Gamma-ray Large Area Space Telescope

GLAST Large Area Telescope

Instrument Flight Software

**Monthly Status Review
December 2, 2004**

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November Issues

- **Resolution of SUROM Discussion**
  - The discussion group decided that four checksummed images of the PBC code should be stored in the SUROM, and a small piece of EMC or CPU boot code should run the first PBC image it finds with a valid checksum.

- **Changes in Toolset for FSW Test Team**
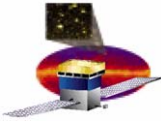 - Possibly switch to LTX/SCP package as a major tool, replacing LATTE

November Activities

- **Expanded FSW code management system (CMX)**
  - **Enhancements are complete**
    - **System can now generate/regenerate entire FSW build**
  - **The upgraded system will be used to generate the ISIS FSW build**

- **Inter-task Communications System (ITC, LCS, CTS)**
  - **Phase 2 of ITC development for CPU to CPU communications is nearly complete**
    - **Testing to begin**
    - **The ITC upgrade makes Friday's demonstration possible:**
      - **Telecommand processing (w/ verification) on SIU**

- **Housekeeping (LHK)**
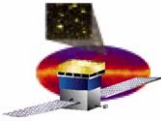 - **Coding complete, except for dependencies on ITC**

- **FES**
  - **Front End Simulators are producing all necessary data: CAL, TKR, and ACD**

November Activities (2)

- **LAT Communications Board Driver and Test Code (LCBD, LCBT)**
  - Driver implementation and testing are complete
  - Completion of the LCB driver and hardware makes the following possible:
    - I&T can now move events at rates limited only by deadtime
    - The Testbed can be operated along the entire chain for the first time:
      - FES ----> T&DF hardware -----> RAD750 -----> LATTE display

- **Primary Boot Code (PBC)**
  - Added SIU application-level BOOT command and BOOT telemetry handlers
    - SIU can now forward boot commands to and boot housekeeping from the EPUs
  - Minor modifications to memory test, initialization, and scrubbing procedure
  - Minor changes to EMC and assembly code
 - Began implementing the PBC checksum code

November Activities (3)

- **File and Memory Management (LFS, FILE, MEM)**
  - **First major release of LFS package, application-level software to handle:**
    - **File dumps, copy and deletion**
    - **Directory creation, deletion; dumps of directory contents**
  - **This development effort supports full progress on several requirements in tomorrow's demo:**
    - **6 memory management**
    - **13 file management**

- **LAT Electronics Module Package (LEM)**
  - **Coding complete**
  - **Bug fixes and minor updates**

- **LAT Configuration Package (LATC)**
  - **Coding complete**
  - **Will soon be released to I&T**

- **Power-On and Initialize GASU Package (PIG)**
  - **Coding complete**
 - **Bug fixes and minor updates**
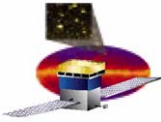
November Activities (4)

- **Attitude/Time Processing (LSM)**
  - **On the attitude piece**
    - **Producing attitude information sourced from a standalone orbit generation program (STK)**
    - **Coding SIU routines to maintain a time history of these packets**
  - Two goals:
    - **Provide a source of attitude and time data that can be used by the FES for developing and testing the Instrument Physics code**
    - **Produce the final flight code for attitude/time processing**
  - **Gathering equipment to support the development**
    - **Purchased GPS time server**

- **Thermal Control (LTC)**
  - **Updating LTC to use new LCB driver and to accommodate other FSW changes**

- **LAT Multiplexed Counters (LMC)**
  - **Allows the ground to request that CAL, TKR or ACD low-rate science counters be output to the SSR in science telemetry**
    - **Complements and extends the low-rate science data reported in the housekeeping stream**
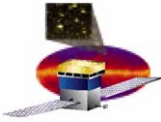
November Activities (5)

- **LAT Instrument Manager (LIM)**
  - **Work in progress**

- **LAT Diagnostics Framework (LDF)**
  - **Work in progress**

- **Charge Injection Calibration (LCI)**
  - **James Swain presented design issues at November 23 LAT Engineering Meeting**
  - **Data compression scheme to match that used for real event data (see below)**
  - **Coding has begun**

- **Instrument Physics (LPA)**
  - **Science data formatting scheme chosen**
    - **Gives close to the best compression possible, but does not demand the maintenance of external tables.**
  - **Data formats for both the ACD and CAL are well underway**
  - **Additional work on TKR data formats required**
  - **The technique being considered puts more demands for cycles on the onboard machines**
    - **It should be okay, but will be checked to make sure**

Response to September RFAs

- **RFA 1**: Calibration – Establish an ICD between FSW and Ground Calibration
  - **FSW and ISOC have agreed to create a comprehensive FSW-ISOC ICD.**

- **RFA 2:** Requirements/Test of Modes – FSW should clarify how the LAT FSW Requirement Modes and FSW Implementation Modes are addressed through FSW test. This is an area that should lead to an update of requirements so test is complete.
  - **This RFA will be addressed**

- **RFA 3:** Gamma Ray Bursts – Clarify requirement and design for Gamma Ray Burst data capture. Make a clear commitment that attempting to meet this requirement will not be allowed to cause a schedule delay.
  - **FSW clearly recognizes the importance of this issue and will not allow GRB burst capture to impact schedule**

Response to September RFAs (2)

- **RFA 4**: Mode Control – Provide clear, complete definitions of the three physics acquisition modes
  - **This RFA will be addressed**

- **RFA 5:** Requirement TBX Closure – Define deadlines for resolution of requirement TBXs and clearly communicate the deadlines to the appropriate LAT systems
  - **6 of 8 TBX's now closed. Deadlines have been communicated to appropriate LAT systems for the remaining two items.**

- **RFA 6**: Management – Clarify the approach to meeting deadlines for successful full integration of the flight software. Especially how integration problems will be handled
  - **Hired full-time engineer devoted to integration issues. This engineer will develop and document an integration plan to be reviewed by the FSW Manager.**
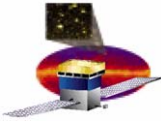
Development Status/Schedule

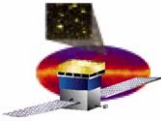| Function	Planned Code/Unit Testing Complete	Status	Remaining Effort (person weeks)	Forecast Code/Unit Testing Complete	Continuing Activities
Processor Basic Services (PBS, VXW)	Complete	100% coded	0	Complete	None
Primary Boot	10/30/04	SIU code complete EPU 90% complete	1	Complete	Checksum implementation
Secondary Boot	10/30/04	100% coded	0	Complete	None
LAT Communications Board Driver (LCBD)	12/15/04	100% coded	0	Complete	None
LCB Service (LCS)	11/30/04	50% coded	2	1/07/05	N/A
Command and Telemetry/1553 Service (CTS)	11/30/04	80% coded	1	1/07/05	N/A
Abstract/Inter-task Communications (ITC)	10/30/04	90% coded	2	1/07/05	N/A
Instrument Configuration (LATC)	12/01/04	100% coded	0	Complete	None
Command and Telemetry Data Dictionary (LCAT)	1/10/05	LCAT tool complete C&T definitions in process	2	1/07/05	N/A

Development Status/Schedule (2)

| Function	Planned Code/Unit Testing Complete	Status	Remaining Effort (person weeks)	Forecast Code/Unit Testing Complete	Continuing Activities
File and Memory Mgmt (LFS, File/Object)	11/30/04	90% coded	1	12/15/04	N/A
Housekeeping (LHK)	10/15/04	95% coded	1	1/14/05	N/A
Thermal Control (LTC)	12/01/04	80% coded	2	1/07/05	N/A
Spacecraft Interfaces (LSM)	11/15/04	80% coded	2	12/15/04	N/A
Watchdog (LSW)	11/15/04	70% coded	3	1/28/05	N/A
Mode Control (LIM)	11/15/04	Coding begins after ITC	3	1/21/05	N/A
Power/Initialize GASU (PIG, part of Basic Services layer)	11/15/04	100% coded	0	Complete	Bug fixes.
Diagnostics (LDF)	11/15/04	Being reassigned	4	01/21/05	N/A
Charge Injection Calibration (LCI)	12/15/04	20% coded	6	01/28/05	N/A

Development Status/Schedule (3)

Function	Planned Code/Unit Testing Complete	Status	Remaining Effort (person weeks)	Forecast Code/Unit Testing Complete	Continuing Activities
Event Integrity and Delivery (part of LPA)	1/07/05	80% coded	2	1/7/05	
Event Filtering (part of LPA)	1/07/05	80% coded	3	1/28/05	
GRB Detection and Response (part of LPA)	1/07/05	60% coded	2	1/28/05	

Requirements to Demo Mapping

Status thru October Demo

Note: Demonstrations held near end of planned month
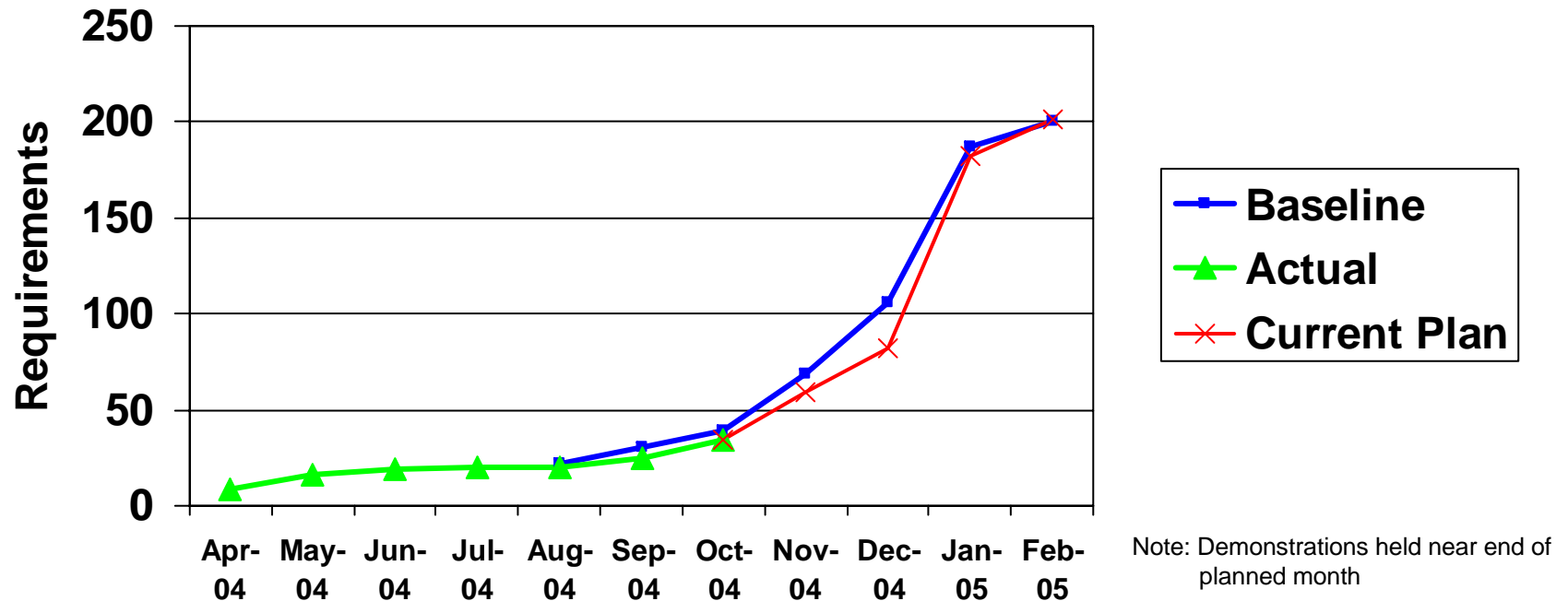
- Only fully demonstrated requirements shown in graph (one of many metrics)
- October demo: 9 of 9 planned requirements successfully demonstrated
- This month (November demo): 25 planned (command processing, file and memory management)
- Transition to demonstrations being run by FSW integration and test engineers
- Interim demonstrations to pick up missed requirements and those needing special configurations between structured monthly demonstrations
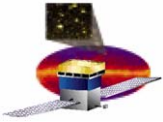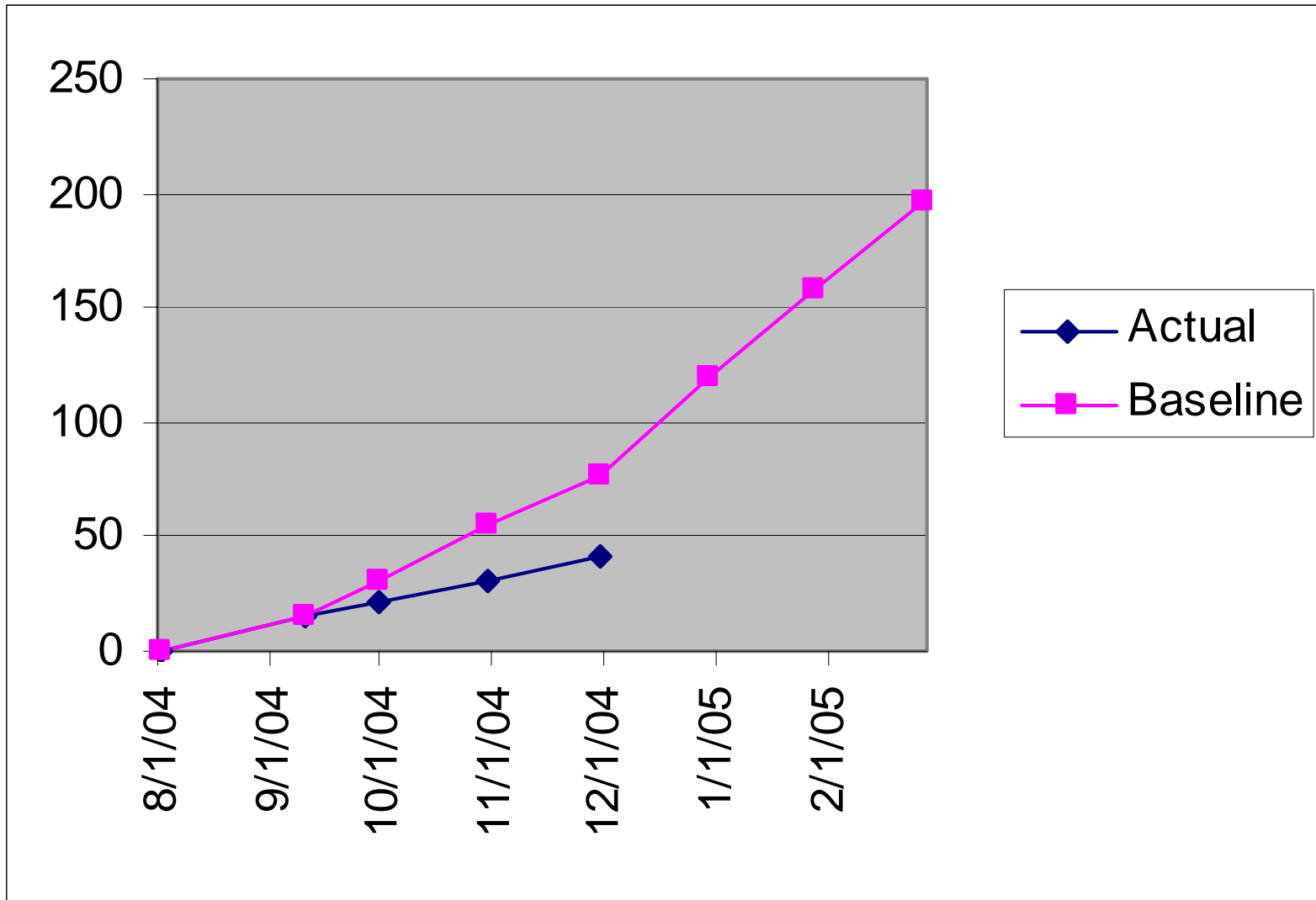
FSW Test Status

- **Overall progress on test scripts and test procedures**
  - **41 of 196 test scripts written vs. 76 planned**
  - **Updated existing test scripts against changes in FSW codebase**
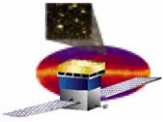
FSW Test Script Progress

FSW Test Readiness Status/Schedule

Test Name	Test Number	Responsible Eng.	Planned Script Development	Actual Script Development
1553 Interface Test	1	Shantha	Sep-04	6 of 8
FSW and LAT initialization	9a	Igor	Sep-04	13 of 19
Command Functional	2a	Shantha	Oct-04	4 of 15
SIU/EPU CPU-to-CPU Communications Functional Test	6a	Igor	Oct-04	0 of 1
FSW and LAT re-initialization and recovery	9b	Igor	Oct-04	4 of 5
File Management and Memory Upload and Dump Verification	2b	Shantha	Nov-04	14 of 22
LAT Pointing Calculations	10a	Igor V.	Nov-04	0 of 2
Electronic Calibration	8b	Igor	Nov-04	0 of 4
Narrowband Telemetry Verification	3	Shantha	Dec-04	
Operational Modes – Safe Modes	13a	Eric	Dec-04	
Event Filtering – Reception of Events and Verification of Filtering Algorithm	8a	Igor V	Dec-04	
Additional Science Processing – Repointing Logic	12b	Igor V.	Dec-04	

FSW Test Readiness Status/Schedule

Test Name	Test Number	Responsible Eng.	Planned Procedure/Script Development	Actual Procedure/Script Development
EPU Internal Configuration Test	6b	Igor	Jan-05	
Wideband Telemetry Verification	4	Shantha	Jan-05	
GRB Handling/Repointing Requests	11	Igor V	Jan-05	
Vehicle Signals Interface Verification	5	Mark Mao	Jan-05	
T&DF, TKR, CAL, and ACD Internal Configuration Test	7	Igor	Jan-05	
Additional Science Processing – GRB detection and location	12a	Igor V	Jan-05	
Operational Modes – Science Modes	13b	Eric	Jan-05	
LAT Time Signal Processing	10b	Igor	Feb-05	
LAT Diagnostic and Calibration Modes	14	Eric	Feb-05	
LAT Thermal Control System (TCS)	15	Eric	Feb-05	
LAT Event Performance Monitoring and Operations	16	Igor V	Feb-05	
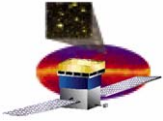
Next 3 Month's Activities

- **ISIS TRR, FQT & Delivery**

- **Development of remaining Flight Unit packages**

- **Development of Flight Unit test scripts and test procedures**

FSW Develop and Test Schedule Through FQT