**Gamma-ray Large Area Space Telescope**

# GLAST Large Area Telescope
## Instrument Science Operations Center

## Monthly Status Review
## 6 December 2007
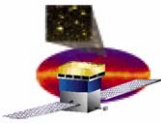
**Rob Cameron**
**ISOC Manager**

# ISOC Highlights

❑ **Recent Events**

– **ETE Test #3: 14-15 November**

– **Day-in-the-life Test: 16-17 November**

❑ **Upcoming Events**

– **LEO sim #3: 17-19 December**

– **ISOC Ops Sim 2: 4-7 March**

– **Mission Planning Exercise 3: starts 14 January**

– **GLAST Flight Operations Review: GSFC, 7-8 February (?)**

– **LAT analysis workshop: 5-8 February**
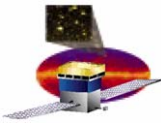
– **ISOC Ops Sim #2: 4-7 March**

# Narrative Procedure Development

- ❑ **All 110 LAT NPs are at level 3 or higher**
- ❑ **Effect of FSW B1-0-5 and B1-0-6 changes on NPs**
  - – **Additional telemetry is available to verify function of command – but no need to update associated PROCs**
- ❑ **Baseline each NP after validation of associated PROCs is complete and a final review of NP is conducted**

| Status by ETE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ETE | Date | # of Procedures | Level | | | | | |
| | | | 1 | 2 | 3 | 4 | 5 | 6 |
| ETE 1a | Apr-07 | 2 | 0 | 0 | 0 | 0 | 2 | 0 |
| ETE 1b | Jul-07 | 9 | 0 | 0 | 0 | 0 | 9 | 0 |
| ETE 2 | Jul-07 | 20 | 0 | 0 | 0 | 12 | 8 | 0 |
| ETE 3 | Oct-07 | 31 | 0 | 0 | 0 | 31 | 0 | 0 |
| ETE 4 | Jan-08 | 48 | 0 | 0 | 47 | 1 | 0 | 0 |
| | | 110 | 0 | 0 | 47 | 44 | 19 | 0 |

# PROC Development

- ❑ **51 PROCs not yet tested on testbed/ETE**
    - – **Includes 26 PROCs not yet written**
    - – **All will be ready for test by ETE 4**
    - – **S. Condamoor and J. Pineau assisting with PROC development**
- ❑ **27 unvalidated PROCs identified as possible candidates for testbed-only test**
    - – **List is still being reviewed**
- ❑ **45 PROCs need to be tested or retested on LAT**
    - – **21 PROCs identified as candidates for testing in a TVAC test opportunity (can be tested during LAT physics runs)**
    - – **Have identified low priority PROCs, but objective remains to test all PROCs before launch**

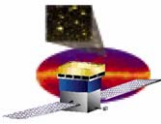| PROC | Not Started | Draft | Not complete | Coded | Needs Update | Ready for test | Tested | Validated | Total |
|------|-------------|-------|--------------|-------|--------------|----------------|--------|-----------|-------|
| Total | 26 | 11 | 0 | 3 | 5 | 6 | 21 | 68 | 140 |

# End-to-End Test #3
## Accomplishments & Issues

- ❑ **Conducted November 14-15**
- ❑ **56 PROCs ran on the Observatory, with 46 successfully verified**
  - – **LAT Fast Turn On via the MOC, HV bias set up, Physics Acquisition runs including a TOO Observation, LCI calibration runs and detection of simulated LAT GRBs exercised**
  - – **5 PROCs had minor problems, 4 require updating either the database or the values for "range checks", and one used the previous version of the PROC inadvertently**
  - – **Cause of the issues are understood in all cases except for two that are being investigated**
    - • **The two being investigated are LATACDHVBIAS & LATPWRDOWNTWRS**
- ❑ **Multiple files (LAT load files and PROC parameter files) were delivered from ISOC to MOC**
  - – **Successful load of multi-segment load files on LAT**
- ❑ **Science Configuration files (i.e. Charge Injection) loaded and used**
- ❑ **Write to Memory demonstrated**

# Day in the Life Test
## Accomplishments & Issues

- ❑ **Conducted November 16-17**

- ❑ **Many Physics acquisition runs (of 30-90 mins duration) during the DITL**

- ❑ **Most activities performed through ATS + RTS**
  - – **ATS activities went very smoothly**
    - • **A couple of minor issues due to incorrect parameter setting, requiring intervention by PROC**
    - • **PROCs used included "Cancel an ARR" and "Start a TOO"**

- ❑ **LAT/GBM interface activities exercised**
  - – **Revealed a few issues – root cause of all understood and being worked**

- ❑ **Investigated all issues experienced through the ETE3 and DITL and presented feedback to the project in the project debriefs on 4 Dec**

- ❑ **Assessment of LAT telemetry limit violations during the ETE3 and DITL indicated no unexplained violations**

- ❑ **Some issues regarding data transmission/receipt/processing are being worked**
  - – **More automation of data gap analysis**
  - – **Improve speed of time ordering and merging of event data from EPUs**
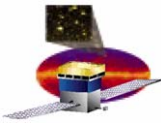
# Mission Planning Exercise #3

- ❑ **Scheduled to begin 14 Jan 2008**
- ❑ **Three weeks in duration**
- ❑ **Goals**
  - **Rehearse mid-week replan of ATS**
    - **Scenario: ARR causes ToO, which causes replan**
  - **Exercise ToO narrative procedure (part of replan effort)**
  - **Exercise sending a high-priority ATS (part of replan effort)**
  - **Exercise LAT Mission Planning software**
    - **PROC request with FSW load files**
    - **PROC request with LATC configuration files - multiple files followed by "file of files"**
    - **PROC request with filter configuration file**
    - **Send LAT down-time (notification of non data-taking period) file to GSSC**
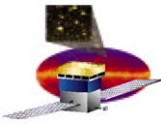    - **Send pointing request file to GSSC**

# ISOC Testing

❑ **GSRD requirements**

– **4 ISOC GSRD reqts signed off in ETE3 & DITL**

– **Cumulative status**

- **31 of 50 passed**
- **10 partially tested**
- **9 untested**

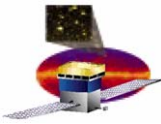– **Remaining GSRD testing planned for MPEX3, ETE4, Ops Sims**
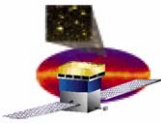
# Flight Operations Software Progress

- ❑ **FOS 4.1.1 released 11/13**
- ❑ **FOS 4.2 release preparation**
  - **Goal: Dec 17, before TVAC & MPEx #3**
  - **Updates from FSW B1.0.5/6 T&C DB changes**
  - **Various tool improvements and bug fixes**
- ❑ **In progress**
  - **Mission Planning Tool updates**
  - **Data Product Viewer**
  - **Register Browser**
  - **Improved Strip Charting**
- ❑ **Completed:**
  - **Telemetry and Diagnostic monitoring web applications**
  - **APID statistics web plots**
  - **Test/Development system setup, including databases**
  - **Improved TTG user interface and optimization**
  - **New Thermal and Power/Sides status GUIs**

# FOS JIRA issues (as of 10/27)

| Package | Issues opened since 10/27 | Issues closed since 10/27 | Total # of issues currently open |
|---|---|---|---|
| Core | 45 | 69 | 57 |
| ETC | 6 | 4 | 2 |
| Monitor: FASTcopy | 4 | 2 | 5 |
| Monitor: Logging | 1 | 3 | 2 |
| Mission Plan Viewer | 0 | 0 | 1 |
| Ops Facility | 11 | 11 | 3 |
| Packages & Installers | 2 | 3 | 1 |
| Trending: Calibration | 0 | 0 | 3 |
| Trending: Telemetry | 0 | 0 | 3 |
| Configuration System | 3 | 0 | 7 |
| LAT T&C | 1 | 2 | 2 |
| Totals | 74 | 94 | 86 |

# LAT Configuration

- **Configuration System development**
  - **I&T/Online: Completion of Register Configuration System for LATc files**
    - **Testing and configuration verification in progress**
  - **Development of standardized Config report (and associated tools)**
  - **Register Browser**
    - **Allows comparison of register configurations**
    - **Will ultimately be able to load from files, LRA, LATc dump and PIG dump telemetry**
  - **Handling of FSW CDM (*_DB.h) files**
  - **LATc binary to XML back-conversion**
- **Config CCB for TVAC files held on Nov 28**
  - **JIRA: OBCONF-5**
- **Post-TVAC: preparation and load of "launch-ready" config files**
  - **Expect Config CCB review in early Feb**
  - **Coordinating with GRB team to have GRBP DB files needed for L&EO**
    - **Analysis of "grid" of GRBs underway to refine params**
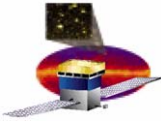
# Current Developments in Science Ops

❑ **C&A/SO workshop (Feb 5-8 at INFN Bari)**

- **Closing out the Beam Test analysis and residual discrepancies with the LAT simulations**
- **Pre-launch performance studies, from the event classification level through IRFs to flux sensitivities**
- **L&EO studies – refining the planned analyses**

❑ **Operations Simulation 2 (March 4-7 at SLAC)**

- **The emphasis will be on addressing aspects not well covered in Ops Sim 1, including mission planning activities**
- **A 7-day data set is planned; most of the time spent in the LEO 'nominal science operations' configuration – for verifying calibration procedures**
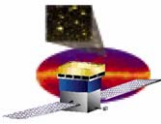- **Configurations are being defined now (E. Charles, SLAC)**

# Science Operations (cont.)

❑ **Analyses of recently obtained ground data (from dynamics testing) have been prepared to find cuts, plots, etc. that illustrate the performance of the LAT at the instrument level and can be automated for routine generation during the mission**

  – **N. Mazziotta (INFN Bari) is coordinating these**

  – **The analyses will also be run on ETE3 and DITL data**

**ACD tile counts (PMTA) for one run of muon data (S. Raino, INFN Bari)**



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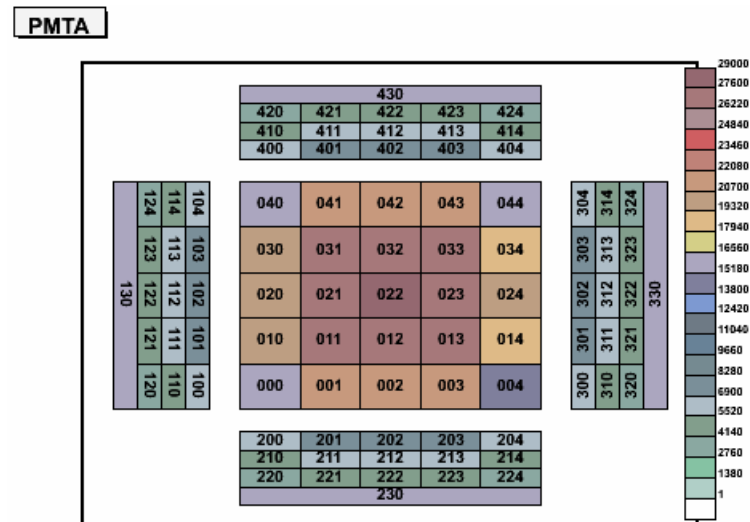
# Science Operations: ASP

- **Automated Science Processing is currently being used in real time with playback of the LEO 55-day data set**

- **The AGN and GRB groups are monitoring the Pipeline results for ASP, practicing the 'Flare Advocate' and 'Burst Advocate' activities, which include follow-up analyses**

- **ASI Science Data Center Web tools for accessing catalog data have been integrated with the ASP task for flaring source searches R. Primavera (ASI, ASDC), M. Turri, J. Chiang, T. Johnson (SLAC)**

| Creation Date | Data Type | MetaData Type | File Format | Name | location |
|---|---|---|---|---|---|
| 2007-11-18 08:42:10.0 | FT2 | | fits | FT2_55day_patch.fits | Download |
| 2007-11-28 14:45:26.0 | FT1 | "EVENTS" | fits | Filtered_evt.fits | Download |
| 2007-11-28 14:45:27.0 | DATA | "SKYMAP" | fits | Filtered_evt_map.fits | Download |
| 2007-11-28 14:47:23.0 | DATA | "PGWAVESOURCESLIST" | list | Filtered_evt_map.list | Download |
| 2007-11-28 14:47:23.0 | DATA | "DS9REGIONS" | reg | Filtered_evt_map.reg | Download |
| 2007-11-28 14:45:28.0 | DATA | "GIFSKYMAP" | gif | Filtered_evt_map_ait.gif | Download |
| 2007-11-28 14:47:39.0 | FITS | "FSUMMARY" | fits | Filtered_evt_map_pgw_out.fits | Download |
| 2007-11-19 09:15:35.0 | FT1 | | fits | merged_04810_04819.fits | Download |
| 2007-11-19 09:17:55.0 | EXPCUBE | | fits | merged_04810_04819_expCube.fits | Download |
| 2007-11-19 09:15:33.0 | FT1 | | fits | merged_04820_04829.fits | Download |
| 2007-11-19 09:18:34.0 | EXPCUBE | | fits | merged_04820_04829_expCube.fits | Download |
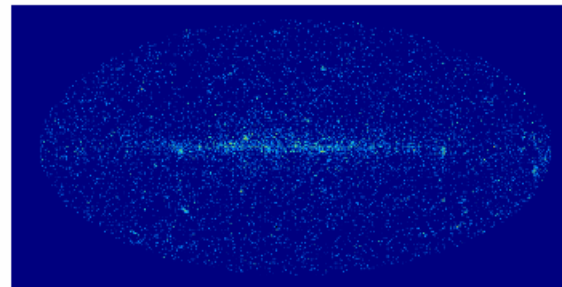
Move mouse inside image and/or click on a source

| Id | ASDC Tools | Ra | Dec | L | B | POS_ERR | Flux (E>100) | errFlux | CHI 2 | Counter Part | Flaring Flag |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | ASDC Tools | 87.25 | -67.75 | 0.0 | 0.0 | 0.0 | -1.000E0 | -1.000E0 | 0.0 | | false |
| | ASDC Tools | 299.25 | -63.25 | 0.0 | 0.0 | 0.0 | -1.000E0 | -1.000E0 | 0.0 | | false |
| | ASDC Tools | 250.75 | -46.25 | 0.0 | 0.0 | 0.0 | -1.000E0 | -1.000E0 | 0.0 | | false |
| | ASDC Tools | 128.75 | -45.25 | 0.0 | 0.0 | 0.0 | -1.000E0 | -1.000E0 | 20.282 | | true |
| | ASDC Tools | 257.25 | -45.25 | 0.0 | 0.0 | 0.0 | -1.000E0 | -1.000E0 | 0.0 | | false |

**Section of an automatically-generated web page with interactive map and tables – flaring source analysis for one downlink**

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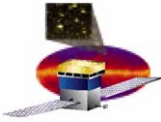
# SAS Status

- **Service Challenge Work**
  - **55 day run main processing completed**
  - **On-going "real-time" data release to collaboration**
    - **Through GSSC and LAT Data Servers**
  - **ASP being run daily on data**

  - **GlastRelease v13 series underway**
    - **Improvements to TriggerAlg**

  - **Processing started for the Big Run: 1 orbit year**
    - **Main processing: expected completion in late December**
    - **Will run some 200,000 batch jobs and fill 40 TB of disk**
    - **Using 350 - 750 cores in SLAC farm**

- **Xrootd**
  - **All Big Run disk access through xrootd**
    - **Will load balance disk usage**
    - **Tape archive**
    - **Proving benefit (file recovery after server crash)**
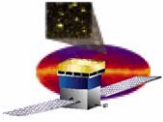
# Backup Slides

# LAT Configuration CCB "Charter"

❑ **LAT configuration will be controlled within the LAT CCB framework**

❑ **Serves as entry point for input from science community (SOOG and GSSC) regarding intent of LAT onboard configurations**

❑ **Approve intent of proposed changes of onboard configuration for various operational scenarios**

❑ **Define general guidelines for testing required for various classes of changes**

❑ **Make implementation decisions for approved changes in cases where implementer requires clarification**

# CCB Members

- ❑ **CCB Chair: ISOC Manager**
- ❑ **Approval Expected:**
  - **LAT Configurator**
  - **LAT Commissioner (thru L+60D)**
  - **Science Ops**
  - **Flight Ops/FSW**
  - **Deputy PI**
  - **Systems Engineering (thru L+60D)**
- ❑ **Approval as needed/optional:**
  - **I&T/Online**
  - **LAT Project Manager (thru L+60D)**
  - **SOOG/Deputy PI**
  - **LAT Analysis Coordinator**
  - **SAS**
  - **LAT Calib&Analysis**

# Controlled Items

- ❑ **A subset of the FSW CDM files (*_DBs) that contain science configuration data (pedestals, gains, filter configuration, GRB algorithm parameters, etc.)**
- ❑ **Application configuration files for housekeeping, thermal control, and charge injection**
- ❑ **Instrument configuration files: LATC, LATC ignore**
- ❑ **RTS command blocks**
- ❑ **EEPROM management strategy (e.g., when to delete obsolete files)**

- ❑ **Note:**
  - **In the prelaunch era after B1-0-2 is uploaded**
    - **The Onboard Configuration CCB approves uploads of controlled items to the EEPROM**
    - **Uploads of controlled items to RAM for testing purposes remains under the purview of the LAT I&T team**
  - **Post-launch, upload of controlled items to RAM will also require approval by the Onboard Configuration CCB**

# Nominal CCB Process

```
                        ┌─────────────────────┐
                        │  Proposed change    │
                        │  entered in JIRA    │
                        └─────────────────────┘
        ┌───────────────────────────────────────────────┐
        ▼                                                ▼
┌──────────────────────────┐                  ┌────────────────────┐
│ Configurator implements  │                  │                    │
│ & tests change,          │─────────────────▶│   CCB members      │
│ reporting                │                  │   notified         │
│ progress/problems/       │◀───────┐         │                    │
│ completion in            │        │         └────────────────────┘
│ Confluence/JIRA          │        │                   │
└──────────────────────────┘        │                   ▼
        │                           │         ┌────────────────────┐
        │                           │         │ CCB members provide│
        │                           │         │ input (w/deadline) │
        │                           │         └────────────────────┘
        │                           │                   │
        │                           │                   ▼
        │                           │         ┌────────────────────┐
        ▼                           │         │ CCB chair approves,│
┌──────────────────────────┐        └─────────│ rejects, or assigns│
│ Upon completion          │                  │ further action     │
│ CCB chair approves       │◀─────────────────│ based on input     │
│ for upload               │                  └────────────────────┘
└──────────────────────────┘
```
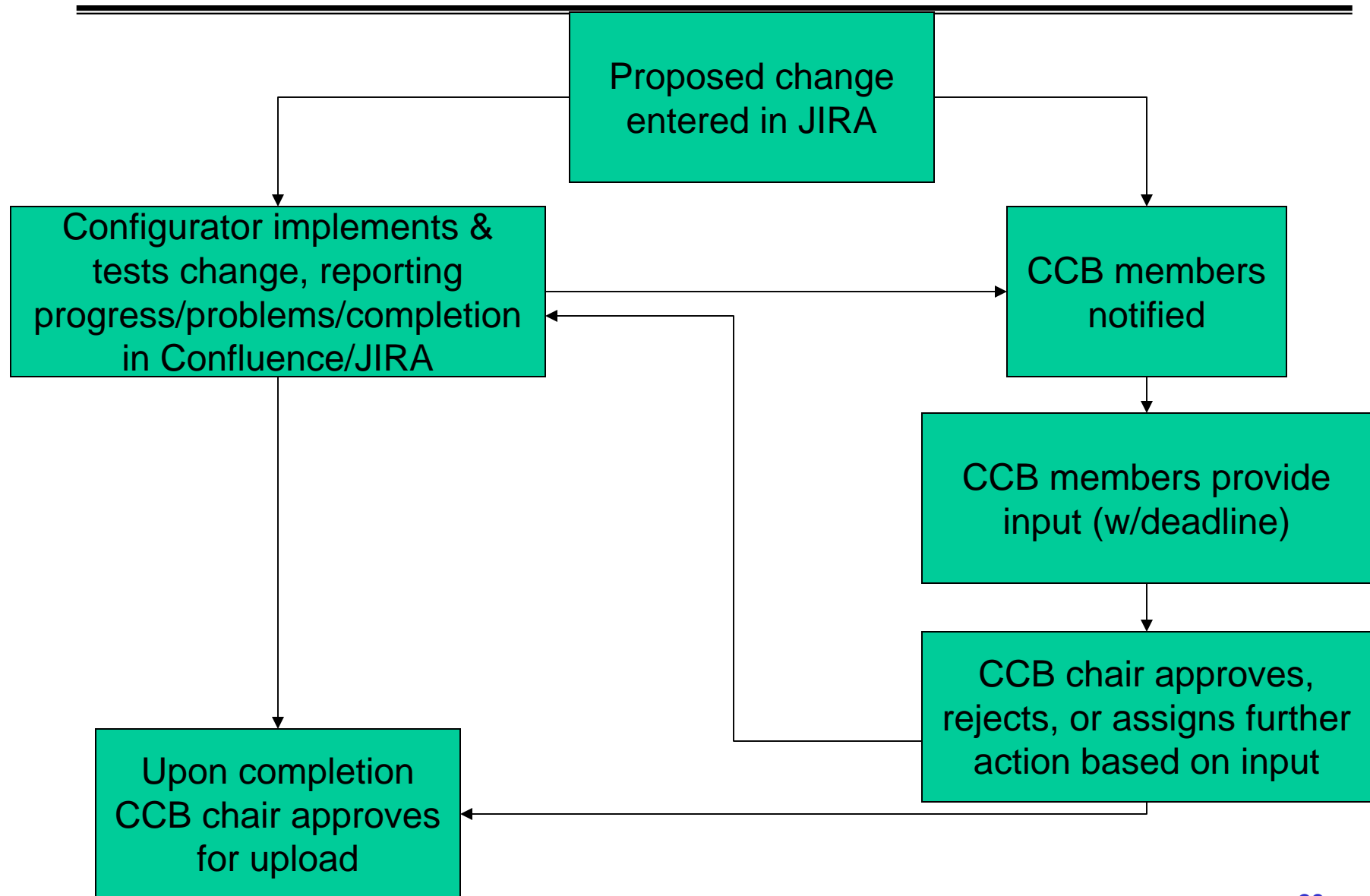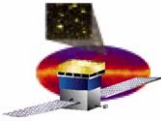
# Links

- **Confluence Onboard Configuration page:**
  http://confluence.slac.stanford.edu/display/ISOC/Onboard+Configuration

- **Confluence Onboard Configuration CCB page:**
  http://confluence.slac.stanford.edu/display/ISOC/Onboard+Configuration+CCB

- **Onboard Configuration JIRA project:**
  https://jira.slac.stanford.edu/browse/OBCONF