





SciNeGHE2010 – Data Analysis Tutorial

- ❑ **Gamma-ray Astrophysics in the Multimessenger Context**
- ❑ **School is composed of this tutorial and the workshop**
- ❑ **Tutorial is composed of three main parts**
 - **Geant4, ROOT, Scripting Tools → The basics of Detector Simulation and Data Analysis**
 - **GALPROP → a tool for the Simulation of Gamma-rays and CR**
 - **Fermi and CR data analysis**
- ❑ **Workshop is based on the analysis of**
 - **Gamma-rays, Cosmic Rays, Neutrinos**
 - **Galactic and Extragalactic Sources**
 - **Operating and foreseen experiments**


Consorzio Interuniversitario per la Fisica Spaziale



International School OF Space Science

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WELCOME

International School of Space Science

The International School of Space Science (ISSS) began its activity in 1991. The School is organized by the **Consorzio Interuniversitario per la Fisica Spaziale** (C.I.F.S.) which joins several Italian Universities active in the field of Space Science (Catania, Firenze, L'Aquila, Milano, Roma "La Sapienza", Roma "Tor Vergata", Torino, Trieste) and Istituto Nazionale di Astrofisica (INAF). Since foundation ISSS is directed by prof. U. Villante.

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Gamma-ray Astrophysics in the Multimessenger Context

Data Analysis Tutorial

Trieste, 2010, September 6 - 7

The 8th edition of the Scineghe workshop on "Gamma-ray Astrophysics in the Multimessenger Context" will be preceded by a two days tutorial on astroparticle experiments analysis methods. The tutorial and the workshop are a unique opportunity for young students entering in the new field of astroparticle physics to learn the state of the art of current experiments and scientific results in this fascinating field. The tutorial and the workshop will constitute the 2010 course of the International School of Space Science (ISSS) which is collaborating with INFN Trieste in the organization of the tutorial.

Why now?

- Fermi LAT started in 1992 → 1 year after CGRO launch



Key to success: a good Monte Carlo


- From the start of GLAST (now *Fermi*-LAT) we had a Monte Carlo model of the instrument
- Contemporary instruments too complex to use simple metrics to characterize their performance
- The Monte Carlo model captures our best and most complete understanding of the instrument
- The MC model is the instruments calibration –or- “yard stick”
- The LAT was designed optimized and “debugged” using the MC model
- All of the reconstruction software was crafted using the MC model as well as directly using the MC model and ray tracing to propagate trajectories through the 3D geometry
- The event analysis was designed and developed using the MC model

B.Atwood

Tokyo Fermi Symposium

Why now?

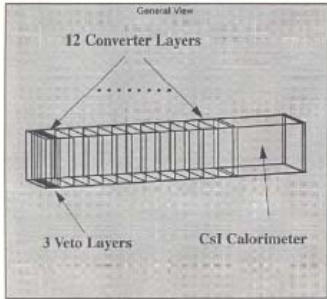
□ Towards the new decade?



The First GLAST MC

Within one day of the first GLAST concept, a MC was put together to explore the design idea

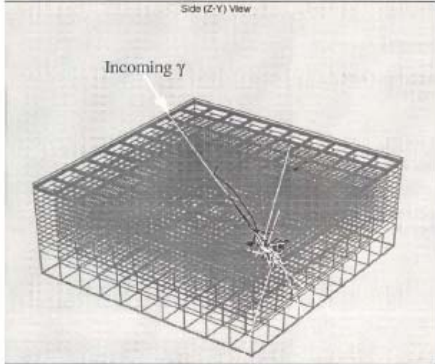
A Single GLAST Tower Module



The 3 Veto Layers and 12 Converter Layers form the GLAST Tracker Module

A GLAST Tracker plus the CsI Calorimeter form a GLAST Tower Module

Contents of the GLAST Simulation



- The 3-layer SSD x-ray front end ACD was replaced with more conventional scintillator tile.
- The number of towers was gradually reduced as the achievable noise performance of the SSD front end electrons proved to be better than initially thought.
- The Calorimeter was first simulate as a pixelated device (easier to do), but was intended from the start to be Per Carlson's crossed hodoscopic design.

B. Atwood

Tokyo Fermi Symposium



Tutorial Program – I

Monday September 6, 2010

09.30	Introduction and scopes of the school	F.Longo
09.45	Geant4 a simulation toolkit - I	F.Longo
10.30 Coffee break		
10.45	The ROOT analysis framework - I	G.Giavitto
11.30	Geant4 a simulation toolkit - II	F.Longo
12.15 Lunch break		
14.00	Hands On Tutorial: Geant4	
15.00	The ROOT analysis framework - II	G.Giavitto
15.45 coffee break		
16.00	High Level Scripting Tools - I	G.Tosti
16.45	Hands On Tutorial: ROOT /Scripting Tools	



Tutorial Program – II

Tuesday September 7, 2010

09.30	Recap of previous day	F.Longo
09.45	GALPROP simulation tool for CR and Gamma-ray analysis	I.Moskalenko

10.30 Coffee break

10.45	Introduction to Fermi Data Analysis - I	F.Longo / G.Tosti
11.30	Introduction to CR data analysis issues	N.DeSimone

12.15 Lunch break

13.30	Introduction to Fermi Data Analysis - II	F.Longo / G.Tosti
14.15	High Level Scripting Tools - II	G.Tosti

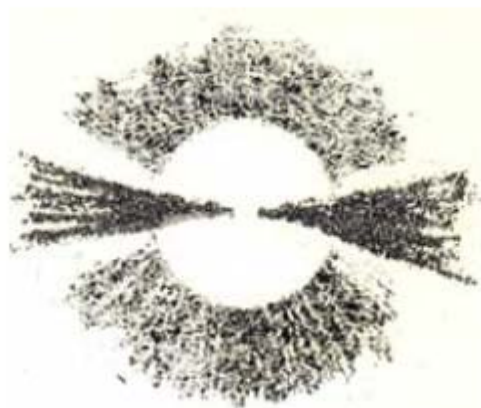
14.50 Break

15.00	From e+e- colliders to High Energy Astrophysics. Following Guido Barbiellini's scientific path.	
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From e^+e^- Colliders to High Energy Astrophysics

Following Guido Barbiellini's scientific path

Department of Physics, University of Trieste - AULA A
Trieste, September 7, 2010



From jets to high energy gamma rays



Tuesday Afternoon

15.00 Welcome addresses

15.15 **e^+e^- colliders**

(G.Giannini - University of Trieste and INFN, Trieste)

16.00 **Electroweak studies at CERN**

(U.Amaldi - University of Milano Bicocca and TERA Foundation)

16.45 Coffee break

17.15 **Silicon detectors for the search of cosmic antimatter and dark matter**

(P.Picozza -University of Roma Tor Vergata and INFN, Roma 2)

18.00 **The violent universe of high-energy gamma astrophysics**

(W.B.Atwood -University of California at Santa Cruz)

18.45 **Concluding remarks**

(G.Barbiellini)