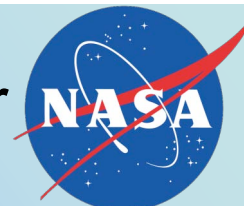




The GLAST Science Support Center

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Abstract

The GLAST Science Support Center (GSSC) will serve as the mission's primary interface to the scientific community. The GSSC will support the planning and scheduling of science observations, as well as establishing and maintaining a publicly accessible archive of all GLAST data products. Data analysis software and documentation will also be maintained and disseminated by the GSSC. In addition, the GSSC will administer the guest investigator program for NASA HQ and provide proposal preparation tools, documentation as well as technical and scientific support. We describe our plans for each of these activities, as well as offering a preview of the forthcoming NASA Research Announcement (NRA) for the Cycle-1 GLAST Guest Investigator Program.

User Support

The GLAST Science Support Center (GSSC), managed by the NASA Goddard Space Flight Center, will serve as the primary interface to the user community throughout the lifetime of the GLAST mission. This includes providing access to all science data products, analysis software and documentation. It also includes assistance in using the provided tools and education about the capabilities of the GLAST instruments and the nature of the data. The GSSC will also provide individual user support regarding software and data issues as well as managing the Guest Investigator Program for NASA HQ.

The GSSC website <http://glast.gsfc.nasa.gov/> will provide a central information repository on the status of the mission as well as provide a gateway for users to access the data and tools. The GSSC website will also host a variety of tutorials and a help desk and FAQ to assist users in analyzing data and provide support for problems encountered.

GLAST Mission Overview

The Gamma-ray Large Area Space Telescope (GLAST) is an international and multi-agency space mission that will study the cosmos in the energy range 10 keV - 300 GeV. The main instrument, the Large Area Telescope (LAT), with an energy range from 20 MeV to 300 GeV, will, compared to previous missions, have superior area ($>8000 \text{ cm}^2$), angular resolution ($<3.5^\circ$ @ 100 MeV, $<0.15^\circ$ @ $>10 \text{ GeV}$), field of view ($>2 \text{ sr}$), and deadtime ($<100 \mu\text{s}$) that together will provide a factor of 30 or more advance in sensitivity, as well as provide capability for study of transient phenomena. The GLAST Burst Monitor (GBM) will have a field of view several times larger than the LAT and will provide spectral coverage of gamma-ray bursts that extends from the lower limit of the LAT down to 10 keV.

The GLAST mission is scheduled for launch in late 2007 into a low earth orbit and has a nominal mission life of 5 years with an expected lifetime of 10+ years. It is primarily a sky survey mission and is capable of observing the entire celestial sphere with the LAT instrument every 3.5 hours (2 orbits).

Targets of Opportunity

GLAST is expected to perform Target of Opportunity (ToO) observations. Requests for ToO observations can be submitted via the GSSC website using an RPS form similar to that used for the RXTE mission. Once submitted, the GSSC advises the Project Scientist whether the proposed ToO is feasible; the Project Scientist is responsible for approving or rejecting the proposal.

The ToO submitter will be notified of the acceptance or rejection of the request. If the request is accepted, the GSSC prepares a ToO Order that is sent to the MOC. Once the ToO is approved by the Project Scientist, the ToO order will be generated and uploaded to the spacecraft within six hours. The status of all accepted ToO proposals will be tracked on the GSSC website.

Proposal Tools

Proposal Planning Tools

Tools will include an exposure and sensitivity calculator as well as observation simulation tools to assist Guest Investigators in feasibility studies:

Source Sensitivity Calculator – This tool estimates the detectability of a point source by the LAT based on the source spectrum, flux and sky position using a precession averaged exposure calculation.

GLAST Simulated 1D Spectral Analysis – This is the HEASARC's WebSpec tool, using the GLAST response functions.

Exposure Time History Display – This tool generates and plots the exposure time history for a specific point on the sky to determine the amount of exposure already accumulated.

Count and Exposure Maps – The GSSC will provide counts, exposure and flux maps of the entire sky on various time scales ranging from a week to the entire mission.

Orbit Simulator – This tool will allow the user to model various pointed and survey profiles to assess exposure accumulation.

Observation Simulator – Using an orbit model from the Orbit Simulator or a standard profile, this tool allows the user to generate simulated LAT data for analysis.

GLAST Symposium

February 5-8, 2007

The Symposium will focus on the new scientific investigations enabled by GLAST, mission and instrument characteristics, analysis tools and opportunities for guest investigators, and coordinated observations and analyses. It is expected that the second Symposium will occur approximately 18 months later.

<http://glast.gsfc.nasa.gov/science/symposium/2007/>

Observation Scheduling

The GSSC is responsible for generating the scientific observing plan for the GLAST mission based on the accepted proposals from the Guest Investigator Program and the sky survey requirements. This is done at two levels, a long-term schedule for the entire cycle (1 year), and a detailed weekly timeline that is used by the GLAST Mission Operations Center (MOC) to generate the spacecraft commands. Both of these schedules are available to the scientific community as they become available to allow for planning of multi-wavelength and simultaneous observing campaigns.

Long-term Schedule

The long-term schedule is generated before the beginning of the cycle from all of the accepted GI proposals. Observations are scheduled with a time resolution of five minutes for the entire year. This timeline will be posted on the GSSC website and the GI's will be notified of the expected observation dates for their targets. The long-term schedule will be updated during the cycle as necessary to account for deviations created by Target of Opportunity (ToO) observations or Autonomous Repoints (ARs). ARs are expected to occur one to two times a month.

Weekly Timeline

The weekly timeline contains the detailed information about the specific observations to be made during a given week with a time resolution of one minute. This timeline is used by the MOC to generate the actual commands sent to the observatory.

A preliminary weekly timeline is generated and available ~3 weeks before the start of the week it is to cover. The GSSC then generates a final weekly timeline that takes into account any necessary changes from the MOC or instrument operations centers (IOCs) and uses an updated spacecraft ephemeris to refine the observation schedule. This final timeline is used by the MOC to generate the observatory commands, and it will be publicly available through the GSSC WWW site.

GLAST Guest Investigator Program

Synopsis:

Yearly cycles, beginning ~2 months after launch.

Funding (approximate and subject to change)—typically \$50-100K per investigation. Cycle 1 (first year)—50 proposals accepted; subsequent years—100 proposals accepted.

Cycle 1 funding for:

- Analysis of released GLAST data (see data policy below).
- Correlated multiwavelength observations.
- GLAST-related theory.
- GLAST-relevant data analysis methodology.

Funding in subsequent years for all the above plus detailed analysis of LAT event lists and pointed observations.

Two stage proposal process:

- Stage 1—scientific justification submitted through RPS.
- Stage 2—funding request for successful stage 1 proposals, submitted through NSPIRES.

Data policy:

- In Cycle 1 (and afterwards) the LAT team will post the lightcurves and spectra of ~20 sources of interest to the community; see http://glast.gsfc.nasa.gov/ssc/data/policy/LAT_Monitored_Sources.html.
- In Cycle 1 (and afterwards) the LAT team will release lightcurves and spectra of intense transient sources (includes flaring AGN, several new transients expected per month).
- GBM data released as soon as processed.
- Starting in Cycle 2, LAT gamma-ray event lists will be released as soon as processed, along with Cycle 1 LAT event lists.
- Gamma-ray burst alerts, localizations, and lightcurves will be circulated as Gamma-ray burst Coordinate Network (GCN) Notices and Circulars.

The **GLAST Fellows Program** will award three three-year fellowships every year.

Analysis Software

The GSSC will provide a suite of data analysis tools and libraries for use in analyzing the GLAST data. This software is being developed in collaboration with the instrument teams. Here we provide a short overview of the Standard Analysis Environment (SAE) software. Full details on the data analysis system can be found in poster 18.03 – **"GLAST Data Access and Analysis Software"**.

General Analysis

The SAE is an FTTOOLS package that includes a data sub-selection tool, tools to generate source models and extract source parameters from existing catalogs. Central to the GLAST data analysis is a Maximum Likelihood tool which localizes point or extended source candidates and estimates their flux over a specified band. This is accomplished by performing fits of the data (source + background components) with user specified spatial/spectral 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 will provide several tools to assist in the study of gamma-ray bursts including tools for spectral and temporal data analysis as well as tools for generating the necessary response functions for analyzing GLAST data with existing tools such as XSPEC. LAT and GBM data can be analyzed individually or simultaneously.

Pulsars

The SAE will provide a number of tools to assist in pulsar analysis including a barycenter arrival time correction tool, period search and profiling tools, and a pulsar ephemeris extraction tool to retrieve ephemerides from a database.

Data Simulation

The SAE also provides an observation simulator that can simulate LAT data based on an input source model.

GSSC Website: <http://glast.gsfc.nasa.gov/ssc>