Some Comments On MW Needs

G. Tosti & P. Giommi

GLAST CAPABILITIES

- Coverage of the 20% of the sky at any instant
- Entire sky coverage in 190 min (~2 orbits)
- Uniform exposure in survey mode (sensitivity gain of a factor of ~1.7 in pointing mode)

Also, we have to take into account...

LAT Year 1 (Phase 1) Data Release Plan

- Proposed plan consistent with AO 99-OSS-03:
  - *"**At all times, including the first twelve months of science operations, the data from transient sources discovered or detected by GLAST will immediately be made publicly available."***
    - operational definition of transient source: any source for which a significant *change* in source flux is detected on a timescale sufficiently short that **rapid follow-up multi-wavelength observations are warranted** (e.g. GRBs, a significant flare from a blazar, a solar flare, etc.)
  - *"**During the first twelve months of science operations, data from specific sources of interest to qualified individual researchers will be made available…"***
    - Data products on specific sources of interest will be released, by the LAT team, periodically via a publicly assessable web site.
  - ***"During the first year, IDS investigators will work with the LAT team, will have access to the data, and will assist in the data verification activities."***
    - "expected that the IDS investigators will work with the instrument team and have access to data to carryout their investigations, with the understanding that during the 1st year the data calibration may not be fully verified and could change."

(From Peter's presentation at the August 2005 Collaboration Meeting)

Monitor and regularly release data, via the web, to the entire community, on list of sources of interest (proposed list follows)

Source type	Source name	other name	Average or min. flux (10^{-8} γ cm^{-2} s^{-1})	Latitude
Sources from 3rd EGRET Catalog				
Blazar	0208-512	3EGJ0210-5055	85.5 ± 4.5	-61.9
	PKS 0528+134	3EGJ0530+1323	93.5 ± 3.6	-11.1
	0827+243	3EGJ0829+2413	24.9 ± 3.9	31.7
	Mrk 421	3EGJ1104+3809	13.9 ± 1.8	65.0
	3C 273	3EGJ1229+0210	15.4 ± 1.8	64.5
	3C 279	3EGJ1255-0549	74.2 ± 2.8	57.0
	1406-076	3EGJ1409-0745	27.4 ± 2.8	50.3
	PKS 1622-297	3EGJ1625-2955	47.4 ± 3.7	13.4
	1633+383	3EGJ1635+3813	58.4 ± 5.2	42.3

(From Peter's presentation at the August 2005 Collaboration Meeting)

Preliminary list – cont'd

	1730-130 NRAO 530	3EGJ1733-1313	36.1 ± 3.4	10.6
	3C 454.3	3EGJ2254+1601	53.7 ± 4.0	-38.3
HMXB	LSI +61 303/ 2CG135+01	3EGJ0241+6103	69.3 ± 6.1	1.0
any source (except Crab, Vela and Geminga pulsars)			**monitor if flux exceeds $2X10^{-6}$ cm^{-2} s^{-1} and report flux down to 2×10^{-7} $cm^{-2}s^{-1}$**	
After confirmed detection by LAT				
Blazar	Mrk 501			
	W Com 1219+285	3EG J1222+2841	11.5 ± 1.8	83.5
	1ES 1959+650	TeV		
	1ES 2344+514	TeV		
	H 1426+428	TeV		
	PKS 2155-304	TeV		

(From Peter's presentation at the August 2005 Collaboration Meeting)

MULTIFREQUENCY IS A KEY INGREDIENT FOR ALL THE SCIENTIFIC ITEMS...AND DUTIES

BUT VERY DIFFICULT TO ARRANGE.....

PKS 1622-297

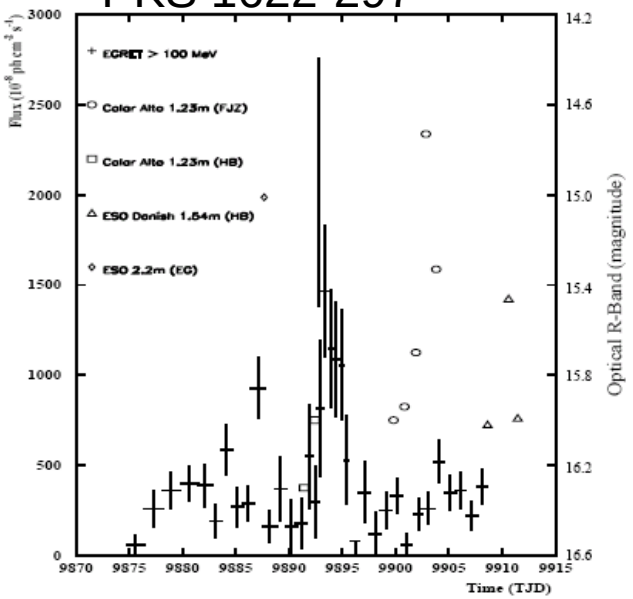
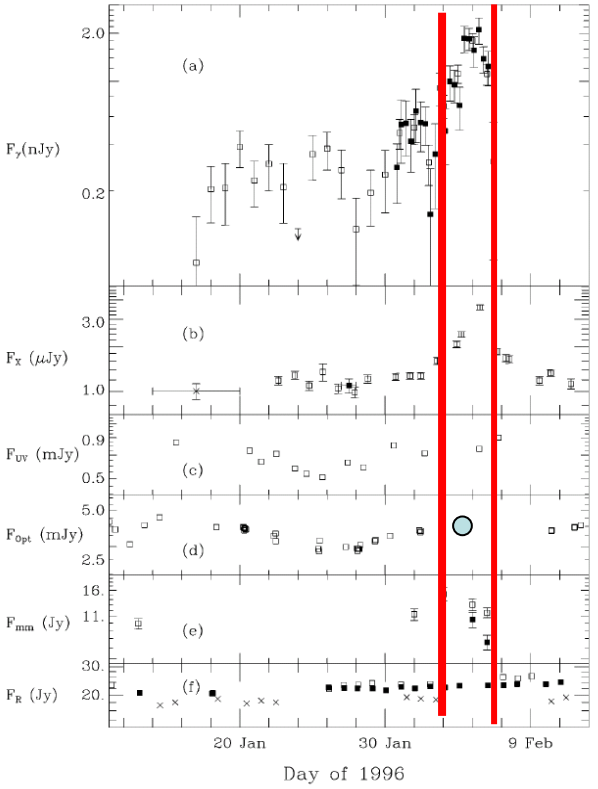


Fig. 8. Time history of PKS 1622-297 in γ-rays at energies above 100 MeV compared to the optical R band (symbols) during its 5-week flare state in 1995. The error bars are 1 σ.

"….Due to the sparse sampling in the optical, flux correlations between optical and γ–ray energies cannot be identified" (Zhang et al 2002)



3C279

Only one Optical Point during the Maximum of the γ-ray flare

(data from Wharle et al.1998)

How we are proceeding to setup a MW Plan

- Analysis of the pre-launch Blazar open-questions
  - Develop some Use cases and list resources needed (pre-launch, follow-up, simultaneous observations)
  - Develop an observing strategy for each Use Case based on GLAST simulation (derive limits on spatial,time and spectral resolution)
  - Pre-launch test of the feasibility of each Use Case (es. Organize some MW Campaign...)
- Leave an open door for New discoveries

Some Pre-lanch Open Question

- Population studies, Luminosity functions, etc,
- Blazar emission models
- Blazar Long/Short term gamma variability
- Blazar gamma duty cycle
- EBL,
- Etc.

Greg's Use Cases

Greg's Science Goals	TARGET	APPROACH	MW DATA	TIME SCALE
1-Blazar Sequence? (A number of recent papers do not confirm the sequence)	About 20 Blazars	SED fitting	IR,OPT,X **(radio?)**	Contemporaneous (**snapshot?)**
2-SSC Model and HBL	Mkn 421, Mkn 501,1ES1959+65	Detection of orphan flares	Soft X-ray, TeV **(optical?)**	Simultaneous **(Long/medium period?)**
3-Are single zone SCC/ECR model applicable ?	3C279,PKS **1622-297?**, PKS 0528+134, Etc...	Relation between synchrotron (SR) and IC components	IR,OPT,UV **(radio? X?)**	Simultaneous - High time resolution
4-Are SR e IC cospatial?	Mkn 421, Mkn 501,1ES1959+65 **(3C279 ... as in 3?)**	Study of time lags at different energy	IR,OPT,UV **(radio? X?)**	Simultaneous - High time resolution
5-Inner jet content (e+/e-, Poynting,)	3C279,PKS **1622-297?**, PKS 0528+134, Etc...	X ray precursor	Soft X	Good coverage (medium term period)
6-total Jet power, efficiency	BL Lac, PKS 1510-089	Modeling of the Compton component	Hard X	Simultaneous
7-Gamma-ray flares related to magnetic dissipation?	AO 0235+164, 3C454.3	Study of IR/opt polarization near SR peak	OPT.IR	Simultaneous - High time resolution

What we need (Specific Items)

- Simultaneous Observations
  - Planned MW Campaign
    - » Source selection
    - » When to start the campaign (the period with the best object accessibility from ground and Space, problems: TAC, weather etc.)
    - » Observing strategy (energy Bands, time resolution)
    - » Duration
    - » Data Collection quality check of data and Analysis;
  - ToT (large flares)
    - » Proposal , how to activate facilities
    - » Observing strategy (energy Bands, time resolution)
    - » Duration
    - » Data Collection quality check of data and Analysis;

What we need (Specific Items)

- Follow-up Observations
  - New Sources Characterization
    - » Facilities needed
    - » Observing strategy (energy Bands, time resolution
    - » Data Collection quality check of data and Analysis;
  - Long Term Gamma-ray Variability, Duty Cycle
    - » Source sample
    - » Correltated MW variability
    - » Observing strategy (energy Bands, time resolution)
    - » Facilities needed
    - » Data Collection quality check of data and Analysis;

What we need (an example)

- Follow-up Observations

  Glast will detect 3000-10000 new blazar... Here we assume ~ 5000

- New Sources Characterization (es. optical variability)
  - Facilities needed in the optical ?
    - » Which telescope size? (EGRET Blazar mag. Range 14-24)

      →1-2m class telscopes
  - Observing strategy
    - » energy Band: V & I (or B & I; or only R)
    - » time resolution: 1 obs. per month (or 1 per week)
  - How many telescopes we need to observe just 1500 sources once per months?

  Total number of observations (1 yr):

  1500(#obj)*12(months)*2(#exps)=36000 obs

  #number of observations for a single telescope(1yr):

  420(min 7 h per night)*280(useful days 1 yr)/10(min 1 obs duration)=10500 obs

  → # of telescope ~4 (fully dedicated)

  DO WE NEED SUCH KIND OF PROJECT?

What we need (Specific Items)

– Pre-launch Activities

- Population Studies
  - » Definition of statistically well-defined Blazar samples at different wavelenghts
  - » MW Characterization of known gamma-ray Blazars (Observing strategy, energy Bands, time resolution, facilities needed)

- Long Term MW variability of known sources
  - » Source sample, (Histrorical LC from archivial data...)
  - » Observing strategy (energy Bands, time resolution)
  - » Facilities needed;
  - » Data Collection, quality check of data and Analysis;

What We Need (primary items)

- Agreement with WEBT,GTN, X-ray Satellites, TeV,IR,Radio facilities
- A “Core Group” of facilities (radio,ir, optical,TeV) able to follow some selected sources when they are both in high and low states
- **An observing strategy for each scientific Use case**

What We Need (secondary items)

- Strong GLAT Team support in preparation/submission of Proposal to Large Facilities (ESO, Hawaii, etc., Radio Tel.)
- Data policy: what can the Glast Team offer to the MW contributors?
- Do we need a communication system for alerts, data exchange (GCN?, ?,?)?
- Do we need a dedicated, object oriented, MW archive (historical data, new obs,literature, etc;e.g. each WG member could adopt a blazar)
- Discussion with the AGILE Team-AGN WG(many facilities involved to support AGILE next years, will be also involved to support GLAST).
- Support from all members of the WG and support for young people