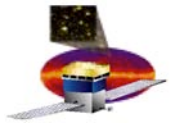
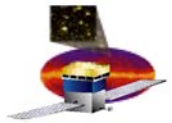


Swift and GLAST Cooperative Efforts

Dave Thompson

GLAST Large Area Telescope Multiwavelength Coordinator



Outline

GLAST Characteristics

Swift/GLAST Potential Areas of Cooperation

- Gamma-ray Bursts
- Blazars
- Unidentified Sources

GLAST: Gamma-ray Large Area Space Telescope is the observatory, not the instruments.

Two GLAST instruments:

Large Area Telescope

LAT: 20 MeV – >300 GeV (LAT was originally called GLAST by itself)

LAT field of view ~2.5 sr

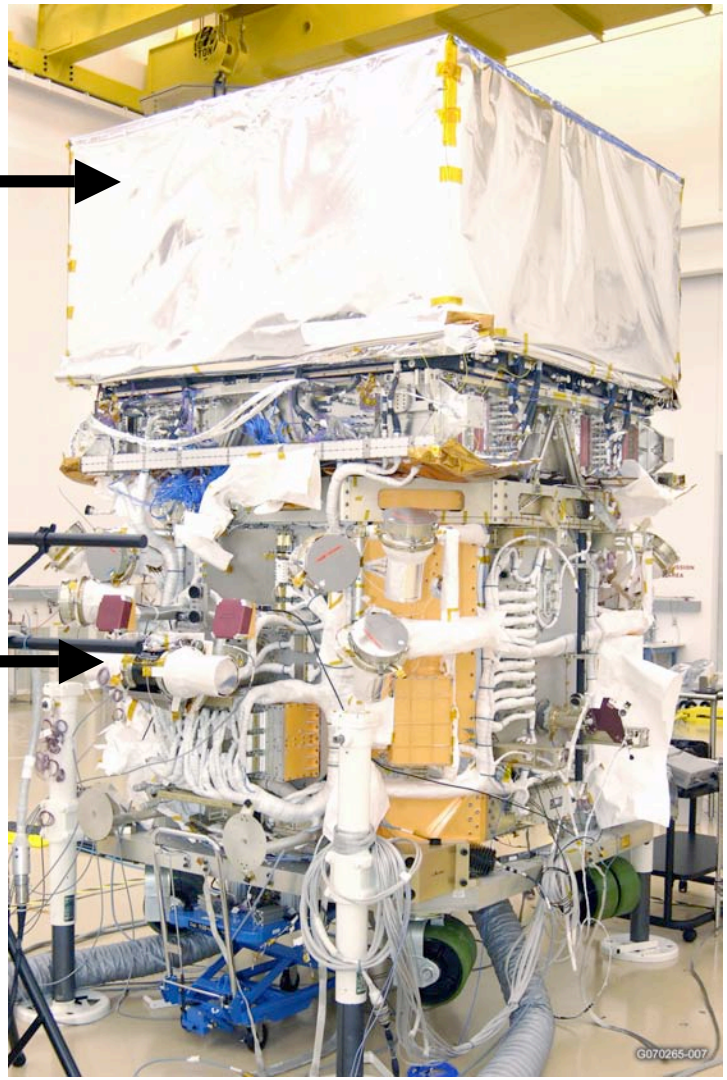
GLAST Burst Monitor

GBM: 10 keV – 25 MeV

GBM field of view ~9 sr

Launch: Late 2007

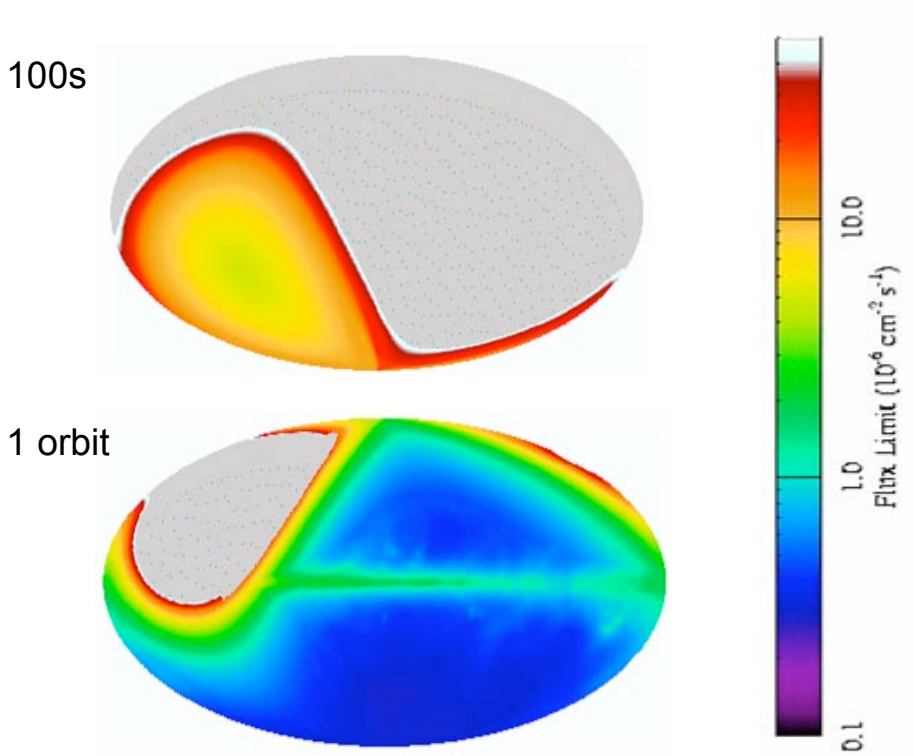
Lifetime: 5 years minimum, 10 years goal



Operating mode

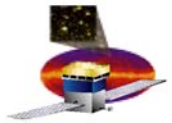
- **LAT has a huge field of view (>20% of the sky). GBM views the entire unocculted sky.**
- **In the default scanning mode, the LAT observes the entire sky every two orbits (~3 hours), each point on the sky receives ~30 mins exposure during this time.**
- **The LAT will produce long, evenly sampled lightcurves for every source in the sky.**

LAT Sensitivity



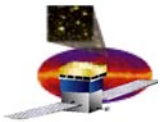
Data Release Plan and Operations - 1

- First Year observations
  - After initial on-orbit checkout (60 days), the first year of observations will be a sky survey.
  - Repoints for bright bursts and burst alerts will be enabled
  - Extraordinary ToOs will be supported.
  - First year data will be used for detailed instrument characterization and key projects (catalog, background models etc) needed by the community.
- First Year Data release
  - All GBM data
  - Information on all LAT detected GRB (flux, spectra, location)
  - High level LAT data (time resolved flux/spectra) on ~20 selected sources.
  - High level LAT data on all sources which flare above 2×10^{-6} ph (>100 MeV/cm^{2}s), continued until the source flux drops below 2×10^{-7} (rate ~1-4 such objects per month).
  - The LAT team will produce a preliminary source list ~6 months after start of science operations, on a best effort basis.

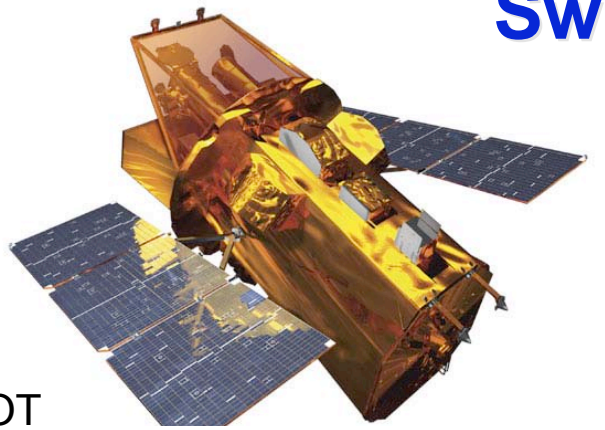


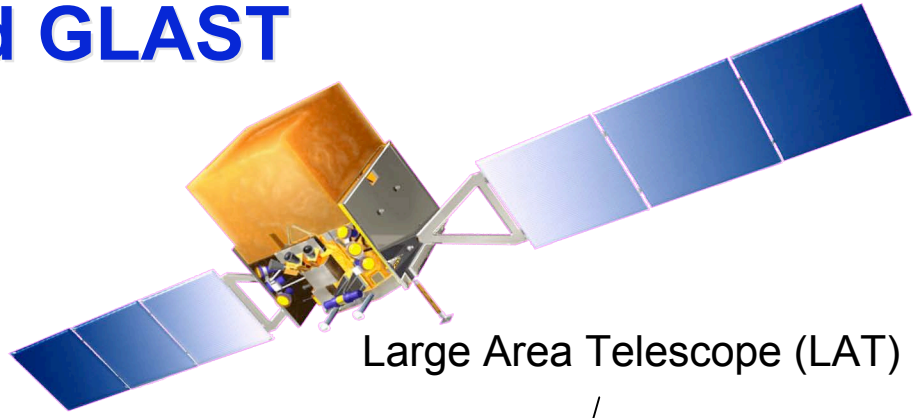
Data Release Plan and Observations - 2

- Year 2 and beyond
  - Observing plan will driven by peer-reviewed guest investigator proposals.
  - Default mode will still be sky survey (very few science topics will need pointed observations).
- Year 2 and beyond data release
  - All data (including the first year data) are released as soon as possible through the GLAST Science Support Center (within 120 hrs is the requirement, but likely to be significantly faster than this in practice).
  - There is no proprietary period for data.
- A Guest Investigator program is starting this year - $$
  - First year emphasizes multiwavelength support, analysis of public data, and analysis technique development. Proposals due Sept. 7.
  - In later years, the GI program includes financial support for analysis of all GLAST data.



Swift and GLAST





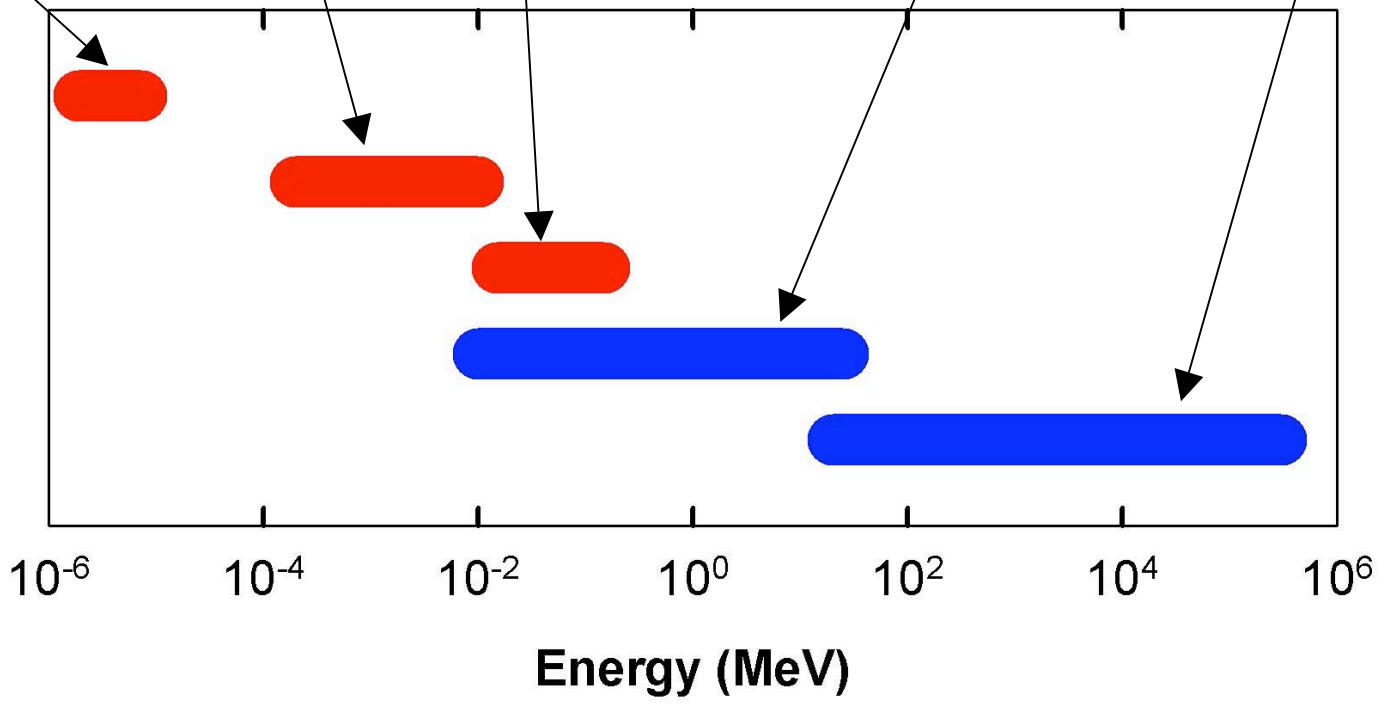
Large Area Telescope (LAT)

UVOT

XRT

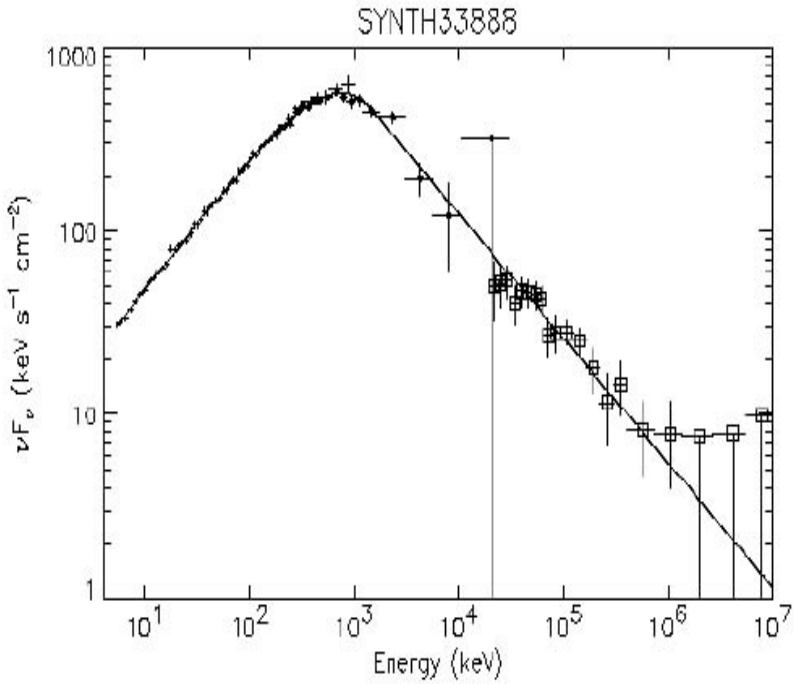
BAT

GLAST Burst Monitor (GBM)



Gamma Ray Bursts

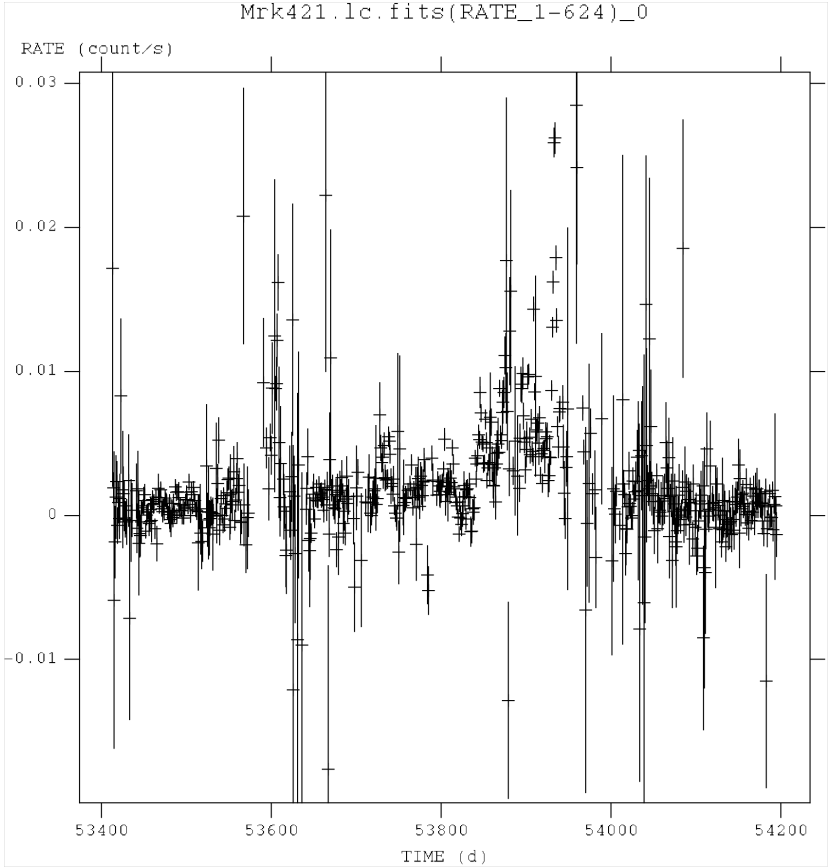
- **Swift offers: accurate GRB positions with BAT; followup by XRT and UVOT for more precise positions and afterglow tracking.**
- **GLAST offers: extended energy measurements with GBM and LAT; some good positions with LAT; high-energy afterglow tracking with LAT.**
- **TBD: How to get GLAST burst alerts to Swift quickly.**
- **Details – talk by David Band**



Simulated GBM and LAT response to time-integrated flux from bright GRB 940217 Spectral model parameters from CGRO wide-band fit 1 NaI (14 °) and 1 BGO (30 °)

Blazar Monitoring

- **Swift already has a blazar study program. The Mkn 421 example shown here is from the BAT transient monitoring program.**
- **GLAST LAT will have a similar program, including public release of data on ~20 sources (most of which are blazars) starting the first year of the mission.**



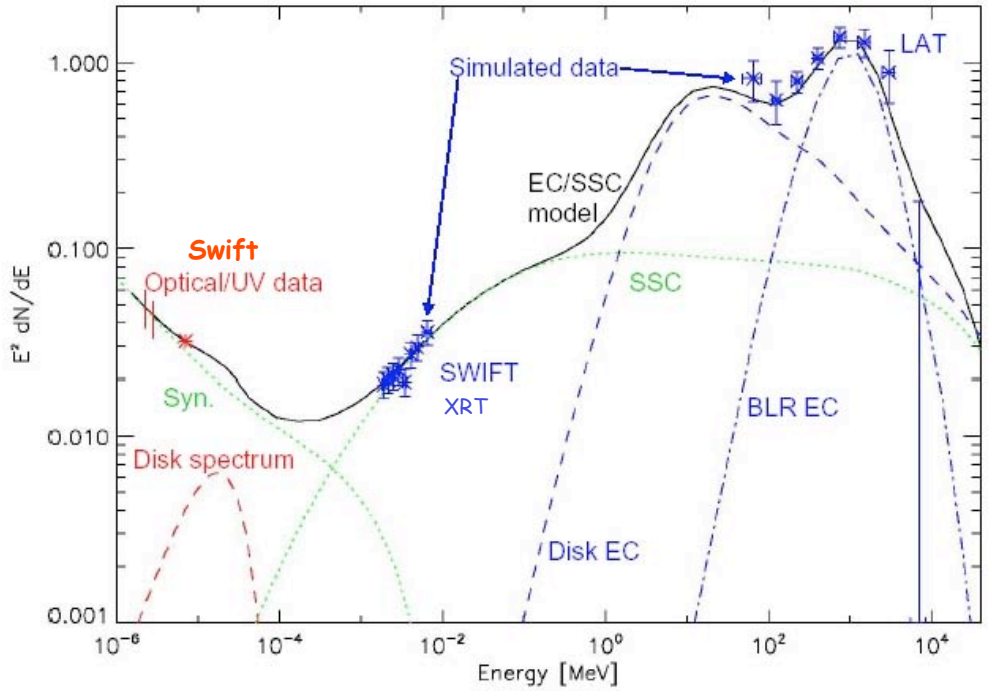
- **Cooperation between these blazar monitoring programs can help broaden the energy coverage, allow time-dependent spectral analysis, and provide triggers for Target of Opportunity campaigns on other telescopes.**

Blazar Flares

- **Multiwavelength observations of blazars are particularly important during gamma-ray flares that are bright enough to allow time-resolved gamma-ray spectra.**

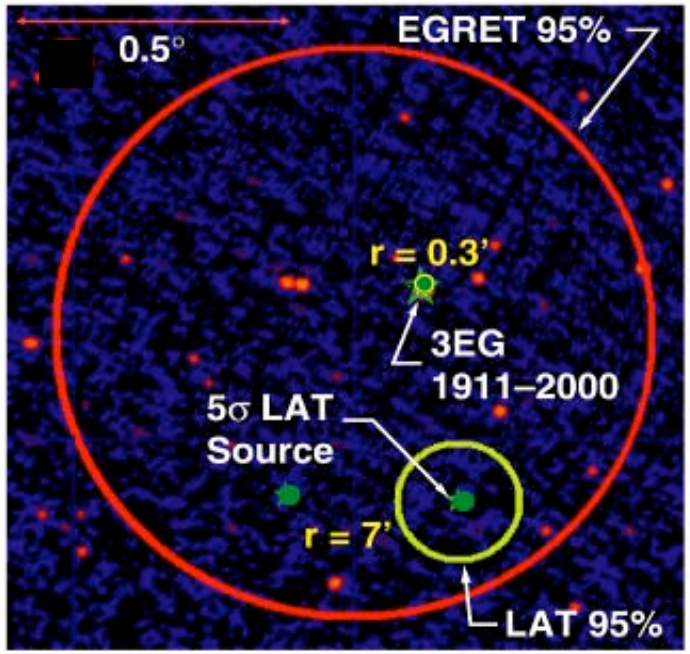
3C279 simulation illustrating how GLAST LAT (one week integration) and Swift could be used together.

Next talk – more on blazars from Ann Wehrle



- **Capitalize on the all-sky coverage of LAT to find very bright flares and on the flexibility of Swift to be able to observe them (time critical science)**

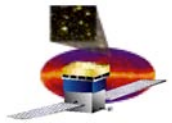
Swift and GLAST Source Identification - 1



Comparison of EGRET and LAT error boxes.

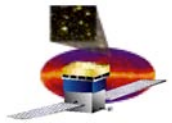
LAT source location is far better than EGRET's, but still not good enough to make unique identifications based on position alone in many cases.

- GLAST LAT will detect thousands of new sources.
  - Most are likely to be AGN at high Galactic latitudes
  - Few hundred Galactic sources
- We can't do the astrophysics until we know what we are looking at.
- We expect major discoveries to result from identifying new classes of gamma-ray sources.



Swift and GLAST Source Identification - 2

- **Swift offers the opportunity to find nonthermal counterparts of GLAST LAT unidentified sources**
  - **LAT error boxes are smaller than the XRT/UVOT fields of view.**
  - **Identification would be facilitated by correlated variability, made possible by LAT scanning and Swift quick response.**
  - **Swift positions are arcsec instead of arcmin.**
- **In effect, the LAT can act as a higher-energy version of the BAT, directing Swift toward interesting sources**
  - **Think of the LAT as the BAT gone to "L"**
- **X-ray observations are less source confused; therefore better for unidentified source follow-up even in the absence of detection of correlated variability. Identification is the first step toward understanding.**
- **Details – talk by Patrizia Caraveo**



SUMMARY

From a presentation at the recent GLAST LAT collaboration meeting:

Swift is arguably the most important single multiwavelength resource we have for the LAT

- **GLAST complements the Swift capabilities for GRB studies by expanding the energy range.**
- **Combined efforts on blazar monitoring and blazar flare studies provide excellent opportunities for detailed modeling of these jet sources.**
- **Swift offers a powerful approach for identifying new LAT source classes, moving toward understanding of the astrophysics involved.**