

**GLAST LAT I&T**

*GLAST Monthly  
Mission Review  
June 29, 2006*

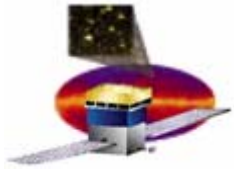


## **Monthly Mission Review**

### **LAT DAQ and Flight Software Status**

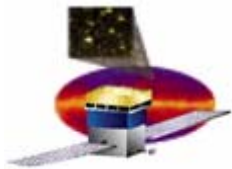
**June 29, 2006**

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Naval Research Lab  
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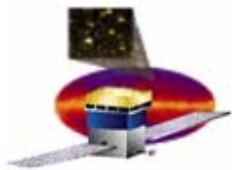
# Topics

- Failure Analysis – FPGA**
- Hardware Completion**
- Primary Boot Code Installation**
- Flight Software Completion**
- FSW JIRA status**



# FPGA Failure Analysis

- **FPGA failure in redundant GASU testing – ACTEL Update**
  - Returned device showed DC parametric damage – high Icc
  - ACTEL successfully reproduced the failure using their tools
  - using Silicon Explorer Actel was able to observe all the signals of logic modules and identified the potential failure – stuck bit at input terminal
  - Focused Ion Beam (FIB) pads placed on the chip at suspect area show unexpected pullup (short) on an internal module input.
  - Future FIB inspection will check circuitry connected to that input.
  - ACTEL is closed this week and thru July 4<sup>th</sup> holidays.



# FPGA Failure Analysis (cont)

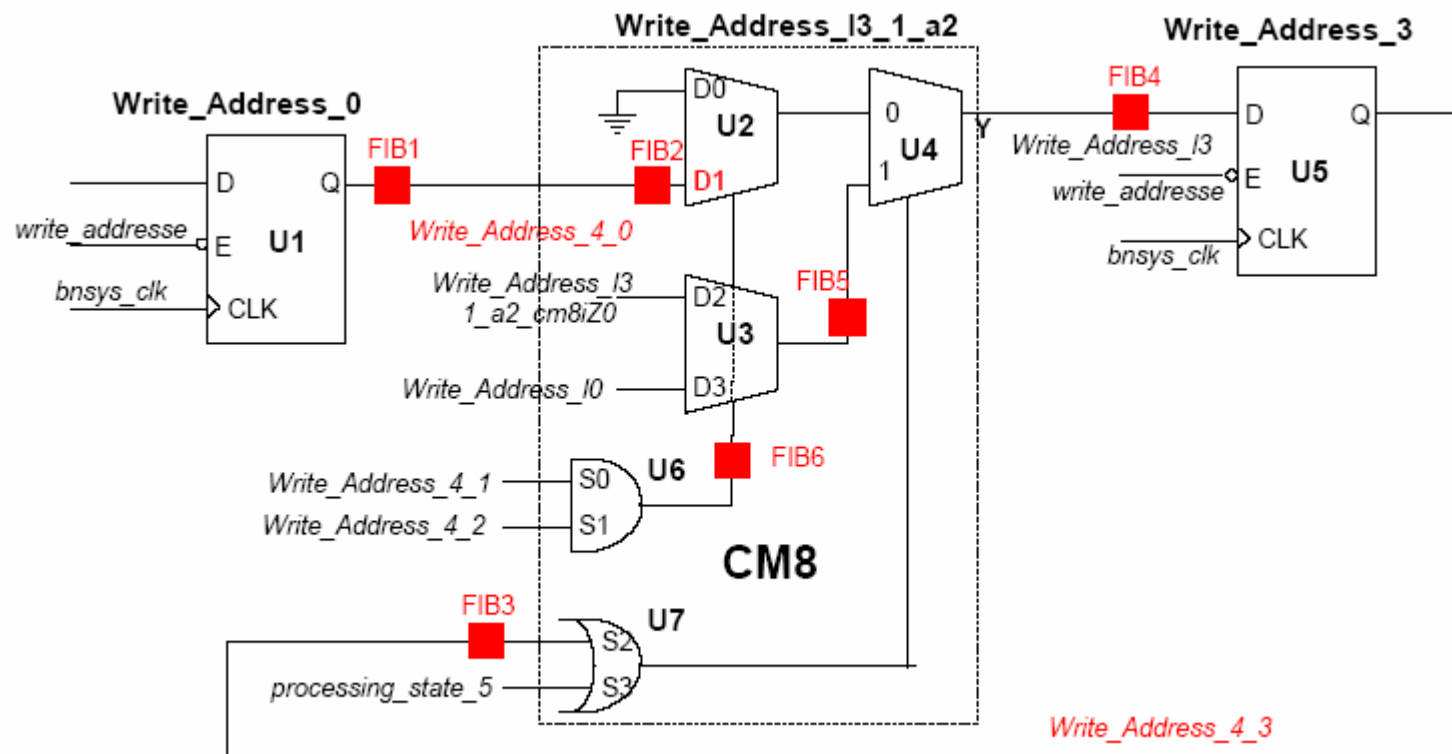
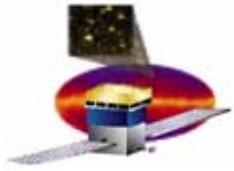
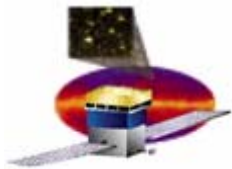


Figure 1: locations of added FIB pads



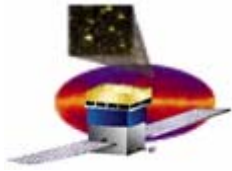
## Completion of DAQ Hardware

- ❑ All DAQ flight hardware and spares have been completed and tested with exception of spare LCB card and the redundant GASU which is in repair for failed FPGA.
- ❑ Spare GASU schedule – in rework at Aeroflex
  - FPGA has been replaced and the board has been conformal coated; CSI on 7/06/06
  - Completion of rework estimated 7/21/06
  - Functional test and environmental retest follow.



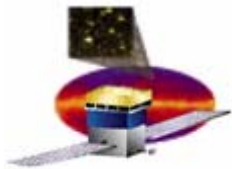
## PBC Install Status – good news

- ❑ The installation scripts have been run > 10 times on EM hardware
- ❑ The scripts are “Paranoid”
  - They abort if an error is encountered
  - They take advantage of FMX to ensure that the correct files are being loaded
- ❑ Script status:
  - SIU and EPU scripts frozen by June 27
  - Procedures finalized June 28
  - Anticipated V&V on June 29-30
  - Works with FSW version 6.9
- ❑ Each will be run > 5 times for further confidence
- ❑ If successful, installation will begin on July 6<sup>th</sup> – 7<sup>th</sup>
  - Jana Thayer will be at NRL to lead the effort



## PBC Install Status – bad news

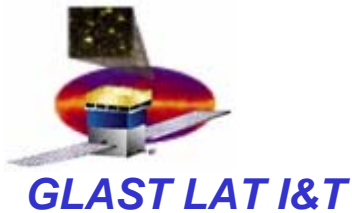
- ❑ **During an SIU practice run, the watchdog timed out and the crate rebooted**
  - Still trying to understand why the watchdog timed out
  - The burn of all 4 PBC images was *successful*
    - Reboot occurred when the rad750 clock speed was changed back to normal (after the write)
  - Script run > 10 times successfully before the watchdog reset
  - The procedure was repeated about 5 times yesterday with no new reboots
- ❑ **Effect on schedule:**
  - LICOS scripts and documentation ready; there are unlikely to be any changes to the scripts as a result
  - To fix the problem will probably require a change to the FSW, either DDT or the watchdog or ?
    - Can't be any more specific until we know more.



## Risks of installing new PBC (1 of 2)

- **If all 4 images of the PBC get corrupted in an SIU or EPU the unit will have to be programmed through the front panel**
  - **Remove the X-LAT plate**
  - **Remove the box**
    - Remove the front plate
    - Remove cover on RAD-750
  - **Note: This does not require breaking any connections within the unit including any of the backplane connections**
  - **Install the new PBC through the front panel using the Corelis JTAG tool**
  - **Reinstall the covers**
  - **Perform a functional test on the box**
  - **Install the box on the LAT**
  - **Reinstall the X-LAT plate**



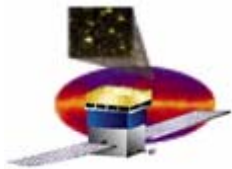


## Risks of installing new PBC (2 of 2)

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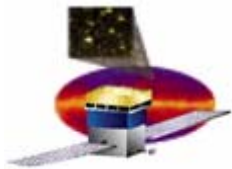
### □ Mitigations

- Practice, practice, practice
- “Paranoid” script and procedure
- The only anomaly that has been observed during script development is when a unit rebooted. Slowing the system clock in order to program the SUROM caused an unrecoverable error in the time hack software resulting in a reboot.
  - All software has been checked for sensitivity to the clock speed, and a special version of the time hack software has been created for use with DDT
  - That reboot corrupted only one copy of the boot
  - The unit could still be rebooted and had that happened on the LAT it would not have required deintegration



# Flight Software Status

- ❑ **Baselined 0.6.6: 149 of 183 requirements**
  - completed FQT 4/17/06
- ❑ **Currently Operating LAT with 0.6.9**
  - Corrections to 0.6.6 functionality / bug fixes
- ❑ **Requirements not covered in 0.6.9**
  - Diagnostic science modes / data (13 rqmts)
  - GRB handling infrastructure and algorithm (16 rqmts)
  - FSW standards (5 rqmts)
- ❑ **Missing Functionality in 0.6.9**
  - Science data stream compression, LPA process - part of event filtering and capacity (rqmt 5.3.9.1)



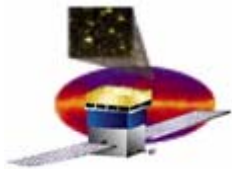
# FSW Development Priorities

## □ Priorities

- I&T support. Critical bug fixes. (no active critical debugging at this time)
- Science data compression
- GRB framework
- GRB algorithm
- Other bug fixes and enhancements

## □ Plan

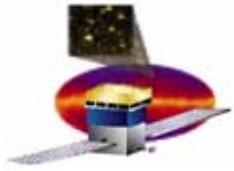
- Maintain B0.6.9 FSW thru LAT environmental test
- d-FQT- A – mid August
  - 178 of 183 requirements, all but compression and GRB algorithm
- d-FQT –B – in November
  - 183 of 183 requirements – GRB algorithm
  - Install in LAT prior to observatory environmental test



## FSW Completion (1)

### □ Build 0.6.10

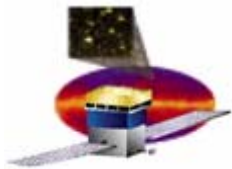
- **Planned for ~ 7/17/06**
- **Includes Diagnostic Functions (13 rqmts)**
  - 5.3.13.1.1 ACD Cosmic Ray Sample Events (script)
  - 5.3.13.2.1 ACD Trigger Mode (script)
  - 5.3.13.2.2 Pedestal Data (script)
  - 5.3.13.1.9.x (Filters for) CAL Cosmic Ray Calibration (7 requirements)
  - 5.3.13.1.10.x (Filters for) TKR Cosmic Ray Calibration (3 requirements)
- **Includes GRB handling infrastructure (everything but algorithm)**
  - 5.3.10.x GRB Detection (4 requirements)
  - 5.3.11.x GRB Response (9 requirements)
  - 5.3.15.x GRB-related Mode Control (3 requirements)
- **Will not be installed on LAT but is interim build for testbed V&V**
- **Delta-FQT-A (~ 8/14/06) all except GRB algorithm related requirements**
  - Complete 178 of 183 requirements. The GRB framework will include a test version of the GRB algorithm so we can prototype test all 183 requirements



## FSW Completion (2)

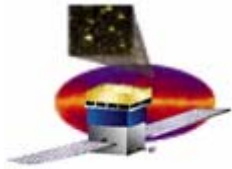
### □ **Build 0.6.11**

- **Include compression of science data streams**
- **Available around 8/14/06**
- **Install on LAT prior to integration onto Observatory**
  - The installation may occur at NRL or SASS, depending on available time for installation and regression testing.



# LAT Compression

- ❑ **Two FSW Processes – LPA (science data stream) and LCI (charge injection calibration) use data compression.**
  - **Each optimized for the particular characteristics of the data streams to be compressed.**
- ❑ **LPA Compression**
  - **Each datagram individually compressed.**
    - Compression symbol table
    - Sequence of individually compressed events.
      - Minimizes data loss on errors or dropouts.
  - **Expect to achieve net compression of 3 – 3.25.**
  - **Conservative resource load is < 25%.**
- ❑ **LCI Compression**
  - **Similar to LPA but different due to data organization and correlations**
  - **Currently in use in B0.6.9**



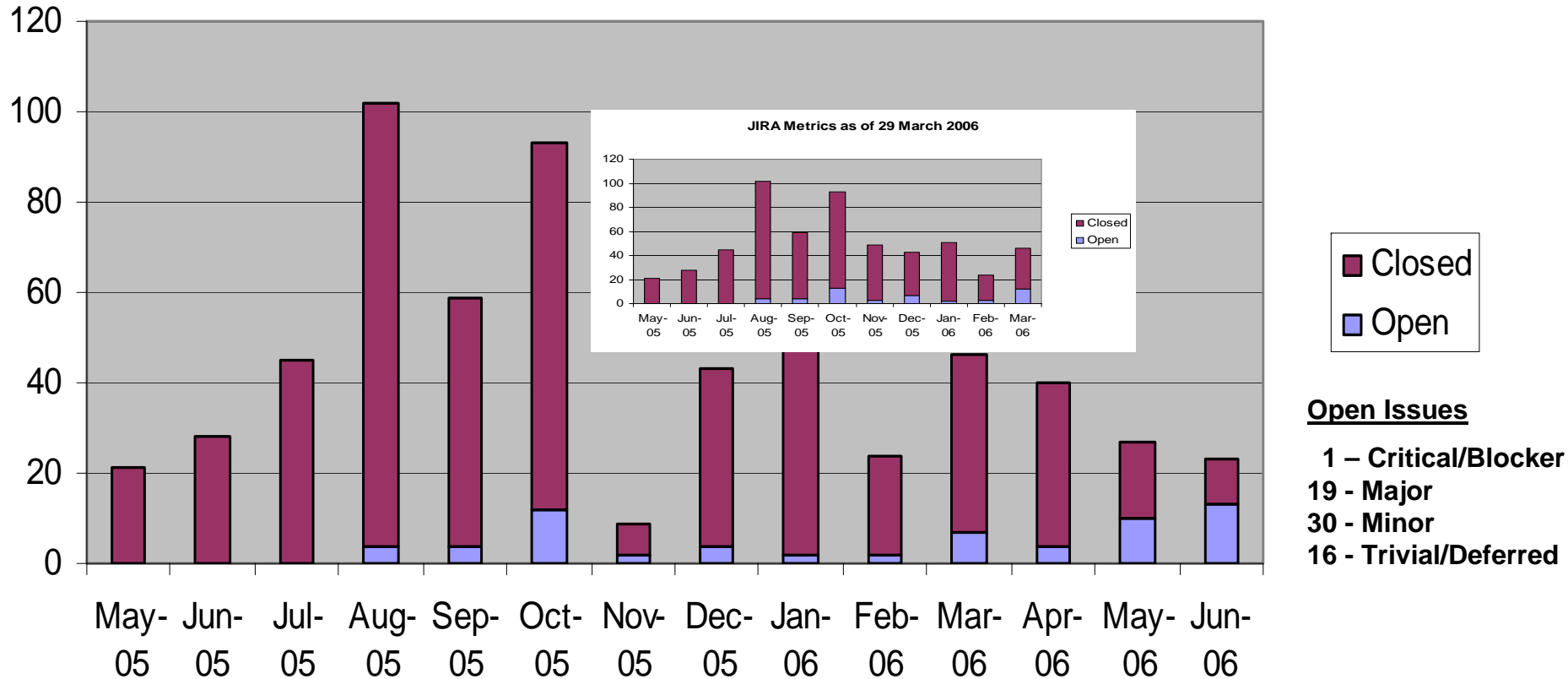
## FSW Completion (3)

### □ Build 1.0.0

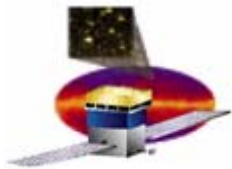
- Includes GRB algorithm
- Includes FSW Standards
  - 5.4.1 System of Units (metric system)
  - 5.4.2.x Coordinate Systems (3 requirements)
  - 5.4.3 Resource Margin
- Available around 10/16/06
- Delta-FQT-B (11/16/06)
  - Complete 183 of 183 requirements
- Install on LAT prior to Observatory Environmental Test

# JIRA Metrics

JIRA Metrics as of 26 June 2006







# Top FSW JIRAs

| Priority | Key                     | Summary   | Issue Type  |
|----------|-------------------------|---|-------------|
| Critical | <a href="#">FSW-292</a> | Implement GRB detection algorithm   | New Feature |
| Major    | <a href="#">FSW-673</a> | Remove CDM Database Unload from EDS   | Bug         |
| Major    | <a href="#">FSW-670</a> | Update PFC Event Processor  | Bug         |
| Major    | <a href="#">FSW-669</a> | Repair LHK TEM E Telemetry Description  | Bug         |
| Major    | <a href="#">FSW-665</a> | Fix LMC Counters  | Bug         |
| Major    | <a href="#">FSW-650</a> | LPA Does Not Report Handler Installation Failures                                     | Improvement |
| Major    | <a href="#">FSW-646</a> | Remove Unused Parameters from LPA_DB Schema   | Improvement |
| Major    | <a href="#">FSW-645</a> | Add SBC Database Key To LPA Datagram Configuration                                    | New Feature |
| Major    | <a href="#">FSW-640</a> | Create a duplicate of the gamma filter with all vetoes disabled                       | New Feature |
| Major    | <a href="#">FSW-638</a> | Increase Max Allowed LPA DB Instances   | Improvement |
| Major    | <a href="#">FSW-633</a> | Add New Mode Associate Command to LPA   | New Feature |
| Major    | <a href="#">FSW-623</a> | CLONE -Documentation for several apids needs to be added to standard webpage          | Improvement |
| Major    | <a href="#">FSW-576</a> | Bug in CAL data compression algorithm   | Bug         |
| Major    | <a href="#">FSW-369</a> | MSG needs to disable reports from within the MSG task                                 | Bug         |
| Major    | <a href="#">FSW-341</a> | LPA Mode Change/Flush Behavior is Incorrect   | Bug         |
| Major    | <a href="#">FSW-305</a> | Summary/statistics telemetry stream needs to be created for on-board event processors | Improvement |