GLAST USER SUPPORT
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GLAST Science Support Center
## (http://glast.gsfc.nasa.gov/ssc/)

Abstract

The Gamma-ray Large Area Space Telescope (GLAST) mission will provide the user community with many scientific opportunities. The mission's interface with the user community is the GLAST Science Support Center (GSSC). Yearly guest investigator (GI) cycles will support research related to GLAST. After the first year GIs may propose pointed observations; however, as a consequence of the large field-of-view of GLAST's instruments, pointed observations will rarely have an advantage over the default survey mode. Data, analysis software and documentation will be provided through the GSSC website (http://glast.gsfc.nasa.gov/ssc/); the website also includes a library of scientific results, and a helpdesk.

GLAST Mission Overview

The Large Area Telescope (LAT) is the main instrument, with an energy range <20 MeV to >300 GeV, effective area of >8000 cm^2, angular resolution <3.5º @ 100 MeV, <0.15º @ >10GeV, field of view of >2 sr, and deadtime <100µs
• The GLAST Burst Monitor (GBM) will detect gamma-ray bursts and extend their spectra from the LAT's lower limit down to 10 keV.
• Mission duration of 5 (required)-10 (goal) years
• The mission will have three phases:
➢ Phase 1— ~60 days after launch. Instruments turned on and checked out.
➢ Phase 2—1 year. Sky survey during the first year of science operations. LAT summary data (not count data) released.
➢ Phase 3—science operations after first year. Investigators may request pointed observations. All data will be public.
• Although pointed observations will be possible, the observatory will probably scan the sky continuously because of the LAT's large field-of-view; this survey mode is planned for at least GLAST's first year.
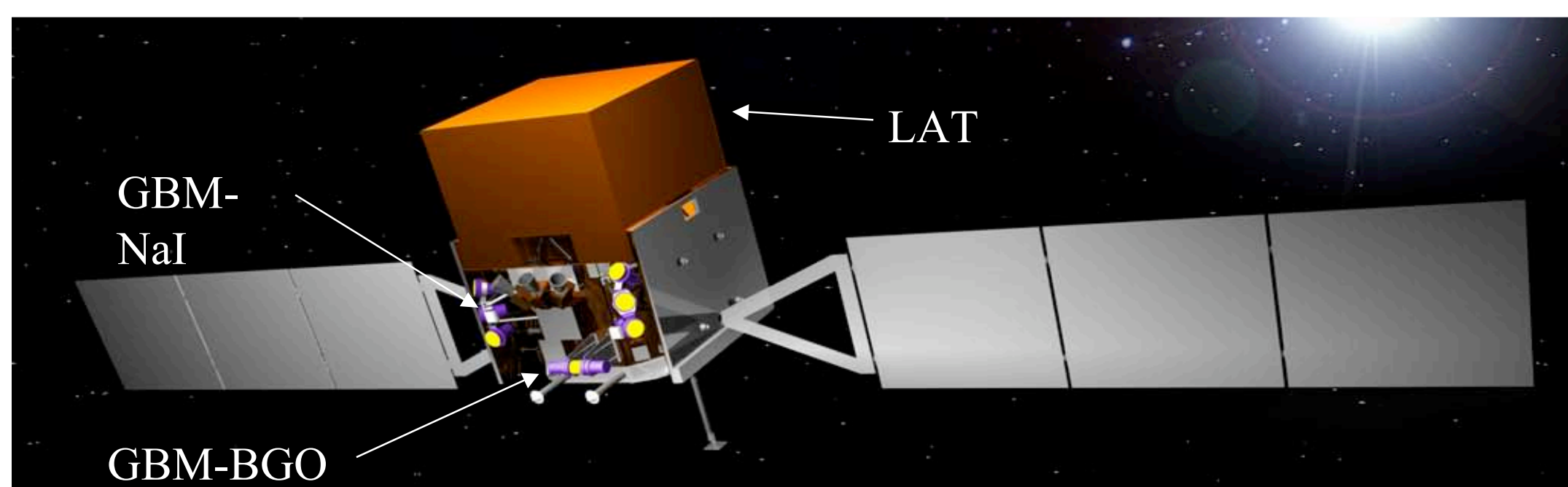
User Support by the GSSC

The GLAST Science Support Center (GSSC) was established at Goddard Space Flight Center (GSFC) to support the user community throughout the GLAST mission by providing data and analysis tools, and the documentation and expertise to use them. See the figure below for the GSSC's position in the GLAST ground system.

Before Launch—The GSSC will educate the user community about the mission's capabilities through posters and talks at scientific conferences, special workshops and tutorial sessions providing hands-on experience with simulated GLAST data and maintaining an up-to-date website with the current status and information about GLAST.

During the Mission—The GSSC's website will provide updates about the mission's status, serve as a gateway to the data, tools, instrument response functions (IRFs) and documentation, and include a help desk and FAQ. The GSSC will also host conferences and workshops to provide education and experience with the GLAST analysis software and a forum for users to report on GLAST's scientific results.

Providing Data to the Community

Data Access—All public data from the GLAST mission will be available through the GSSC's website. Much of the data will be served through the NASA High Energy Astrophysics Science Archive Research Center's (HEASARC) Browse (an interface to all of NASA's high energy astrophysics data from both current and previous missions); the GSSC website will link to this interface. Those data not available through Browse will be served directly from the GSSC's website.

GLAST Data Policy—During the first year of the mission, all LAT data are proprietary to the instrument team and the Interdisciplinary scientists, although information on detected transients and ~20 selected sources (the list is posted on the GSSC website) will be made public as soon as possible. GBM data will be released from the beginning of science operations. A month after the end of this year, these data will become publicly available. Starting the second year, all subsequent science data acquired by the spacecraft will be in the public domain immediately without a proprietary data period. Full details on the GLAST Data Policy can be found on the GSSC website.

Guest Investigator Program

The GLAST mission will support a Guest Investigator (GI) program that the GSSC will administer for NASA Headquarters. The program was announced in NASA's Research Opportunities in Space and Earth Science (ROSES) for 2007. The tentative plan is for funding ~50 proposals at the ~$50-100K level in the first cycle. The GI program will include a GLAST Fellows program with a schedule similar to the Hubble and Chandra Fellows programs.

For the mission's first year (the first GI cycle), GIs may not propose GLAST observations and will not have access to LAT photon data until they are released at the beginning of the 2nd cycle (2nd year). However, during this first year the LAT team will post information on bright transients and ~20 selected sources (the list is posted on the GSSC website). GIs may request funding for the analysis of released data, multi-wavelength observations, support projects (e.g., developing new analysis methods) and GLAST-related theoretical research during the first cycle.

During the subsequent yearly cycles, GIs may also request pointed observations, if scientifically justifiable. However, continued surveying of the sky will probably be the most efficient method of accumulating exposure for the largest number of sources, and we anticipate that most observing programs will be satisfied by survey mode. During this phase of the mission, all data will be available to the public from the GSSC's website.

Detailed proposal instructions are provided in the GLAST section of ROSES and on the GSSC website. In brief, a two step proposal process will be used:
• First, proposers will submit their science proposals through RPS (a GSFC system).
• Those GIs whose scientific proposals are selected will then submit the proposal's funding portion through NSPIRES (a NASA system).

To assist scientists prepare GI proposals, the GSSC will provide a set of tools for determining the feasibility of LAT data analysis and observations:
• Source detectability calculator—a web-based tool that calculates the significance of a LAT point source observation with a specified intensity in a given exposure time.
• GLASTspec—a GLAST version of WebSpec, a web-based tool that runs XSPEC's *fakeit* command. Users will be able to simulate both GBM and LAT spectra for appropriate spectral models.
• SAE simulation tools—Users will be able to fold a spatial-spectral source model through the LAT instrument response functions to simulate an observation. The simulated data can then be analyzed with the SAE tools. During the mission's first year LAT count data will not be released, GIs will not be able to propose observations, and the relevant SAE tools will not be available for the first round of proposals.

In addition a variety of tools, such as a converter between different time formats, will be available through the GSSC website.

GLAST Users' Group (GUG)

The GUG has been meeting for three years; it has reviewed the GSSC's plans and documents, and beta-tested the analysis software. The GSSC supports the GUC's operations. More details about the GUG, such as membership and meeting minutes, can be found on the GSSC website.

GLAST Science Software

The GSSC will provide a suite of data analysis tools and libraries for the analysis of GLAST data. This software is being developed by the instrument teams with assistance from the GSSC; development is advanced, and the tools are undergoing extensive beta-testing. The instrument teams and the scientific community will all use the Standard Analysis Environment (SAE), which will run on Windows and different flavors of UNIX platforms, and will not require the purchase of additional software. Most of the SAE is implemented as FTOOLs, and will be part of the HEADAS system maintained by the HEASARC. Consequently the data files input and output from the tools are FITS files. Therefore, the SAE will be an extension of the data analysis environment familiar to the high energy astrophysics community. In addition, we are developing a GUI interface to run these tools.

General Analysis—The SAE consists of several general purpose tools including a data sub-selection tool, tools to generate source models and extract source parameters from existing catalogs, and the workhorse of the GLAST data analysis, the Likelihood tool to perform maximum likelihood fits of the data with the specified models. The suite also provides an event binning tool to create time, energy and spatially binned data sets and tools to compute exposure and response matrices.

GRBs—The SAE provides several tools for studying gamma-ray bursts including tools for spectral and temporal data analysis and model fitting as well as tools for generating the necessary response functions and binning events for analyzing GLAST data with existing tools such as XSPEC. These tools can be used to analyze both LAT and GBM data, either individually or simultaneously.
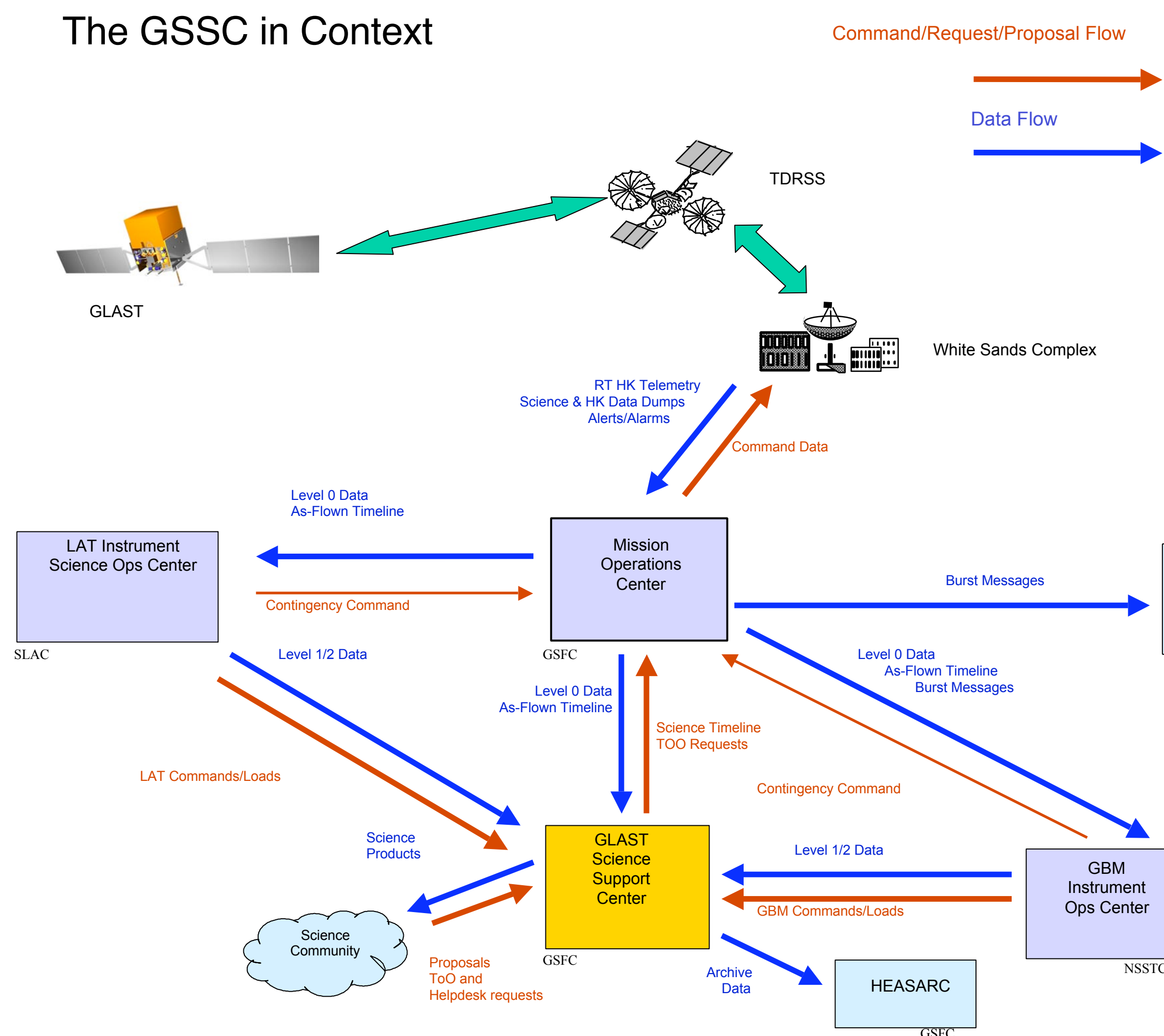
Pulsars—The SAE includes a barycenter arrival time correction tool, period search and profiling tools, and a pulsar ephemeris extraction tool to retrieve pulsar ephemerides from a pulsar database.

Data Simulation—The SAE also provides an observation simulator that simulates LAT data based on an input source model and spacecraft orbit profile.

Support for Target of Opportunity (TOO) Observations

The user community will submit TOO requests through a web-based form (specifically, through GSFC's RPS system). These requests may be new or pre-approved through the GI program after the first year. The request may be for an immediate observation (with a latency of <6 hours after the request is approved) or for a repointing during the next business day. The request will be evaluated by a GSSC duty scientist, and approved or rejected by the Project Scientist; the scientist requesting the TOO observation will be notified. If the Project Scientist accepts the proposal, the GSSC submits a TOO order to the Mission Operations Center (MOC). The status of accepted TOO requests will be posted on the GSSC website.

The GSSC in Context

GSSC Website:

http://glast.gsfc.nasa.gov/ssc/