-up (from TEM to GCRC). Simple change to FSW PIG package, JIRA created.
- **Impacts on On-orbit performance**
 - None if FSW PIG is modified
 - Small impact if FSW is not corrected, might have to perform LATC configuration (or at least first command to GCRC) twice to insure correct register content after power-up



NCR 855 cont'd

LATC Verify Errors in Tracker GTRC (2) **CND**

- **Issue**
 - Tracker front-end register (RC and FE) was not read successfully
- **Analysis**
 - Issue in 14 of > 1,500 LATC configurations
 - Affects about 10 bits of ~ 2 million bits written/read in each LATC
 - Subsequent readouts showed register contents as expected
 - Mostly at the start of commissioning:
 - Twelve happened in first 160 runs,
 - One in run 290,
 - One in run 739.
 - None in last 800(TBR) write/reads
 - Analysis of LATC errors was not operational in the beginning of commissioning, thus detailed information only available for the last two
- **Resolution Plan**
 - Monitor during environmental testing for any new occurrences, better analysis/debug tools in place
 - The two runs with analysis data available exhibit a FSW issue that may be related
 - Thus plan to execute LATC configuration setup and test loop on testbed
 - Although testbed does not have real front-end electronics, it has registers on front-end simulator boards so from FSW perspective LATC won't know the difference
- **Impacts on On-orbit performance (if issue is real)**
 - With no action, the LAT will not start the physics acquisition and one orbit worth of data would not be collected
 - Several options for FSW mitigation to eliminate the problem
 - Don't do anything besides reporting mismatch (since read issue), Re-issue LATC (write-read), read again to just verify content

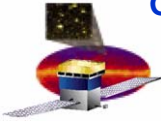


NCR 625

ACD Veto Hitmap PHA Apparent Retrigger

CND

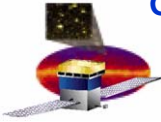
- **Issue:**
 - `AcdVetoHitmapPha` apparent retrigger in GARC 11, GAFE 17 under high level charge injection.
- **Analysis:**
 - Root cause is unknown. This is a test script that we no longer use as the functionality that it tests is covered in other tests, though not as explicitly. The main purpose of this test is to confirm that the PHA and veto data are consistent with each other and with the software scalars.
 - For particle data we have scripts to check the consistency between the PHA, Veto and GEM data explicitly.
- **Resolution Plan:**
 - Monitor that Veto and PHA data are consistent in particle data runs.
 - No plans to re-run this particular script.
- **Impacts on On-Orbit performance:**
 - None.



NCR 718

ACD Channel 1123 Veto Threshold Min. is 0.45 pC

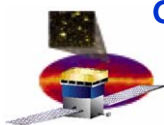
- **Issue:**
 - Can not set the VETO threshold for GARC 1, GAFE 13 (aka tile 123, pmt 1) below 0.45pC (about 2/3 of a MIP) The nominal setting for would be 0.25pC (0.2 - 0.3 of a MIP).
- **Analysis:**
 - The root cause is not known. Trying to set any VETO threshold below 0.45 pC results in the same actual threshold trigger point. Likely this is an issue with the front-end electronic in this channel.
 - This channel is in the 3rd row of side tiles and will NOT be part of the normal operating mode ACD veto. However, it may be used in any ACD triggered operations. In any case, it is still possible to set the threshold of fire well below a MIP, so this will have a minimal effect even in the ACD triggered operations.
- **Resolution Plan:**
 - Use as is. Monitor for degradation. Make plans to treat this channel specially in offline calibration and analysis.
- **Impacts on On-Orbit performance:**
 - None in regular operation. Minimal in-efficiency in ACD-triggered operation. Does not affect any science requirements.



NCR 829

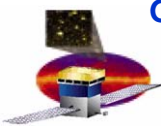
ACD Coherent Noise at 1000 System Clock Ticks

- **Issue:**
 - ACD shows coherent noise at 1000 system clock ticks after each event.
- **Analysis:**
 - The root cause is not known. The pedestal value in each channel varies with time since previous event.
 - Pedestal is shifted down ~30 bins at ~500 ticks after previous event, and up ~15 bins at ~1000 ticks. These shifts correspond to about -0.08 MIPs to +0.04 MIPs.
 - Zero suppression threshold is nominally 15 bins above nominal pedestal, so upward drifts in pedestal can cause excess numbers of hits near 1000 ticks after previous event.
 - Preliminary analysis has not seen similar effects in the VETO and CNO lines, suggesting that any effect there are too small to cause noticeable changes in performance.
 - LAT design requires ACD to be efficient above 0.2-0.3 MIPs, i.e. margin still exists.
- **Resolution Plan:**
 - Use as is. Quantify effect for each channel and correct offline.
 - Determine temperature dependence of effect.
- **Impacts on On-Orbit performance:**
 - Still under investigation
 - Possible reduced efficiency for very small pulses (~0.1 MIPs or less) that occur ~500 - 750 ticks after previous event
 - Possible excess noise occupancy at on-orbit background rates. Mitigate by raising zero suppression thresholds to ~25 bins above pedestal. This would dramatically reduce the number of the excess hits with minimal effect on science performance.



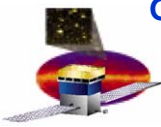
Open NCR List

NCR	Date Opened	Affected Hardware	Problem Description	Resolution plan	NCR Category	Could Not Duplicate
535	6/20/2005	TKR	Monitor trend data for TKR 4 thru LAT testing (spin-off NCR)	Close after TV	Known Feature	
594	8/2/2005	TKR	TKR Layer efficiency for Y9 and Y17 are lower at SLAC than Pisa.	Close after TV	Monitor for Verification	
624	8/27/2005	ACD	Fluctuations in temperature reading (originally an ACD PR)	Open for PSR	CND	CND
625	8/27/2005	ACD	AcdVetoHitmapPha apparent retrigger	Open for PSR	CND	CND
626	8/27/2005	ACD	ACDMonitor script high counts during T/V (originally ACD PR)	Close after TV	Monitor for Verification	
684	10/3/2005	TKR	Noise Occupancy failures due to intermittent hot strips.	Open for PSR	CND	CND
718	10/27/2005	ACD	VETO threshold for channel 1123 can't be set below minimum value of 0.45pC (originally an ACD PR)	Close after TV	Known Feature	
806	1/17/2006	Trigger	CAL is retriggering during SVAC run	Closure near	Known Feature	
809	1/17/2006	Integration	EPU crate s/n GLAT 2522 spontaneous reset	Open for PSR	CND	CND
829	2/10/2006	ACD	ACD coherent noise at 1000 system clock ticks after each event collected in flight config.	Closure near	Known Feature	
840	3/8/2006	DAQ	RunControl software problems observed on spare PDU during T/V test (NCR #794); opened NCR to track FSW updates	B0.7.0	Known Feature	
851	3/16/2006	DAQ	One or more EPU resets unexpectedly due to large number of events and interaction with end of run activities	B1.0.0	FSW Discrepancy	
852	3/16/2006	DAQ	LCB errors observed during muon run	in process	EGSE	



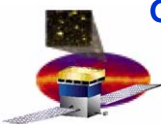
Open NCR List

NCR	Date Opened	Affected Hardware	Problem Description	Resolution plan	NCR Category	Could Not Duplicate
855	3/23/2006	FSW	LATC verify occasionally reports errors in CRC, SPT, ARC	Open for PSR	CND	CND
859	3/23/2006	FSW	CAL LCI data compression less than expected, results in very large datagrams	B0.6.11	FSW Discrepancy	
880	4/12/2006	Integration	SIU Spontaneous Reboot	Open for PSR	CND	CND
881	4/12/2006	Integration	EPU Spontaneous Reboot	Open for PSR	CND	CND
882	4/12/2006	DAQ	GLAT2525 power up software crash due to Result FIFO not empty.	B0.7.0	Known Feature	
883	4/13/2006	Integration	RunControl software occasionally crashed during PDU TV Testing	Closure near	EGSE	
884	4/15/2006	Integration	VSC errors observed during LAT power on	Closure near	EGSE	
890	4/19/2006	Integration	Radiator heater isolation tests fails on +Y Radiator	Closure near	Hardware Discrepancy	
894	4/29/2006	Integration	LATC dump GTFE mask error	in process	FSW Discrepancy	
897	5/3/2006	DAQ	Spare GASU AEM FPGA failure	Open for PSR	Hardware Discrepancy	
898	5/4/2006	DAQ	TEM7 TKR Cable 7 temperature tensor failure	Close after TV	Hardware Discrepancy	
901	5/9/2006	DAQ	EPU 2 unexpected reboot	Open for PSR	CND	CND
902	5/9/2006	DAQ	EPU 0 unexpected reboot	Open for PSR	CND	CND
903	5/9/2006	Integration	LAT04x errors during upload of B-0.6.8	Closure near	EGSE	



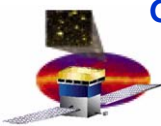
Open NCR List

NCR	Date Opened	Affected Hardware	Problem Description	Resolution plan	NCR Category	Could Not Duplicate
905	5/10/2006	Integration	GRB Handling test errors (Flight SW or EGSE SW)	Open for PSR	CND	CND
909	5/16/2006	Integration	LAT06X EEPROM writecount test reads wrong register	Closure near	no defect	
913	5/23/2006	EGSE	LCI Error reported during ACD CPT	B0.x.x	FSW Discrepancy	
915	5/26/2006	Integration	Heater installation issues.	Close after TV	Hardware Discrepancy	
922	6/5/2006	TKR	TkrReadingConfigurationTest_LPT errors.	in process	FSW Discrepancy	
928	6/12/2006	Integration	Required X-LAT MLI Blanket assy not installed per drawing.	Close after TV	Hardware Discrepancy	
931	6/19/2006	ACD	ACD bias was not set correctly.	Closure near	EGSE	
932	6/20/2006	TKR	Tracker tower 7 exceeded the noise occupancy spec.	Waiver	Hardware Discrepancy	
933	6/22/2006	EGSE	Reported 1PPS error in the msg log.	Closure deferred	EGSE	
936	6/24/2006	EGSE	ScriptEngineCommon.py:682 ERROR - SIU: ISR> SUMT_rtMsgTimeout CTDB EDRVTIMO Bus timeout errors.	in process	Under Investigation	
938	6/26/2006	ACD	AemEnv0 Pkt was not seen by the AcdHvbs script when trying to verify the LAT configuration.	Closure deferred	EGSE	
939	6/28/2006	Integration	The RTD sensors sampled by the EPU show sensitivity to conducted interference during the CS102 test.	in process	Hardware Discrepancy	
941	6/28/2006	Integration	Several sets of temperature points appear to be swapped. This was discovered during LAT 15X tests on the thermal control system	Closure near	Hardware Discrepancy	
942	6/29/2006	Integration	Velcro on ACD and LAT thermal blankets do not align and both sides are loop and cannot secure to each other.	Close after TV	Hardware Discrepancy	



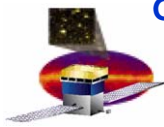
Open NCR List

NCR	Date Opened	Affected Hardware	Problem Description	Resolution plan	NCR Category	Could Not Duplicate
943	6/30/2006	Mechanical	Excess plating along the edges of the radiator conductive shim	Closure near	Hardware Discrepancy	
945	7/6/2006	Integration	DDT constituent not loaded on Processor crates.	Closure near	EGSE	
946	7/11/2006	Integration	ACD FREE Board 5 HV2 failed to report SAA voltage after successful execution of that command.	Open for PSR	Hardware Discrepancy	
948	7/19/2006	Integration	EPU1 reboot occurred in run# 77007053, with a resulting LPA Stop error.	Open for PSR	CND	CND
949	7/21/2006	Integration	Primary SIU rebooted during run 077007086. The LAT was in config 1.	Open for PSR	CND	CND
950	7/24/2006	Integration	Data from dry run LAT CPT using backup VSC taken from July 20, 2006 to July 23, 2006 show some runs with missing events	Closure near	EGSE	
956	8/1/2006	EGSE	VSC crate reboot and operator actions created LATC verify error	Closure near	EGSE	
957	8/4/2006	DAQ	RAD750 CPU junction temperature higher than expected for 48 hrs during LAT T/V bakeout	in process	Hardware Discrepancy	
958	8/7/2006	Integration	GTRC phase error during Hot Thermal balance	in process	Known Feature	
959	8/8/2006	EGSE	VSC crashed during LAT T/V test and emitted timetone messages at high rate	Closure deferred	EGSE	
960	8/8/2006	EGSE	Script missed LPA stop command from LAT and aborted run	Closure deferred	EGSE	
961	8/9/2006	TKR	One GCFE (Tower 4, CAL FM105) fails to meet noise spec	in process	Hardware Discrepancy	



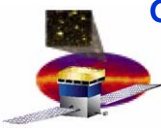
Open NCR List

NCR	Date Opened	Affected Hardware	Problem Description	Resolution plan	NCR Category	Could Not Duplicate
962	8/9/2006	Integration	LICOS charge injection dictionaries inadequate for CAL CPT, LPT	Closure near	EGSE	
963	8/10/2006	ACD	ACD inner shell thermistor exceeded red limit of 40 deg C during LAT Hot OP Plateau test	Closure near	Hardware Discrepancy	
964	8/11/2006	Integration	Radiator panels missing Velcro hook tabs on -Z edge	Close after TV	Hardware Discrepancy	
966	8/14/2006	EGSE	ISOC VSC_UBPU_P_C telemetry reports values 10X less than expected	Closure near	EGSE	
967	8/14/2006	EGSE	VSC telemetry inaccurate compared to CDACS test thermistor	Closure deferred	EGSE	
968	8/16/2006	Integration	LAT Cold Survival Power On sequence deviated from plan	in process	Under Investigation	
969	8/16/2006	Integration	FREE boards HV1 and HV11 show high OOT voltage during Cold CPT	Closure near	Known Feature	
970	8/18/2006	Integration	Chi2/ndof is OOT during Hot to Cold transition and Cold testing	in process	Under Investigation	
971	8/18/2006	Integration	LATC verify errors observed at Cold T/V temperatures	in process	Hardware Discrepancy	



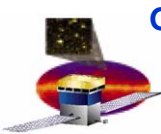
LAT Waivers (1/3)

CCR #	Title	Description	Status
433-0311	DC Voltage Tolerance	LAT is required to tolerate 0-40V DC. Due to MOSFET switches at power feed inputs, LAT can tolerate minimum 15V, excluding transient events.	Approved
433-0356	Test Point Short Circuit Isolation	LAT is required to operate within spec if any test point is shorted to ground. A shorted external clock select pin would render the redundant GASU inoperable.	Approved
433-0357	DC Voltage Tolerance #2	LAT required to tolerate 0-40V DC. After a voltage drop analysis, it was found that the TEM MOSFET switches would receive too low a voltage with the DAQ feed voltage at 15V. To operate the TEM's safely, the input voltage needs to be 18.5V minimum.	Approved
433-0358	GTFE TID	LAT is required to perform TID testing on all GTFE ASIC lots. The final two lots were not tested since previous lots exhibited such large margins.	Approved
433-0360	Tracker Environmental Test With Non-Flt or Missing Cables	Several tracker towers went through environmental test with a subset of missing or non-flight flex cables. The replacement flight cables were not subjected to component-level vibe and will not see twelve tvac cycles.	Approved



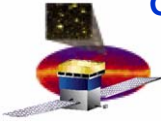
LAT Waivers (2/3)

CCR #	Title	Description	Status
433-0361	24AWG STD Strength Cu	High strength Cu alloy is required for 24AWG wire. LAT uses standard strength Cu wire. As reported by the LAT PCB, standard strength 24AWG wire has been used on previous NASA projects with GSFC's approval with no compromise to product reliability.	Approved
433-0362	J-STD vs NASA STD	LAT circuit card assemblies uses J-STD-001 as the workmanship standard instead of NASA-STD-8739.3.	Approved
433-0367	Tracker Flex Cable and MCM Coupon Failures	Several flex cables and MCM's are installed on the LAT although they have failed coupons.	Approved
433-0368	Radiator Sine Vibe	The radiators will not be installed for LAT-level sine vibe test. Instead, the radiators were subjected to alternative tests, i.e. pull test, tap test, LAT-level acoustic test.	Approved
433-0369	EMI Skirt Stay Clear	Center EMI skirt pieces near SC-LAT flexures exceed the LAT stay-clear by 0.015" max.	Approved
433-0374	VCHP CECM	The VCHP feed violates the CECM requirement. The measured value is ~700mVp-p vs the requirement of 200mVp-p.	Submitted



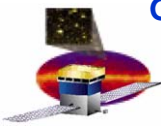
LAT Waivers (3/3)

CCR #	Title	Description	Status
433-xxxx	LAT Test Point Keyed Connectors	Test point connectors are not keyed	Submitted
433-xxxx	Separate Test Connectors	JL-39 contains signals of different classes i.e. LVDS and analog.	Submitted



SC-LAT ICD Waivers

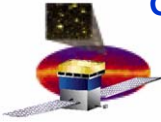
ICN #	Title	Description	Status
-095	LAT Grid Interface Hole Out-of-Tolerance	Several grid interface hole locations are out of tolerance. Using the as-built LAT Grid and SC interface hole locations, the analysis shows the predicted forces to align the shear pins are small and a minimum of 0.007" exist between the bolts and holes in the flexures and mating should not be an issue.	Approved
-107	Recessed Grid Bushings	The +Y and -Y LAT grid interface hole bushings are recessed by 0.022" worst case. Stress analysis at the SC mount interface shows the margins of safety for ultimate and yield bearing strength is 7% which is acceptable. The margin of safety for pin bending is >200%.	Approved



SC-LAT ICD Status

- SC-LAT ICD EIY46311-000C is released
- The table below lists pending changes

ICN #	Title	Description	Status
-096	Unregulated Power Voltage	For shorts periods of time, the SC will be unable to provide the minimum 25V for the unregulated feeds. The voltage may get as low as 23V.	SASS voltage drop analysis in process
-099	LAT Integration	This is an appendix to the ICD that is meant to capture agreements for Observatory I&T activities.	Needs final update, ready to sign
-100	LAT Impedance	Incorporate into ICD the as-measured LAT differential impedance.	In SASS review



NCR and Waiver Summary

- **The LAT Team is confident that none of the NCRs or Waivers presented are significant enough to prevent the LAT from moving forward with environmental testing.**
- **The LAT Team recommends proceeding with the LAT environmental testing as planned.**