Serving Data to the GLAST User Community

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GSSC Web Site

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

Abstract

The scientific community will access the public GLAST data through the website of the GLAST Science Support Center (GSSC). For most data products the GSSC website will link to the NASA High Energy Astrophysics Science Archive Research Center's (HEASARC) Browse interface, which will actually serve the data. However, the photon list produced by the Large Area Telescope (LAT), GLAST's primary instrument, will require a customized GSSC interface. These photons will be detected over the LAT's large field-of-view, usually while the LAT is scanning the sky, and thus cannot be attributed to the observation of a particular object. Users will request all photons detected from a region on the sky over a specified time and energy range. Data from the GLAST Burst Monitor (GBM) from a given burst will be packaged together and accessible through Browse. Through its website the GSSC will also provide long and short term science timelines, and GLAST-related GCN Notices and Circulars. The different data products provided by the GSSC will be described.

GLAST Mission Overview

GLAST is an international and multi-agency space mission that will study the cosmos in the 10 keV-300 GeV energy range. The main instrument, the Large Area Telescope (**LAT**), is a pair conversion telescope. It will have an effective area (>8000 cm^2), angular resolution (<3.5º @ 100 MeV, <0.15º @ >10GeV), field of view (>2 sr), and deadtime (<100μs) that will provide a factor of 30 or more advance in sensitivity compared to previous missions, as well the capability for studying transient phenomena. Data from the LAT are processed by the LAT Instrument Science Operations Center (**LISOC**) before being sent to the GSSC.

The other instrument on GLAST, the GLAST Burst Monitor (**GBM**), consists of 14 detectors that will monitor >8sr of the sky, including the LAT's field of view. Gamma ray bursts will be localized to 9° (1s, brightest 40% of the bursts) by comparing the rates in different detectors. The GBM also extends GLAST's burst spectral sensitivity to the <10 keV to >25 MeV band. Data from the GBM are processed by the GBM Instrument Operations Center (**GIOC**) before being sent to the GSSC.

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. See posters in **Session 24** for additional information about the GLAST spacecraft and instrumentation.

Data Properties and Impact on Data Serving

The large field of view of the LAT, combined with the continuously scanning operating mode, makes it impossible to define an "observation" in the traditional sense where there is an obvious start and stop time to the data gathering. Rather any given object is constantly moving into and out of the instruments field of view and is typically observed for ~30 minutes every 3 hours of observing.

The low angular resolution at low energies also results in photons from one source overlapping with photons from nearby sources and requires simultaneous fitting to disentangle closely spaced objects. Typically a user will need data from a part of the sky equal to a 20-30° diameter field of view to fully analyze an object at the center of that field. This corresponds to ~1-2% of the entire sky for a single analysis.

The LAT is expected to collect ~3 Hz of photon data and ~30 Hz of event data continuously. This corresponds to ~100 million photons and ~1 billion events a year. With the current data record specifications, this translates into ~10 GB of photon data and ~1 TB of event data a year with a typical photon query returning 100-200 Mbytes of data.

It is also expected that the LAT will detect thousands of sources. The large number of sources, combined with the moderately large data volume and high degree of source overlap make it unrealistic to prepackage the data on a source by source or even region by region basis. This would result in an unnecessary duplication of the same data multiple times in the data system.

All of these factors point toward the development of a dynamic data retrieval system that retrieves the data as needed according to the user's unique specifications instead of relying on static prepackages files.

LAT Data Server

The LAT Data Server will provide users with access to events, photons, and position and attitude history from the LAT. It will accessed by users through a customized web interface hosted by the GSSC.

The user enters the desired position with optional energy and time cuts and will then be served a page with the estimated query time and a link to a results page. When the data files are ready (FITS files), they will be made available for download on the results page.

The data server is implemented as a small cluster of Linux PCs which operate on event lists stored in FITS files. Based on the user's query, the photons matching the data cuts are extracted and presented to the user as a downloadable FITS file.

The photon and event databases will be updated immediately when new data are received by the GSSC from the LAT instrument team.

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 will be made public as soon as possible. A month after the end of the first year, these data will become publicly available.

Starting the second year, all subsequent science data acquired by the spacecraft will be immediately in the public domain without a proprietary data period. Full details on the GLAST Data Policy can be found on the GSSC web site.

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 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.

LAT Data

Photon and event data will be served through the GSSC's LAT data server. The GSSC populates the photon database based on event data received from the LISOC. Events are all triggers reconstructed by the LISOC and will include, e.g., electrons and protons in addition to photons. There are about 200 parameters associated with each event. Based on these parameters, a subset of events are classified as gamma-rays. There are about 20 parameters associated with each photon. This is the data in the photon database. Most users will only need the photon data for scientific analysis, but the event data will be there for those who wish to rescreen the data themselves. For convenience, searches in Browse will likely be linked back to the data server. New data will be added as soon as it is received from the LISOC. This will occur within 72 hours of the data being taken but likely in much less time. A variety of source catalogs will be served through Browse. Burst and transient catalog will be updated on a per event basis. Other catalogs will be updated infrequently. Also available will be an interstellar emission model. This will be refined as the mission progresses and updated infrequently.

GBM Data

Data products for the GBM will be similar to that of the BATSE instrument on the Compton Gamma Ray Observatory. For bursts, catalogs with derived parameters, which include preliminary lightcurves and spectral fits, will be provided through Browse. The catalog entries will link to data packages which will include accumulated counts (CTIME and CSPEC files), response functions, backgrounds, and other files necessary to analyze the data. New bursts will be added to the catalog as soon as the data is received from the GIOC. Although burst alert notices will go out immediately, the data will not enter the archive until the GIOC is finished processing the data. The entire day of data is processed by the GIOC to account for background variability before any data is sent to the GSSC.

Spacecraft Data

In addition to the science data, various data products dealing with the spacecraft will be available via the GSSC website to help proposers and observers. These will include proposed and observed science timelines for coordinating simultaneous multi-wavelength observations, spacecraft alerts, pointing and livetime history, and various other spacecraft related data.

GLAST Data Products