The GLAST Science Support Center’s Role in Supporting the User Community [24.10]

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Abstract

The GLAST Science Support Center (GSSC) is GLAST’s interface with the scientific community and is responsible for scheduling the science observations to be performed by the GLAST mission. The GSSC will provide GLAST mission data, analysis software and documentation to the general community. In addition, the GSSC will administer the guest investigator program, provide proposal preparation tools to assist proposers in assessing the feasibility of observing sources of interest. Here we present an overview of the GSSC responsibilities and services to be provided to the user.

User Support

One of the primary roles of the GSSC is to support the user community throughout the planning and execution of a GLAST mission. This is not only for providing data and tools. It also includes assistance in the proposal writing process and education about the capabilities of the GLAST instruments and the nature of the data. The GSSC will also provide individual user assistance for data issues as needed. To address this role, the GSSC is planning a number of support activities both during the mission and after launch.

Before Launch – The primary focus of the GSSC’s user support role prior to launch is educating the user community about the capabilities and limitations of the GLAST instruments. The GSSC will also host conferences and workshops to provide education and to gain the experience the GLAST Science Software and its user base. The GSSC will sponsor a tutorial at the meetings of the GLAST instrument teams and will work with the GLAST instrument teams to develop a comprehensive user handbook.

During the Mission – During the mission the GSSC’s website will continue to provide updates about the status of the mission as well as general information about the instrument. The GSSC will also host conferences and workshops to continue to support the user community. The GLAST mission data will be available at the GSSC website. The GSSC will provide a help desk and FAQ to assist users in analyzing data and provide support for problems encountered.

Observation Scheduling

The GSSC is responsible for generating the 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 large-scale (1-year) and a detailed weekly timeline that is used by the GLAST Mission Operations Center (MOC) to generate the science timeline. Both of these timelines are available to the scientific community as they become available for planning of multi-wavelength and simultaneous observing campaigns.

Long-term Schedule

The long-term observation 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 data 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 Reports (ARs) which are automated slewings of the observatory to observe transient sources that meet criteria defined in the onboard software. 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. It includes both the target and the time of observation. The weekly timeline is updated during the mission once targets are added to the weekly timeline.

Weekday Planning

The weekly timeline includes 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 to perform the observations. A preliminary weekly timeline is generated and available 14 days before the week in which it is to cover. This preliminary timeline is used to plan any ancillary spacecraft and instrument events for weeks as well as the TDRSS contacts necessary to download the spacecraft data.

A few days before the week in which the GSSC begins a new weekly timeline (that takes into account any changes from the MOC or instrument operations centers (IOC)) and uses an updated spacecraft ephemeris to refine the weekly timeline. The on-line timeline is provided by the MOC to the GSSC as a weekly timeline.

Data Products

The GLAST mission will support a Guest Investigator (GI) program that will be administered by the GSSC for NASA Headquarters. It is divided into two phases: the first year and the rest of the mission.

For the mission’s first year (the first GI cycle), GIs may not propose observations. The mission’s photo data will be available beginning when the beginning of the mission. The GSSC will provide light curves of >20 strong sources as well as the characteristics of bright transients. Therefore observations will be restricted to those that result from the light curve of the LAT. The second year will extend this data to the entire sky.

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 in capable of observing the entire celestial sphere with the LAT instrument every 3.5 hours (300 orbits).

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 10 keV to 300 GeV, will, compared to previous missions, have superior angular resolution (>3.5” @ 10 keV, <10” @ 100 GeV) and energy resolution (1%) of 30% or more advance in sensitivity, as well as being capable for study of transient phenomena. The GLAST Burst Monitor (GBM) will have a field of view several times larger than the LAT and will be able to trigger on ~100 events per day.

The GLAST mission will be to use the data from the LAT and GBM for a wide range of scientific goals. The GLAST GBM will be used to observe bursts and the LAT to study objects with a wide range of energies. The GLAST mission is currently scheduled for launch in 2007.

Proposition Tools

To assist scientists in making Guest Investigator proposals, the GSSC will provide a suite of tools for planning observations and submitting proposals.

Proposal Submission

The GI proposal cycle will run through the GSSC website using RPS and will consist of a two-phase proposal process. Initially proposers will submit science proposals for review. Those Guest Investigators who are selected will then submit the funding portion of the proposal.

Proposal Planning Tools

This tool will include an exposure and sensitivity calculator as well as observation simulation tools to assist potential Guest Investigators in assessing the feasibility of observing their desired targets. The planning tools include the following.

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 prescription averaged exposure calculation.

GLAST Simulated 10-Spectral Analysis – This is the HESS/ASCAP’s WebSpec tool, extended to use the GLAST response functions. These response functions are used in XSPFIT.

The above tools will be available for cycle one. The following will be available for all subsequent cycles.

Experience Time Hourly Intensity Map – This tool generates and plots the exposure time history for a specific point on the sky to allow proposers to determine the amount of exposure already accumulated on their targeted.

Count and Exposure Map – 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.

The following tools are part of the SAE (see Analytical Tools section) and can be used for proposal planning after the first cycle.

Orbit Simulator – This tool will allow the user to model various orbital and survey profiles to see the effect on the exposure and data accumulation.

Observation Simulator – Using an orbit model from the Orbit Simulator an orbit, the user can generate simulated LAT data for analysis.

LALT Simulation Tool – This is the main analytical tool of the SAE and works both on actual data from the spacecraft data and generated by the Observation simulator to analyze the observed or simulated data.

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 by the instrument teams with assistance from the GSSC to provide a sole and robust framework for interpreting and analyzing the GLAST data. Here we provide a short overview of the standard analysis environment (SAE) software.

Full details on the data analysis system can be found in Figure 24.1 – “The Standard Analysis Environment for GLAST’s LAT Detector”.

General Analysis

The SAE provided by the GSSC will consist of several general purpose tools to assist in analyzing data including a data sub-selection tool, tools to generate source models and source parameter estimates from existing catalog, and the workbook 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 timing tool to create time series, visually 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 and model fitting tools for generating the necessary response functions and timing 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 will provide a number of tools to assist in pulsar analysis including a barchart 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 provides an observation simulator that can simulate GLAST data based on an input source model and a potential spacecraft orbit