



**Gamma-ray Large
Area Space
Telescope**

INFN Activities on GLAST

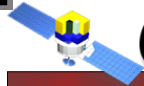
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**GLAST-IFC Meeting
Frascati 3 September 2007**



Frascati 3 september 2007



GLAST
The Gamma Ray Large Area Space Telescope

R. Bellazzini



Overview of INFN Italian activities

- **Science working groups**
- **ISOC operations**
- **Simulations and core activities**

40 FTE – ~1M\$/year INFN+ASI funding



GLAST LAT Science

- **Science Working Groups**
 - **Calibration and Analysis Methods** ([L.Latronico](#), [P.Bruel](#))
 - **Blazars and other AGNs** ([G.Tosti](#), [B.Lott](#))
 - **Diffuse and Molecular Clouds** ([T.Porter](#), [I.Grenier](#))
 - **Catalogs** ([S.Digel](#), [I.Grenier](#))
 - **Pulsars, SNR and Plerions** ([R.Romani](#), [A.Harding](#))
 - **GRB** ([N.Omodei](#), [V.Connaughton](#))
 - **Sources in the Solar System** ([G.Share](#), [F.Longo](#))
 - **Unidentified sources, populations and other galaxies** ([P.Caraveo](#), [O.Reimer](#))
 - **Dark Matter and new physics** ([J.Conrad](#), [R.Johnson](#))
(just rotated [A.Morselli](#), [E.Bloom](#))
- **Satellite groups**
 - **IRF Working Group** ([R.Rando](#))
 - **IRF Monitoring (ISOC)** ([C.Cecchi](#))
 - **Beam Test Analysis** ([L.Latronico](#), [P.Bruel](#))



SWG General Activities

- Organize meetings
 - EVO every ~ 2 weeks
 - F2F meeting (during collaboration meetings, GLAST workshops,...)
- Drive the science activities and analysis
- Organize multi-wavelength Campaign
 - preparing proposals to be submitted to other observatories
- Organize Conference participations
 - GLAST LAT Speaker's Bureau at <http://glast.pi.infn.it/SB/SBmain.html>
- Identify papers to publish



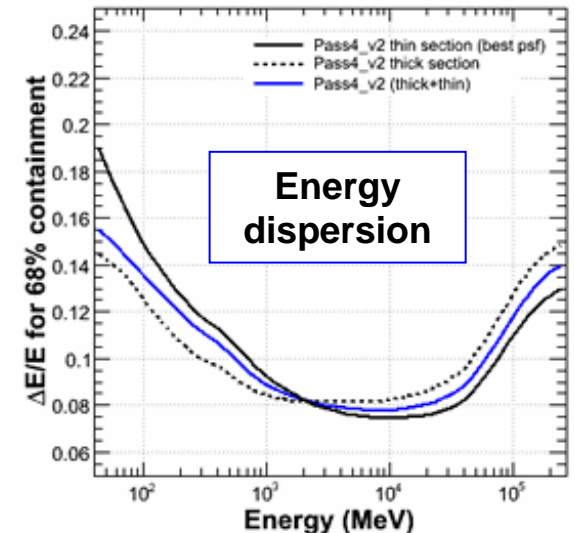
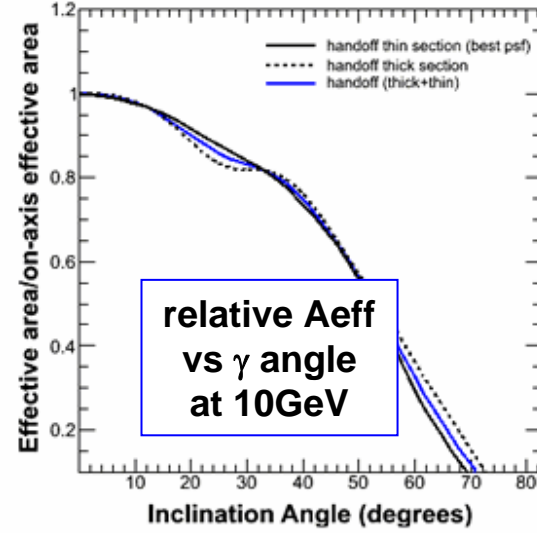
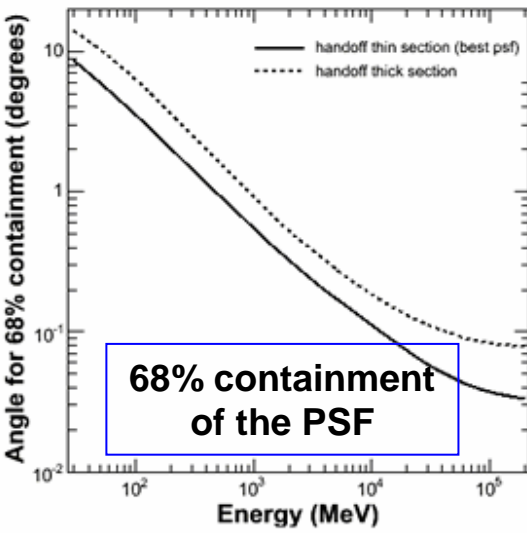
Scientific analysis

- **LAT performance characterization (Padova, Pisa)**
 - **Background rejection verification**
 - **Event classes selection**
 - **IRF parameterization**
 - **IRF induced systematics**
 - **Public performance page update**
- **LAT Calibration (Bari, Padova, Perugia, Pisa, Trieste)**
 - **Beam Test**
 - **Geant4 validation**

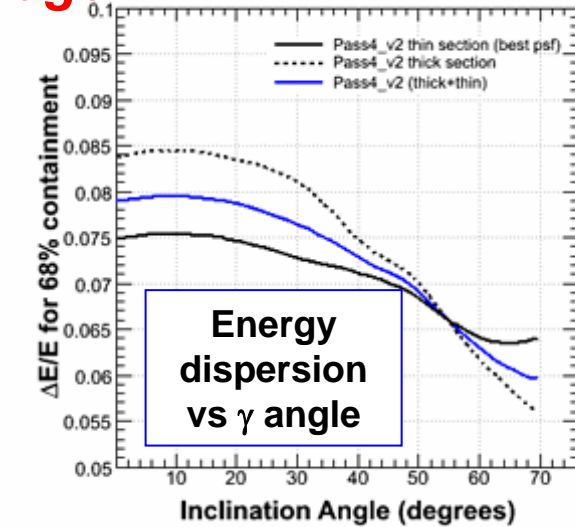
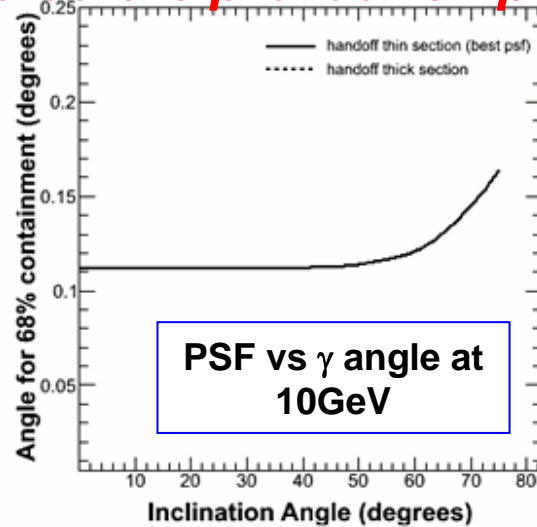
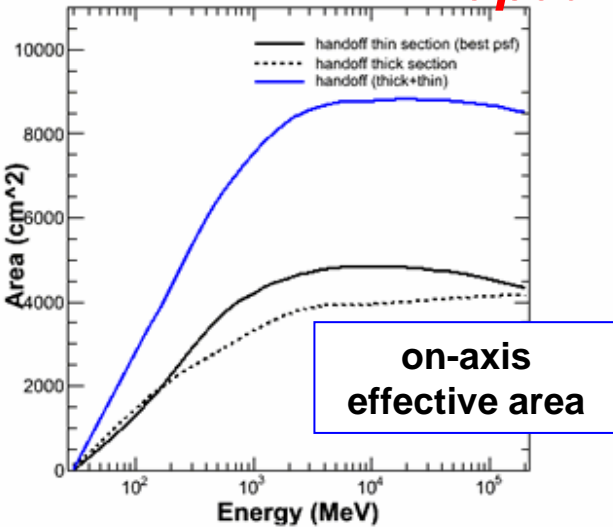


LAT Performance

http://www-glast.slac.stanford.edu/software/IS/glast_lat_performance.htm



update before pre-launch package





Scientific analysis

- **Gamma-Ray Bursts (Pisa, Trieste)**
 - GRB detection and theory
 - GRB simulation
 - Event classification
 - LAT sensitivity to GRB
- **Dark Matter (Roma)**
 - LAT sensitivity to DM signal
 - Galactic Centre
 - Kaluza-Klein DM
- **Pulsars (Bari, Pisa)**
 - Pulsar simulation
 - Spectral studies and emission model studies
 - Search techniques



Scientific analysis

- **Active Galactic Nuclei (Perugia)**
 - **Multiwavelength campaigns**
 - **Variability studies**
- **SNR (Padova)**
 - **SNR simulation (spatial model and spectra from HESS and Cangaroo data)**
 - **Spectral analysis and background analysis**
 - **demonstrated LAT capabilities on 2-month timescale?**
- **Solar Physics (Bari, Padova)**
 - **Tools for analysis of moving sources**
 - **Solar flares detection and interpretation**
- **Catalog (Perugia)**
 - **Source detection (PGWave)**
- **Science workshop and meetings**
- **Papers**



5th Workshop on Science with the New Generation High Energy Gamma-ray Experiments SciNeGHE07

The light of the dark: solving the mysteries of the Universe

Villa Mondragone, Frascati, Rome, (Italy) June 18 - 20, 2007

- About the Workshop
- General Information
- Fee
- Scientific Program
- How to Reach
- Accommodation
- Registration
- Abstract Submission
- Committee
- Conference Poster

Previous Workshop

- > Elba Island 2006
- > Cividale del Friuli 2005
- > Bari 2004
- > Perugia 2003

THE WORKSHOP

This will be the fifth of a series of **Workshops on High Energy Gamma-ray Experiments**, following the Conferences held in *Perugia 2003, Bari 2004, Cividale del Friuli 2005, Elba Island 2006*.

This year the focus will be on the use of gamma-ray to study the Dark Matter component of the Universe, the origin and propagation of Cosmic Rays, Extra Large Spatial Dimensions and Tests of Lorentz Invariance.

An update on the current and planned research for space-borne and ground-based experiments dedicated to the observation of the gamma-ray sky will be given.

Among the participants there are both hardened veterans of the first dedicated gamma-ray missions (like **SAS-2, COS-B, CGRO**) and young students entering the fascinating field of gamma-ray astrophysics participating in the new generation of high energy gamma-ray astrophysics experiments like **GLAST, AGILE, MAGIC, HESS, ARGO, VERITAS** and **MILAGRO**.

SCIENTIFIC TOPICS



Organising Committee

- A. Morselli (INFN & Univ. Roma Tor Vergata) – Chair
- D. Bastieri (INFN & Univ. Padova)
- V. Buffaro (INFN & Univ. Roma Tor Vergata)
- A. De Angelis (INFN & Univ. Udine)
- A. Ferrari (CIFS & Univ. Torino)
- N. Giglietto (INFN & Politecnico Bari)
- A. Lionetto (INFN & Univ. Roma Tor Vergata)
- F. Longo (INFN & Univ. Trieste)
- N. Omodei (INFN Pisa)
- E. Orzi (INFN & Univ. Roma Tor Vergata)
- G. Tosti (INFN & Univ. Perugia)

<http://www.roma2.infn.it/SciNeGHE07/>

Workshop Italiano su: Astrofisica Gamma dallo Spazio

AGILE e GLAST

2 e 3 LUGLIO 2007

ASI Science Data Center
ESA - ESRIN
Frascati



Papers

- **Published:**
 - **20 contributions to GLAST Symposium**
- **Under editors review**
 - **Design and Initial Tests of the Tracker-Converter of the Gamma-ray Large Area Space Telescope**
 - **cat.II TKR subsystem paper, submitted to AstroParticle Physics**
- **Pre-launch**
 - **The construction of the tracker flight towers of the Large Area Telescope of GLAST**
 - **cat. II TKR subsystem manufacturing paper, draft in preparation**
 - **Environmental tests of the flight GLAST LAT Tracker Towers**
 - **cat. II TKR manufacturing paper, draft in review, planned submission to NIM**



Papers

- **Pre- launch**
 - **Final Beam Test paper**
 - **IRF Monitoring**
 - **Simulations, Sensitivities (eg. DM paper, Blazar overview, GRB theory and GLAST)**
- **Planned Post-Launch**
 - **Category 1 papers: each science group is preparing a list of papers to be written in first year (all major discoveries) by the full LAT collaboration**
 - **Category 2 papers: written by LAT science group active members**
 - **On orbit calibration of the GLAST LAT**
 - **On orbit performance monitor of the GLAST LAT**
 - **BL Lac**
 - **Comprehensive paper on Blazar observations**
 - **.....**



Conference contributions

- **First Glast Symposium**
 - **20 contributions**
- **Scineghe07 (INFN organization)**
 - **GLAST LAT Cosmic Ray data analysis at ground**
- **Vienna Conference on Instrumentation 2007**
 - **The GLAST Large Area Telescope - Design, Construction, test and calibration**
- **2007 Europhysics Conference on High Energy Physics**
 - **GLAST and the future of High Energy Gamma-ray astrophysics**
- **30th International Cosmic Ray Conference 2007**
 - **Search for point-like Dark Matter sources with the GLAST Large Area Telescope**
- **TeV particle astrophysics, TAUP, ICATPP07**



ISOC Operations

- **Data Fast Monitor (Pisa)**
 - Monitor raw data in electronics space
 - Independent from pipeline processing and event building
 - Common tools for alarm handling and monitor tools configurations
 - Heritage from beam test online development
- **Optimization (Bari)**
 - Impact of failures (ACD, TKR, CAL)
 - Performance
 - LAT configuration
- **Performance Monitoring (Perugia, Padova)**
 - IRFs high level monitoring
 - PSF, Aeff, Energy Resolution
 - Background and Trigger Monitoring



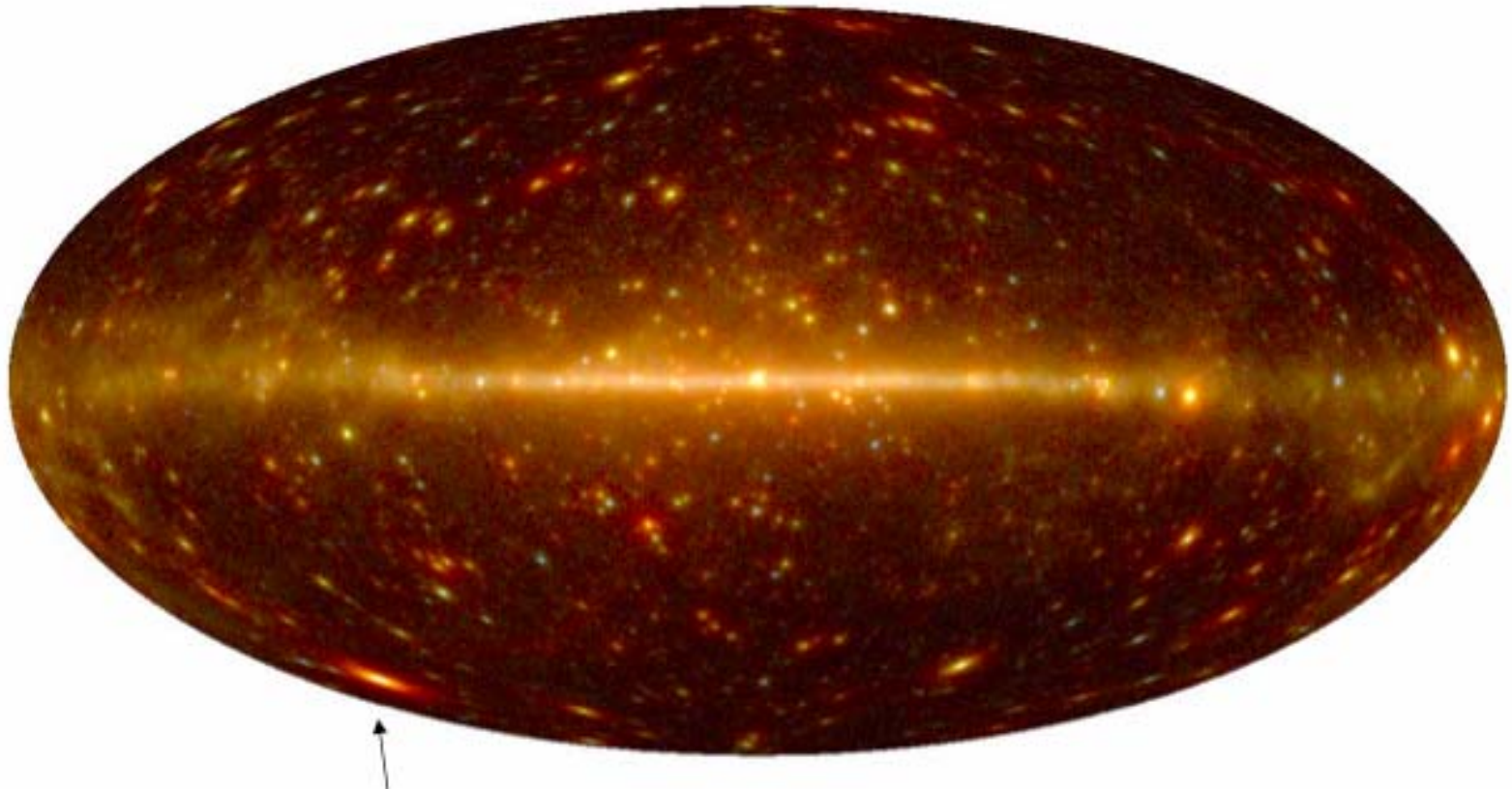
ISOC Operations

- **Data Processing (Perugia, Pisa, Trieste)**
 - **Pipeline Management for L1 data delivery**
 - **Automated Science Processing for flares and transients**
- **Science Operations Coordination (Bari, Pisa)**
 - **Organization of shift responsibilities**
 - **Procedures and protocols for instrument monitoring, anomaly resolution**
- **Flares and transients advocates (Bari, Perugia, Pisa, Trieste)**
 - **GRB**
 - **Solar flares**
 - **AGN flares**
- **L&EO studies**



Simulations

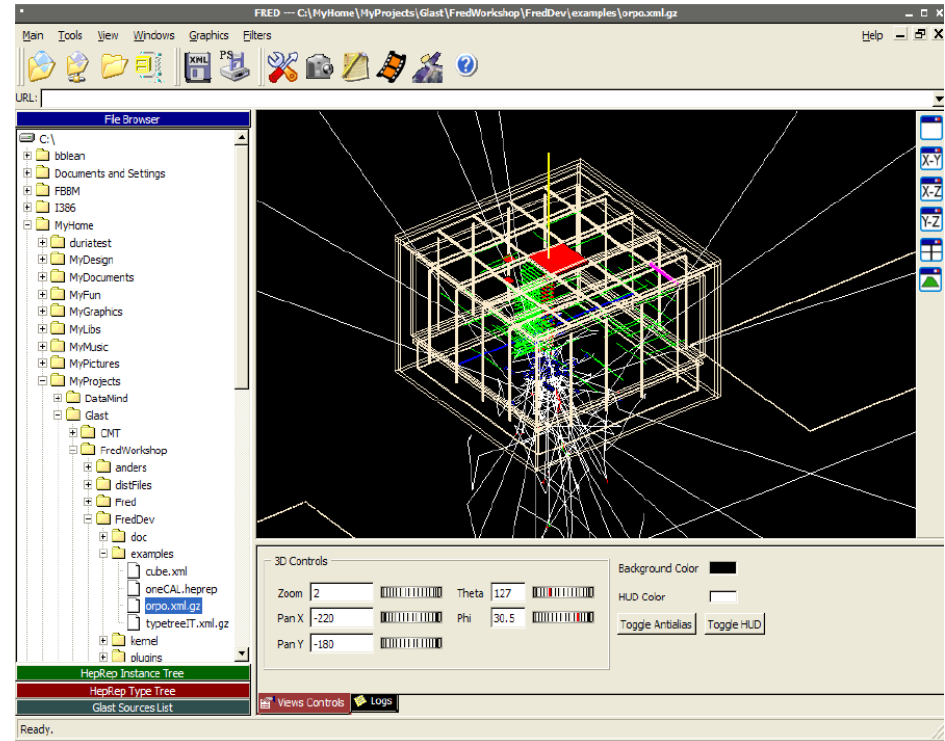
- **Service challenge (Perugia, Pisa, Trieste)**
 - sky model definition and implementation of sources
 - Coordination of sky model generation
 - Pipeline usage
 - SC System Test





Core activities

- **Core software development (Pisa, Trieste)**
 - TKR alignment
 - TKR digitization
 - Release-management
 - Event Display
 - configuration management graphics tools
 - Geant4 validation and maintainance





Summary

- **INFN has key responsibilities in GLAST data analysis**
 - **From the Instrument Characterization to the High Level Science Analysis**
 - **Demonstrated by Test Beam, Data Challenges, Service Challenge, I&T data analysis, coordination of many SWG**
- **INFN is heavily contributing to ISOC**
 - **operations planning**
 - **Development of tools**
- **INFN support GLAST science through SC simulation and key core developments**