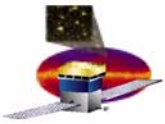**Gamma-ray Large Area Space Telescope**

Monthly Mission Review

LAT System Commissioning

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Commissioning Task Force

❑ **Commissioning Task Force**

– **Established 6 Mar 2006**

– **Charge: Complete LAT testing prior to shipment to NRL**

– **Members from DAQ, FSW, Online, System Eng**

- **Grove**
- **Haller (DAQ systems), with Russell (FSW) and Thayer (DAQ h/w)**
- **Claus (Online systems)**
- **Hascall (Sys Eng), with Bright (NCR support)**

– **Supported by Resource Management Group**

- **Members from LAT management, SLAC management, INT, DAQ, System Eng, ISOC**

– **Team in place, with knowledge across LAT subsystems and authority to assign resources needed to get finish the job.**
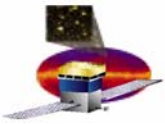
Process

□ **Daily flow**

- **Resource management meeting**
  - **Status of testing/debugging**
    - **Active discussion of anomalies and plans for resolution**
  - **Define needs, assign personnel, update daily plan**
- **Test and debug**
  - **Active, direct participation from DAQ, FSW, Online, Offline, …**
    - **Thanks to Gunther for leading the show in person most days**
    - **Large team in Bldg 33 every day, working the issues from acquisition to analysis**
  - **Anomalies lead to Commissioning JIRAs**
    - **Tool for communication, initial diagnosis, triage**
    - **Resolved to existing process for anomaly resolution**
      - » **NCRs, FSW JIRAs, Online JIRAs, information, non-issue**
- **Daily summary and plan for tomorrow**
 - **Distributed every night among Comm Team, INT, ISOC**
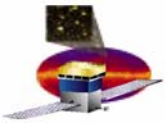
Commissioning JIRAs

❑ Commissioning JIRA list to coordinate early diagnosis of anomalies, list desired enhancements, and lessons learned during the commissioning phase

- Consistent with I&T Operations Policy, which allows a period of time to determine whether an anomaly is an operator/script error or an NCR
  - Disciplined debugging process
  - Does not supplant existing process for anomaly resolution
- Provides a central location to record recommended improvements to test methods or FSW. These are formalized in FSW or I&T JIRAs as appropriate
- Provides a mechanism to tag items for ISOC information

❑ Systems and the Commissioner routinely review the list to determine items appropriate for NCRs

- Key criterion is problem identification
- Requires some preliminary correlation of data gathered
- All Commissioning JIRAs will be closed out at end of Commissioning phase

❑ As anomalies arise

- First reported as COM JIRA
- Initial diagnosis leads to disposition
  - Hardware problems become NCRs (none yet)
  - FSW bugs become NCRs and FSW JIRAs
  - FSW feature requests become FSW JIRAs
  - Ground sw bugs and feature requests become Online or Offline JIRAs
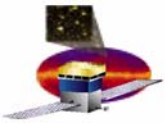
Commissioning status

- ❑ **Progress since 1 March**
  - – **Hardware**
    - • Detector and DAQ integration complete
    - • Full complement of EPUs, SIUs installed and in use after return from RAD750 NCR work.
      - – **See Gunther's summary**
  - – **FSW upgrades**
    - • Three releases: BO-6-4, BO-6-5, BO-6-6
    - • Successfully collecting LAT data from LPA (physics runs) and LCI (charge injection calibration)
  - – **Ground software**
    - • LICOS test executive in use
      - – **Scripts for test cases**
      - – **Basic housekeeping alarming**
    - • Offline event reconstruction, science analysis

- ❑ **Issues**
  - – **No hardware failures**
  - – **Current issues are software**
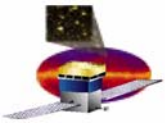
Status of Commissioning JIRAs

- ❑ **38 Commissioning JIRAs opened since 6 Mar**
  - – **10 open and under study or review**
    - • 6 of these are "improvements" or lessons learned
      - – Ex. Improvement: COM-18 Need streamlined power-down
      - – Ex. Lesson learned: COM-25 Disable unpowered trigger inputs
    - • Remaining 4
      - – Unknown
        - » COM-35 PIG register dump unreadable
      - – Likely dataflow:
        - » COM-37 Erroneous timestamps on telem packets
        - » COM-28 ACD LCI data corruption in AcdVetoCal
        - » COM-08 LCB errors in muon runs
  - – **24 resolved and/or closed to NCRs and/or FSW JIRAs, as appropriate**
  - – **4 under early NCR work**
    - • **COM-29 = NCR-851 EPU reboot on exception**
    - • **COM-19 = NCR-859 Bug in CAL data compression algorithm**
    - • **COM-10 = NCR-855 LATC verify failure for registers other than CRC**
    - • **COM-09 = NCR-854 ACD header parity errors observed**
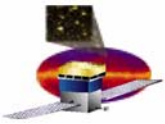
Issues: COM38 = NCR 863
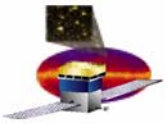
- ❑ **Anomaly Description**
  - – **LCI script TkrNoiseAndGain causes the LAT to enter a state of continuous Busy. Livetime stops incrementing, and all TREQs are discarded.**

- ❑ **Investigation**
  - – **Similar tests work on LAT via LATTE**
  - – **Preliminary investigation shows that a TEM is Busy, with corresponding TKR and CAL contributing to Busy. Monitoring of VSC FIFO flags shows no evidence that downstream pressure is contributing to the Busy state.**
  - – **Preliminary determination: Data rate is too high, coupled with a known error setting TKR timeout (existing FSW JIRA)**

- ❑ **Resolution**
  - – **Reduce the rate of data collection**
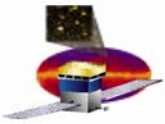 - – **Modify TEM settings during LCI runs to minimize/eliminate susceptibility to overrun.**

Issues: COM-10 = NCR 855

- ❑ **Anomaly Description**
  - – **Intermittent LATC verify errors, indicating that the registers are not set up properly**

- ❑ **Investigation**
  - – **All instances have been readout controller (RC) registers**
  - – **LATC verify report bug fixed to allow visibility into problem**
  - – **Last 2 events provided some clues that are being investigated off line**

- ❑ **Resolution**
  - – **Testing has been moved to the Dalek**
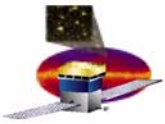 - – **LAT is being monitored with a plan to use LATTE to capture LAT state if the problem repeats**

Commissioning goal

- ❑ **Before shipment from SLAC, demonstrate flight and ground processes for:**
  - – **Instrument health and safety monitor**
    - • **LHK, alarming**
  - – **Subsystem performance monitor**
    - • **Detector CPTs, LPTs**
      - – **CPT dry runs completed (with two exceptions)**
    - • **T&DF "CPT"**
      - – **Not yet demonstrated, scripts under development**
    - • **Baseline requirement verification**
  - – **Calibration**
    - • **Electronic calibration (LAT07x)**
      - – **Not yet demonstrated, but CPTs contain abbreviated versions of the same processes**
      - – **Ground analysis of LCI not yet demonstrated**
        - » Full system won't be in place prior to shipment to NRL
        - » Process will rely on conversion to old data format (LDF) until then
    - • **Particle calibration (LAT70x, LAT71x)**
      - – **Dry runs completed**
    - • **Calibration exists and is in use (collected under LATTE)**
  - – **S/C interfaces**

Conclusion

❑ **Commissioning team is in place**

- **Large group from subsystems, DAQ, FSW, …, Offline working together in Bldg 33**
    - **Gunther is leading the current DAQ commissioning**
- **Actively communicating**
    - **COM JIRAs and daily status/plan**

❑ **Current issues**

- **No hardware failures**
- **Software issues are being worked**