Gamma-ray Large Area Space Telescope
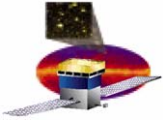
GLAST Large Area Telescope

Monthly Mission Review

LAT DAQ and Flight Software Status
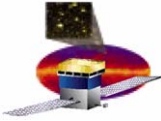
July 28, 2006

Gunther Haller

**Stanford Linear Accelerator Center**

Topics

- **Hardware Completion**

- **Flight Software Completion**

- **Preparations for August FSW Delta-FQT**

- **FSW JIRA Status**

Status of DAQ Hardware

- **Status of Spare LCB**
  - **In line for testing**
  - **This board is the 3rd spare; no critical path is affected**

- **Followup from last month's redundant GASU FPGA failure**
  - **Analysis of incident is complete**
  - **ACTEL is working on a final report**

- **Spare Flight GASUs**
  - **Aeroflex replaced the failed ACTEL FPGA**
  - **GASU box reassembled and shipped to SLAC early this week**
  - **Safe-to-mate testing has begun**
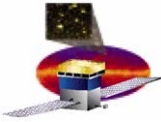   - **Followed by TC, Vib, TV, EMI tests**
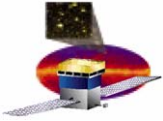
Outcome of July PBC Installation

- **Primary Boot Code**
  - **Successfully re-burned PBC on all 5 LAT SIU/EPU crates**
  - **Completed 7/6 – 7/7**
- **Secondary Boot Code**
 - **Uploaded B0-6-9 secondary boot code module to LAT crates**
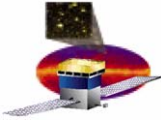
Flight Software Status

- **Baselined 0.6.6: 149 of 183 requirements**
  - **Completed FQT 4/17/06**

- **LAT Operation at NRL Continues using Build 0.6.9**
  - **With one exception: A small set of thermal control configuration files were modified and loaded to support TVac**
    - **Rather than issue a Build 0.6.10 to provide these new configurations, FSW produced only the needed files**
    - **Though produced outside of a formal release, the modified source code and files are tracked in CMX and FMX**

FSW Development Priorities

- **Priorities**
  - **Continue 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**
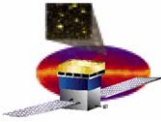
FSW Completion (1)

- **Build 0.6.10**
  - **Released 7/14/2006**
  - **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)**

- **Will not be installed on LAT but is interim build to support:**
  - **Preparation for d-FQT-A**
  - **Testbed V&V**
 - **Testing, evaluation, and refinement of the new diagnostic filters**
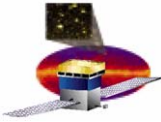
New Diagnostic Filters

- **Utilized in the same way as the Gamma filter already running with Build 0.6.9 at NRL:**
    - Decide on the filter(s) to use before starting a data collection run
    - Command the LAT Physics Acquisition (LPA) software application to select the desired filter set
- **DFC - Diagnostic Filter**
    - Provided purely for testing purposes
    - Used to filter out a specified rate of external/solicited/periodic triggers from the actual physics triggers to show that the nature of the physics data is immune to a high rate of activity in the LAT.
- **MFC - Minimum Ionizing Filter**
    - This filter is meant to be a multi-purpose filter to select Minimum Ionizing Particles. By installing multiple copies with different parameter settings one can (for example)
        - Select inter-tower MIP tracks for track alignment purposes
        - Select intra-tower MIP tracks for track alignment purposes
        - Select MIP particles for ACD tile calibration purposes
- **HFC - Heavy Ion Filter**
    - This is meant to select CNO events.
    - It has a number of adjustable parameters to select the Z cutoff value and to match the cuts with the actual resolution of the calorimeter.
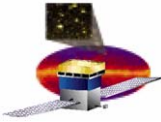
Update on Science Data Compression

- **Good progress made:**
  - **Encoding: GEM - done , ACD – done, TKR - 75%, CAL - prototype code**
    - **Includes specialized compression for:**
      - **normal readout**
      - **non-zero suppressed readout**
      - **4-range readout**
  - **Decoding: Work not started, although decoding should be much easier than encoding**

- **Final set of compression code to be released with Build 0.6.11 or 0.7.0**
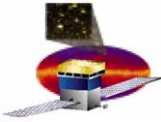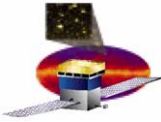
FSW Completion (2)

- **Build 0.6.11**
  - **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)**
  - **Available the week of 8/7**
  - **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.**
- **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**
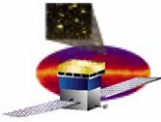
FSW Completion (3)
Deferred Enhancements

- "Build 0.7.0"
  - FSW development effort through 0.6.10 and 0.6.11 is focused on I&T support and requirements selloff at FQT
  - So far, enhancements have been deferred
    - A total of 58 enhancements proposed by Systems Engineering and the ISOC
    - A request from working groups to be able to perform immediate analysis on a small number of events "leaked" down in the real-time alert telemetry stream during a GRB
- FSW has agreed to fold these enhancements into the development schedule:
  - 7/21 FSW CCB meeting held with all interested parties
    - Pruned the list of 58 items down to ~20 items now formally tracked in JIRA
  - ISOC: improvements to telecommand and telemetry interface and command confirmation functionality
  - SE: Improve access to and control over hardware registers; provide clearer indication of EPU boot state in telemetry
  - FSW configuration files: improve onboard traceability
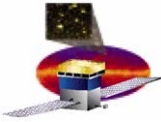- GRB real-time event delivery in Build 1.0.0

FSW Completion (4)

- **Build 1.0.0**
  - Includes GRB algorithm and shipment of real-time events down in alert telemetry stream
  - 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**
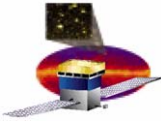
Preparation for FSW Delta-FQT-A

- **Test Procedure Status**
  - **3 of 3 DCMODE test procedure documents for diagnostic filters and data collection are complete**
    - **Minor procedure updates to reflect specific details of the 0.6.10 implementation in progress**
  - **3 of 4 GRBREQ and GRBPRC test procedure documents for the GRB-related requirements are drafted and under review by SQA and SE**
    - **The 4th test procedure document (for test GRBPRC_001) is deferred to FQT-B, when the detection algorithm is complete**
  - **Procedure document OPMODE_002 for GRB-related mode changes is complete**
- **Test Script Status**
  - **Script development**
    - **DCMODE: 1 of 3 scripts complete**
    - **GRBREQ: 2 of 2 scripts complete**
    - **GRBPRC: 1 of 2 scripts complete (remaining script deferred to FQT-B)**
    - **OPMODE_002: Script complete**
  - **Script dry runs**
    - **DCMODE: 1 dry run completed last spring**
    - **GRBREQ: Dry runs to be completed in early August**
    - **GRBPRC: Dry run to be completed in early August**
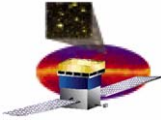   - **OPMODE_002: Dry run complete**

JIRA Metrics

## JIRA Metrics as of 27 July 2006
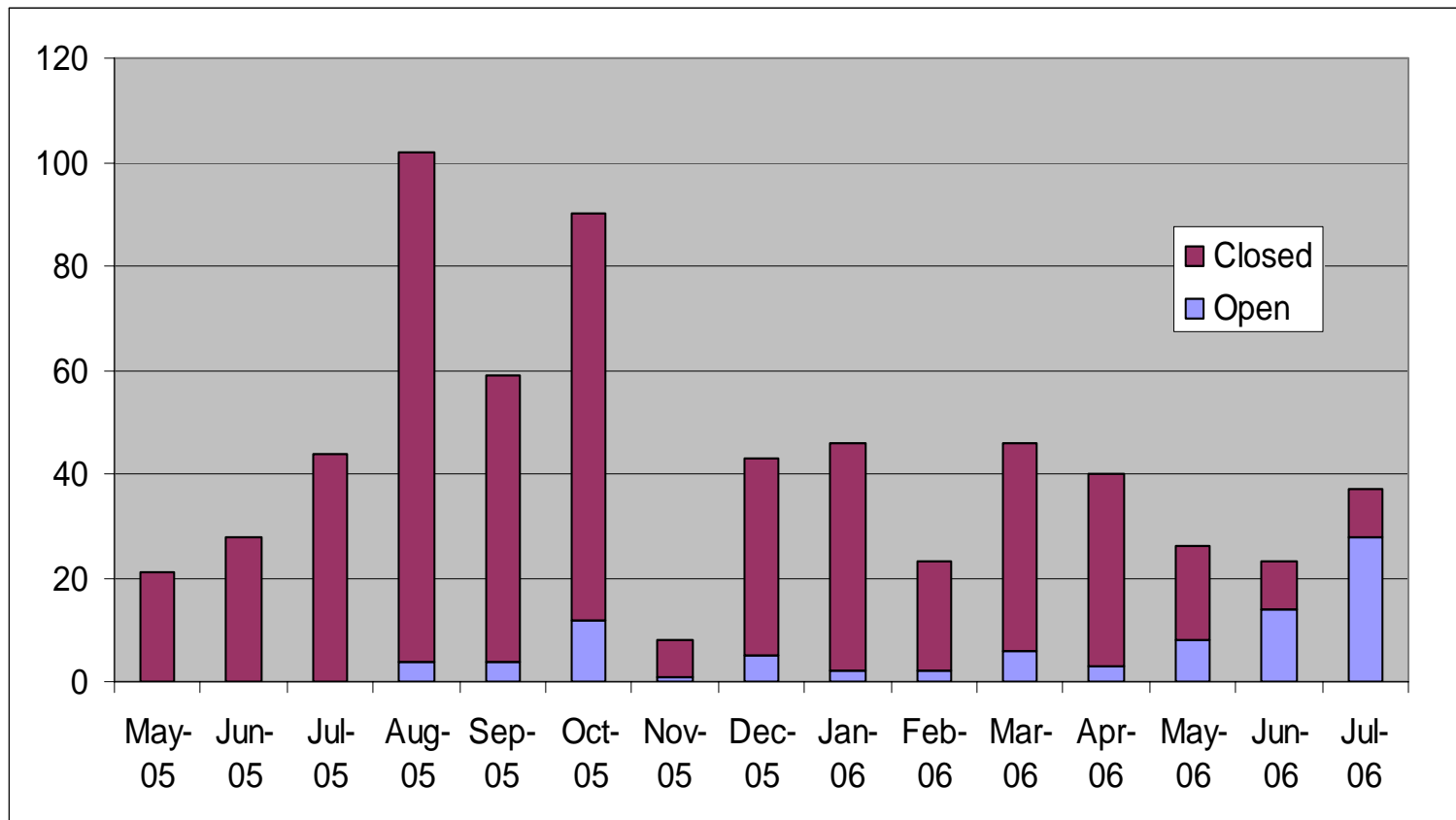
Open Issues

1   – Critical/Blocker
23 – Major
42 – Minor
8   – Minor

Top FSW JIRAs (Critical or Major Severity)

Priority	Key	Summary	Issue Type
Critical	FSW-292	Implement GRB detection algorithm	New Feature
Major	FSW-456	EMP and LCM do zlib compress with malloc/free, should use MBA_alloc/free	Improvement
Major	FSW-305	Summary/statistics telemetry stream needs to be created for on-board event processors	Improvement
Major	FSW-369	MSG needs to disable reports from within the MSG task	Bug
Major	FSW-576	Bug in CAL data compression algorithm	Bug
Major	FSW-623	CLONE -Documentation for several apids needs to be added to standard webpage	Improvement
Major	FSW-341	LPA Mode Change/Flush Behavior is Incorrect	Bug
Major	FSW-682	LTC estimation filter timescale is too short	Improvement
Major	FSW-680	Swap LHKPnxHP3DSIT and LHKPnxHP5DSIT to address miswiring of thermal sensor	Bug
Major	FSW-562	Make sure that PIG's power sequence is still correct	Improvement
Major	FSW-168	Add LIM mode status to regular housekeeping packet	New Feature
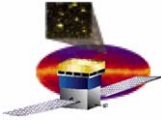
Top FSW JIRAs (Critical or Major Severity) (2)

Major	FSW-684	There need to be general no-op commands for each task.	New Feature (7/21 ENHANCEMENTS MTG)
Major	FSW-685	Expand LHKDIAGAPID argument range for LHKREQDIAGPKT	Improvement (7/21 ENHANCEMENTS MTG)
Major	FSW-686	Mnemonic LHKSMEM0MPTID should be LHKSMEMDMPTID	Improvement (7/21 ENHANCEMENTS MTG)
Major	FSW-687	LHKT0TEM28V0ST and LHKT0TEM28V1ST et al are missing conversion	Improvement (7/21 ENHANCEMENTS MTG)
Major	FSW-270	mnemonics in telemetry packet 720/0x2D0 do not begin with ?L?	Improvement
Major	FSW-698	Separate LTC master config files into fof, data	Improvement (7/21 ENHANCEMENTS MTG)
Major	FSW-699	Create report to identify configuration files in use	Improvement (7/21 ENHANCEMENTS MTG)
Major	FSW-701	Add flexibility to MSG level output based on destination	Improvement (7/21 ENHANCEMENTS MTG)
Major	FSW-702	EPU secondary boot indication	Improvement (7/21 ENHANCEMENTS MTG)
Major	FSW-704	Read, report and clear flag registers	Improvement (7/21 ENHANCEMENTS MTG)
Major	FSW-703	Ensure all registers are set	Improvement (7/21 ENHANCEMENTS MTG)
Major	FSW-705	Support chip reset commands (and possibly others)	Improvement (7/21 ENHANCEMENTS MTG)
Major	FSW-688	LMEMPAD re-use	Improvement (7/21 ENHANCEMENTS MTG)