

GLAST Large Area Telescope Multiwavelength Planning

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On behalf of the GLAST LAT Collaboration



Abstract

Because gamma-ray astrophysics depends in many ways on multiwavelength studies, the GLAST Large Area Telescope (LAT) Collaboration has started multiwavelength planning well before the scheduled 2007 launch of the observatory. Some of the high-priority needs include: (1) radio and X-ray timing of pulsars; (2) expansion of blazar catalogs, including redshift measurements (3) improved observations of molecular clouds, especially at high galactic latitudes; (4) simultaneous broad-spectrum blazar flare measurements; (5) characterization of gamma-ray transients, including gamma ray bursts; (6) radio, optical, X-ray and TeV counterpart searches for unidentified gamma-ray sources. Work on the first three of these activities is needed before launch.

The GLAST Large Area Telescope is an international effort, with U.S. funding provided by the Department of Energy and NASA.

Multiwavelength Observations are Important for GLAST

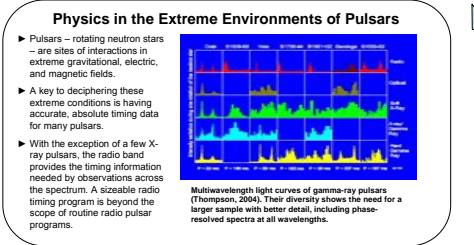
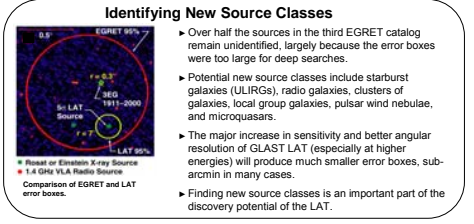
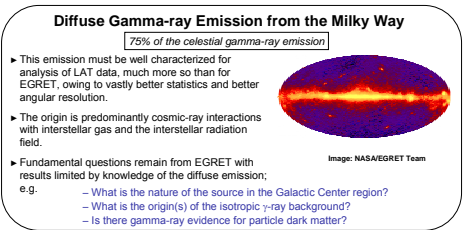
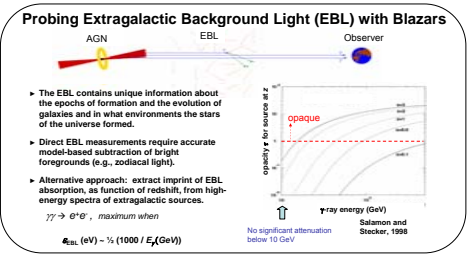
Some Goals of Multiwavelength Observations

- ▶ Source identification and population studies
- ▶ Intensive exploration of the brightest and most variable sources that will allow deep study of the source physics
- ▶ Rapid follow-up on transients (e.g. GRBs, blazar flares)
GLAST mission is designed to support rapid notification for follow-up
- ▶ Understanding the high-energy diffuse emission of the Milky Way

Planning Approach

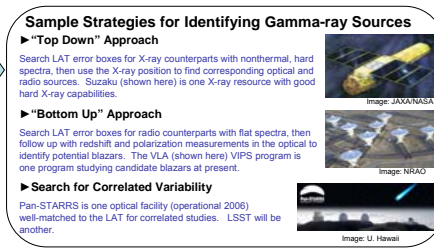
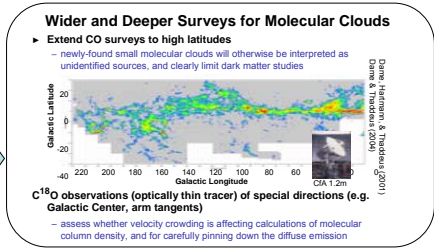
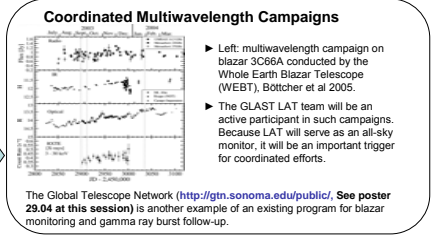
The GLAST LAT Multiwavelength Coordination Group (GLAMCOG) has recently been formed to prioritize science-driven needs and develop an implementation plan for cooperative multiwavelength observations before and during the GLAST mission. This work will be coordinated with the GLAST Burst Monitor and GLAST Project science teams.

Some of the known multiwavelength needs are described in this poster, along with the steps being taken to meet those needs. This work is preliminary and does not represent the full range of multiwavelength activities that will be investigated.



SUMMARY OF SOME MULTIWAVELENGTH NEEDS AND PLANNING

Science Objective	GLAST Provides	Multiwavelength Requirements	Multiwavelength Planning Activities
Differential measurement (vs Z) of extragalactic background light to Z~5.5	Measurement of blazar spectra in band where cutoffs are expected from $\gamma + \gamma_{\text{EBL}} \rightarrow e^+ + e^-$	Broadband contemporaneous/simultaneous spectral measurements (radio, optical, X-ray, TeV) of blazar spectra, particularly around the synchrotron peak	Cooperate with and expand existing multiwavelength blazar and GRB campaigns (e.g. WEBT, ENIGMA, GTN, Swift) to have the broadest possible coverage during the mission
Resolve origin of particle acceleration and emission mechanisms in systems with relativistic jets, supermassive black holes	All-sky monitoring coverage of blazar flares and Gamma Ray Bursts (GRB)	Redshift and afterglow measurements for GRB	Participate with and encourage programs to expand blazar catalogs and measure redshifts for flat-spectrum radio sources
Reliable model of Milky Way diffuse emission required for accurate source localization and to facilitate search for dark matter	Mapping of cosmic ray interactions with all forms of interstellar matter	Radio and optical surveys of flat-spectrum radio sources to extend blazar catalogs, including redshift measurements	Promote needed CO and other tracer observations; work with observers to reduce data and incorporate into a model of the diffuse gamma-ray emission
Search out and understand new classes of gamma-ray sources	Large number of source detections; Relatively uniform sky coverage; Good positions, energy spectra, time histories	Extend CO surveys to high galactic latitude; survey special directions (eg. spiral arms, galactic center) with optically thin tracer (e.g. C ¹⁸ O)	Identify facilities and plan proposal strategies for obtaining observing time needed to identify gamma-ray sources at other wavelengths; Cooperate with existing and planned monitoring surveys; Prepare for use of the many available astronomical catalogs
Understand particle acceleration and emission mechanisms in extreme environments of rotating neutron stars	Spectra and light curves resulting from primary interactions of the most energetic particles	Counterpart searches at all other wavelengths; Population studies; Correlated variability; Multiwavelength modeling; Contemporary, complete astronomical catalogs	Select pulsar candidates for radio timing; work with radio astronomers to monitor timing of selected pulsars; plan proposals for X-ray pulsar observations



SUMMARY

The GLAST Large Area Telescope science will be optimized by coordinated multiwavelength observations and analysis.

GLAST welcomes cooperative efforts from observers at all wavelengths. See <http://glast.gsfc.nasa.gov/science/multi/>

To be added to the Gamma-Ray Multiwavelength Information mailing list, please contact Dave Thompson (djt@egret.gsfc.nasa.gov).

The GLAST Guest Investigator program will have opportunities for developmental and correlative observations. See <http://glast.gsfc.nasa.gov/ssc/proposals/>

