First results from GLAST-LAT beam test at CERN-PS and SPS

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Outline

- The Glast Mission
- The Beam Test Motivations
- The CERN-PS and SPS Runs
  - Physics program
  - Data collection and configurations
  - Preliminary analysis
- Conclusions

The GLAST Mission

GLAST Telescope measures the direction, energy and arrival time of celestial gamma rays

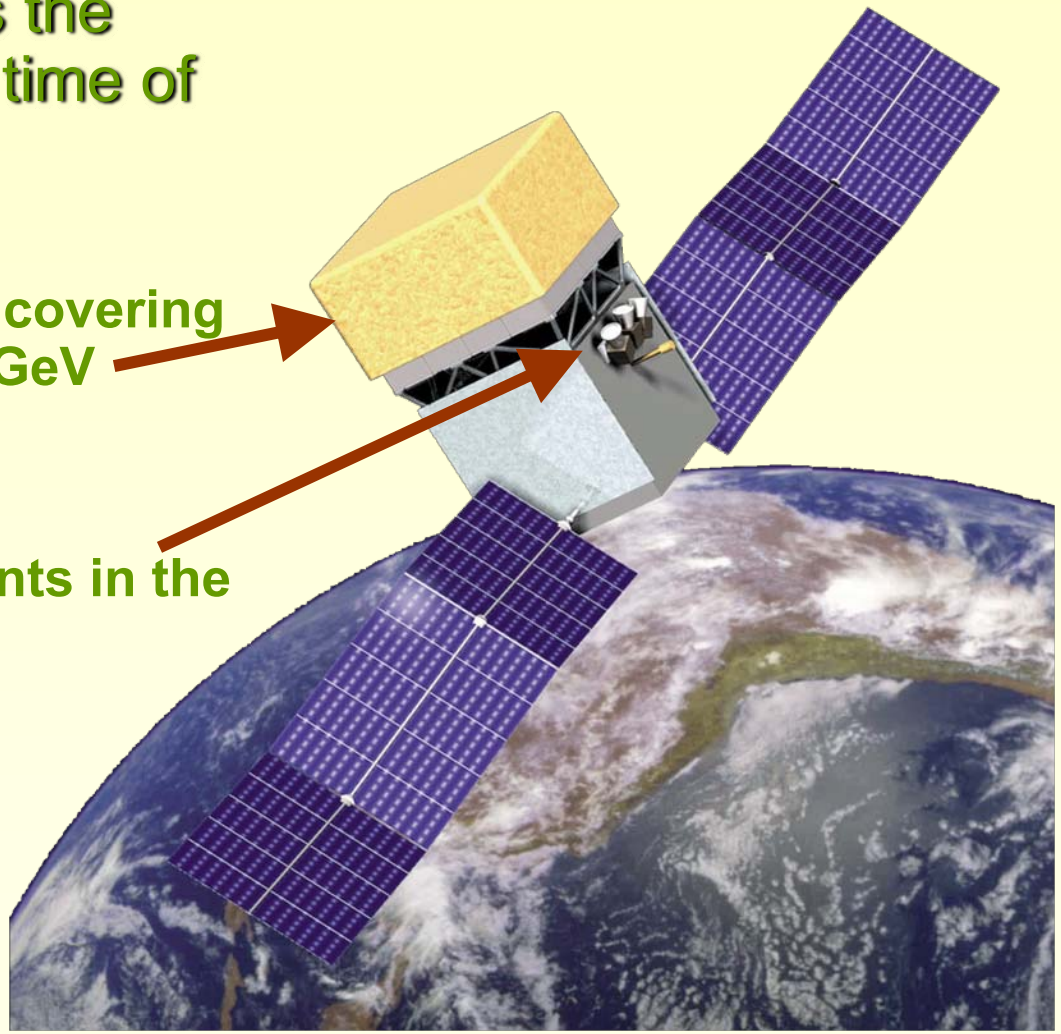
-LAT will observes gamma-rays covering the energy range ~20 MeV -300 GeV

- GBM will detects transient events in the energy range ~20 keV – 20 MeV

Launch: 2007
Florida

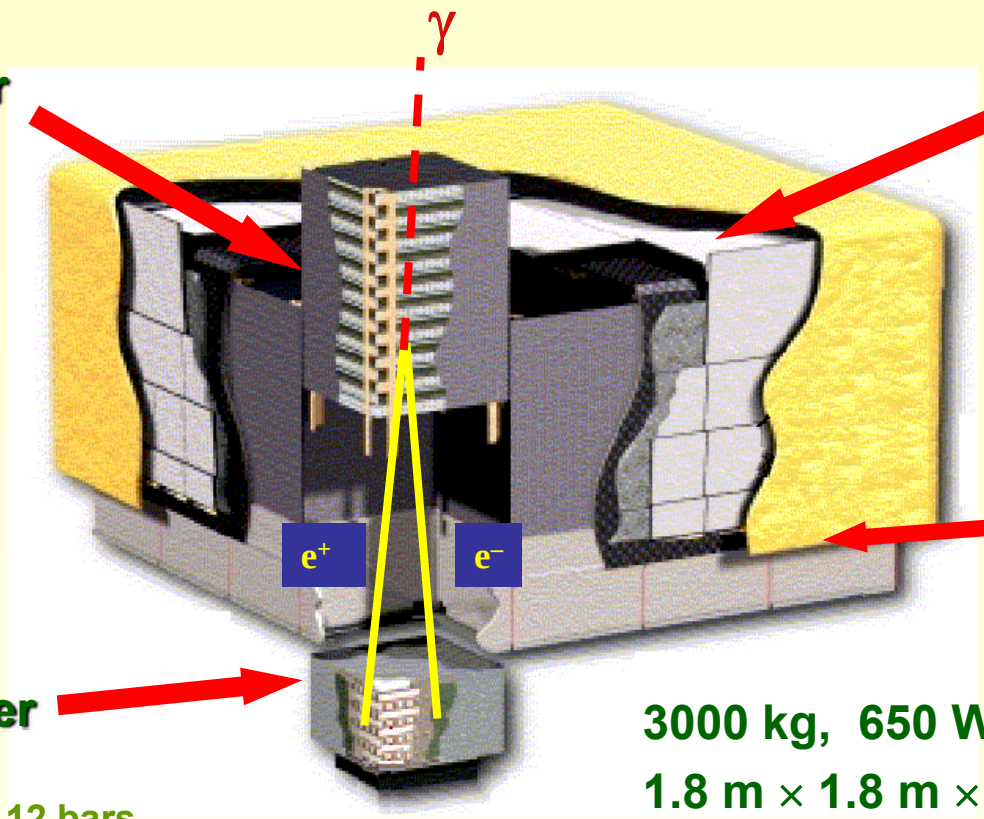
Orbit: 550 km,
28.5^{o} inclination

Lifetime: 5 years
(minimum)



GLAST Large Area Telescope (LAT)

16 identical towers



Si Tracker Tower

SSDs pitch = 228 μm

12 layers × 3% X_0

+ 4 layers × 18% X_0

+ 2 layers

Total channels: 884736

ACD

Segmented scintillator tiles

0.9997 efficiency

Grid (& Thermal Radiators)

CsI Calorimeter

Hodoscopic array

8.4 X_0; 8 planes × 12 bars

2.0 × 2.7 × 33.6 cm

3000 kg, 650 W

1.8 m × 1.8 m × 1.0 m


LAT without ACD

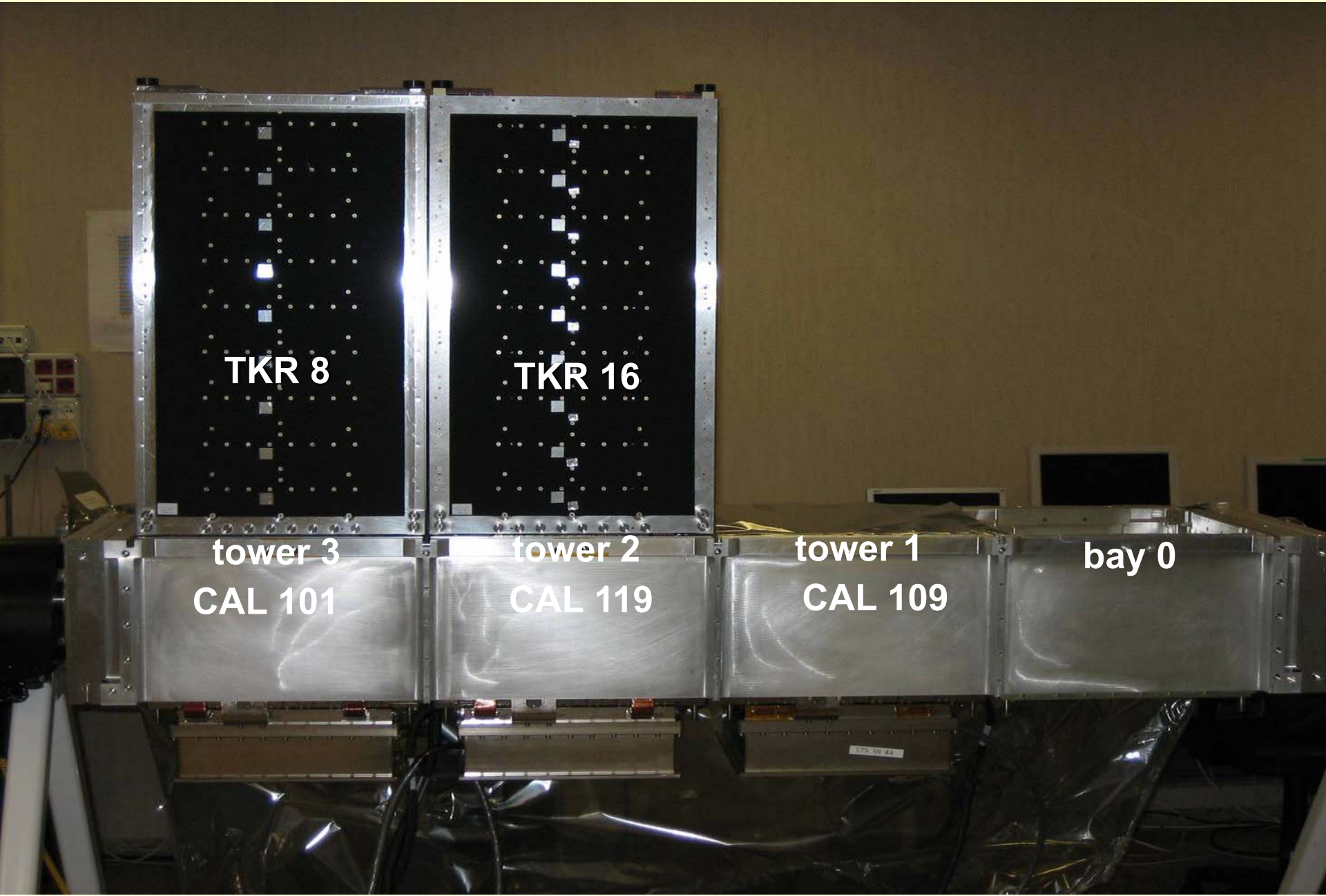

Full LAT assebled

Beam Test Motivations

- LAT calibration on a beam after Full LAT runs with cosmic ray at ground
- Most events on orbit contained in 2 towers

- **Goals**
  - expose a LAT Calibration Unit (CU) to different beams:
    - tagged photons, electrons, protons, positrons
    - energies from 500MeV to 300GeV
    - different configurations (angle, impact point)
  - validate full LAT Monte-Carlo simulation

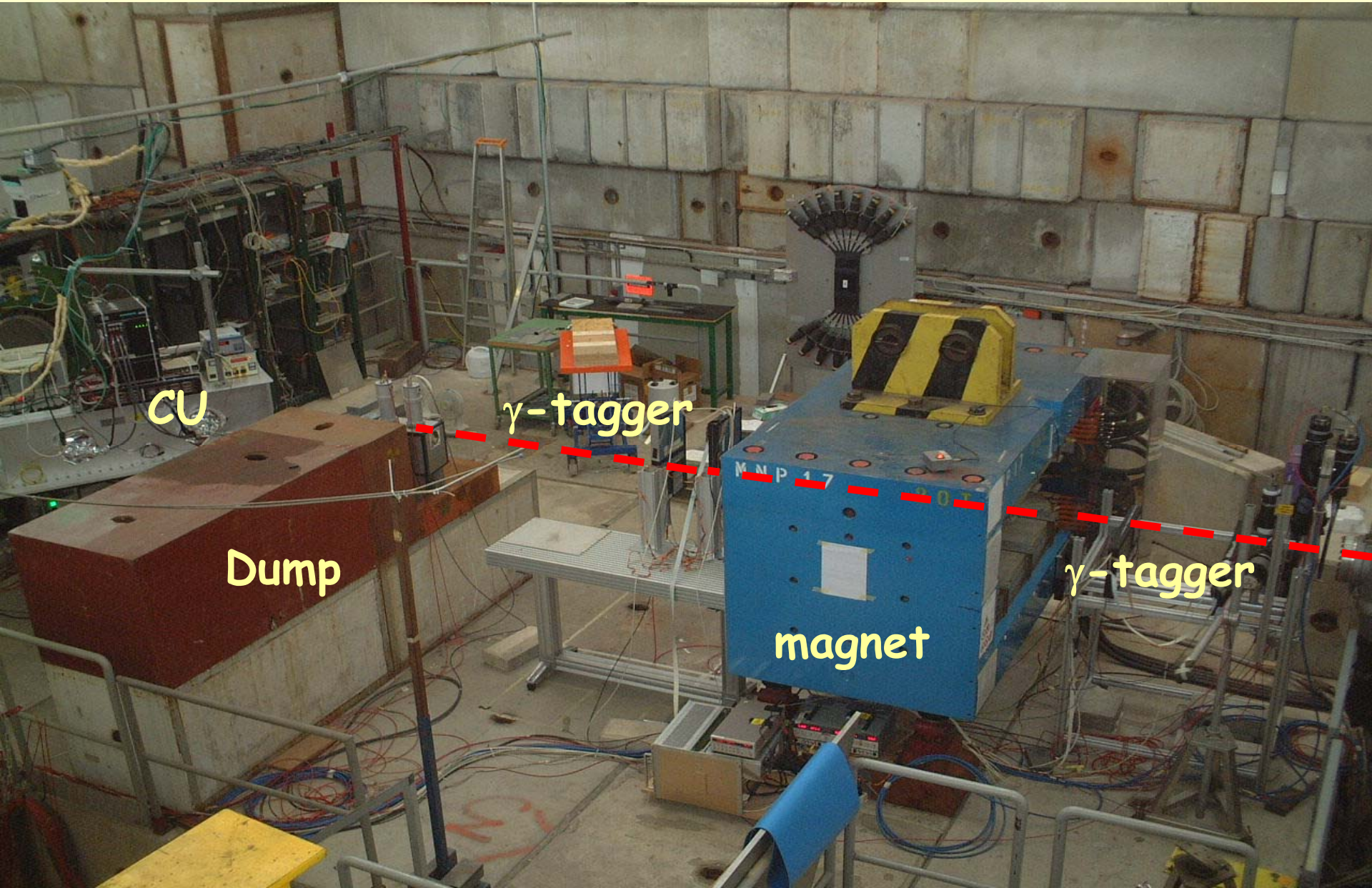
The GLAST-LAT Calibration Unit



Beam Line @ CERN

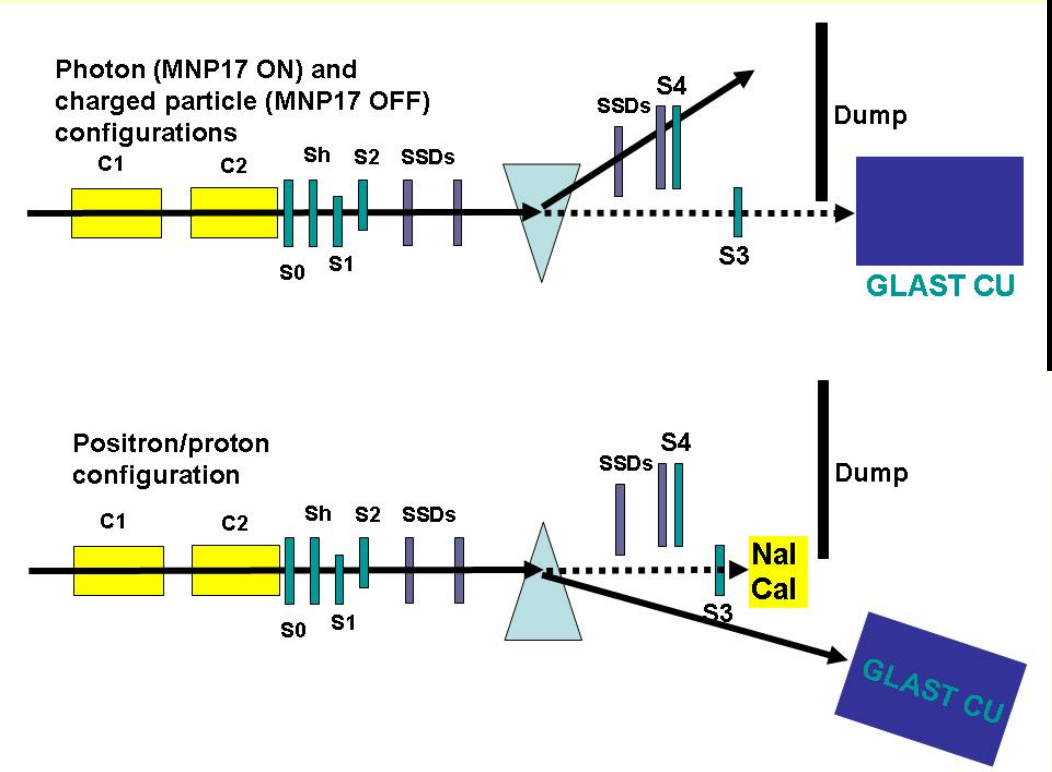
- T9 line - CERN Meyrin
  - Beam extracted from PS
  - e-, e+, p, π 0.5-10GeV/c
- H4 line - CERN Prevessin
  - Beam extracted from SPS
  - e, p, π 10-300GeV/c

The experimental setup @T9



The experimental setup:

Gamma and charged particle detection



Gamma runs

	Tagged mode	Full-brems
Trigger	S_{front}+S4 +Č	S_{front}+ Č
trigger rate	O(100Hz) (AD DAQ)	O(1KHz) (No AD DAQ)

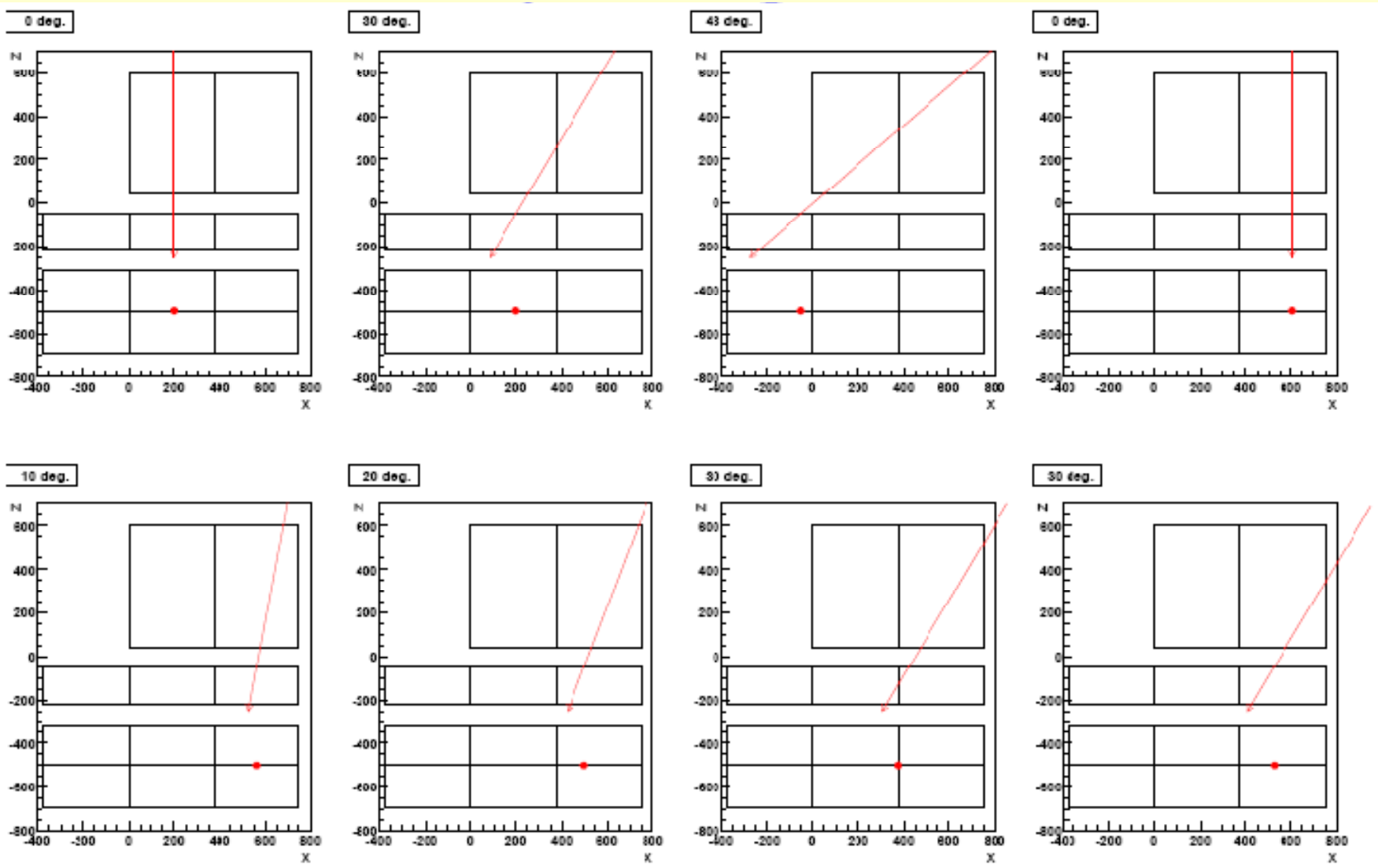
Magnet ON

Full brem spectrum from 2.5GeV e

Positron runs

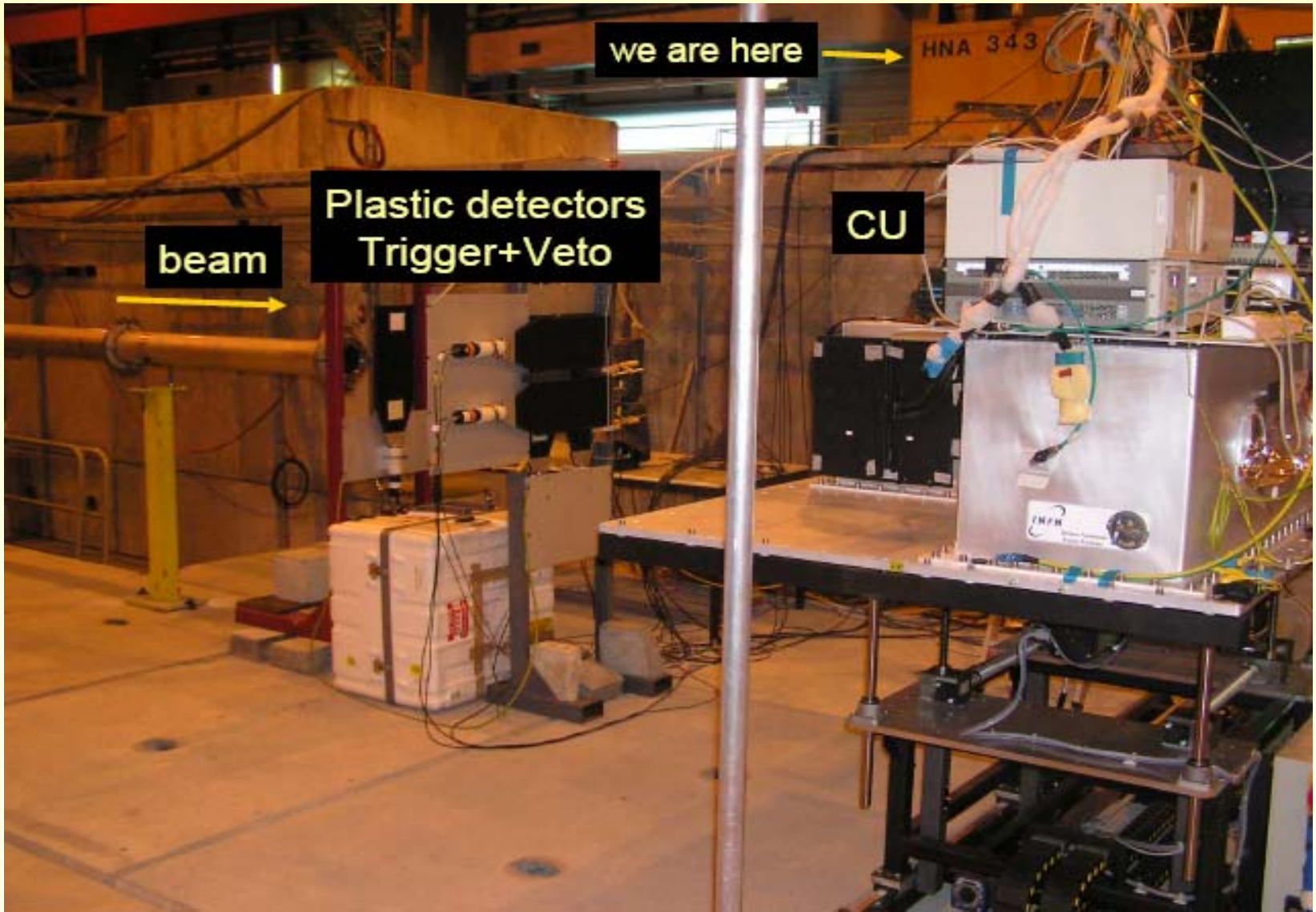
- Magnet ON
- Trigger: S_{front}
- Extended dump to stop brem γ from e+

Photon data taking configurations

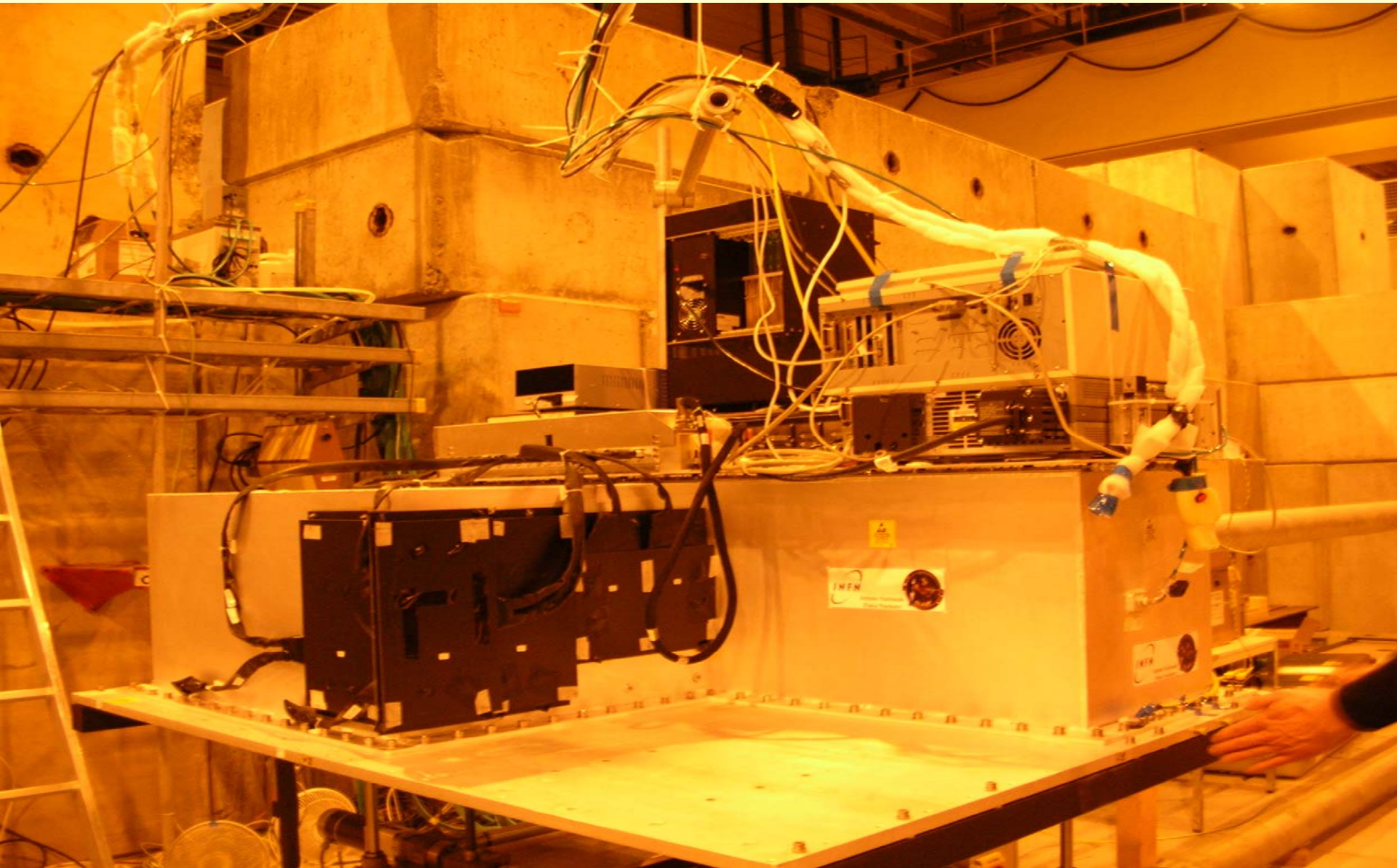


Photons

The experimental setup @ H4

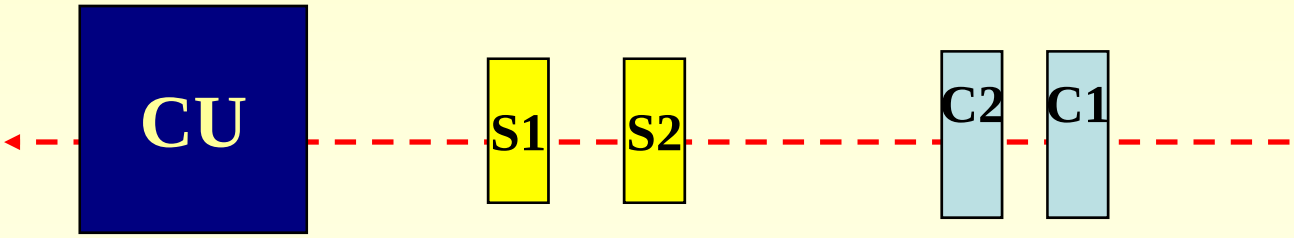


The experimental setup @ H4



H4-SPS setup

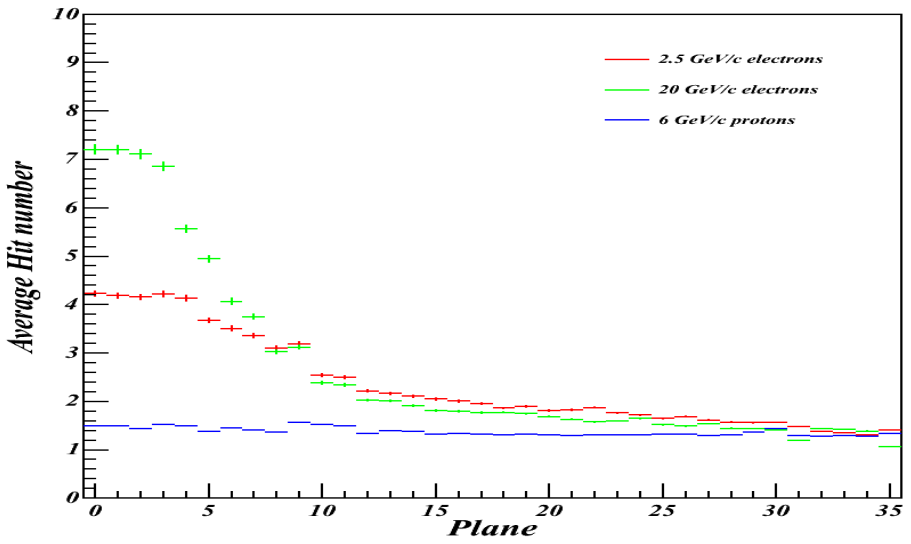
- **CU and electronics: the same of T9 run**
  - Trigger: plastics scintillators and cherenkov for p/π discrimination

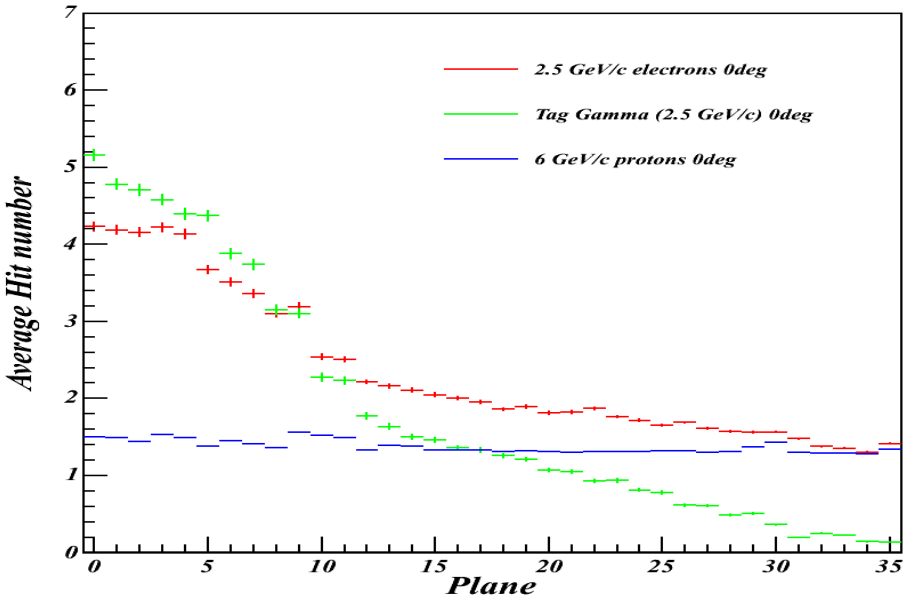


- **Looking for**
  - High energy EM shower
  - High occupancy in TKR
  - ACD backsplash

Preliminary results

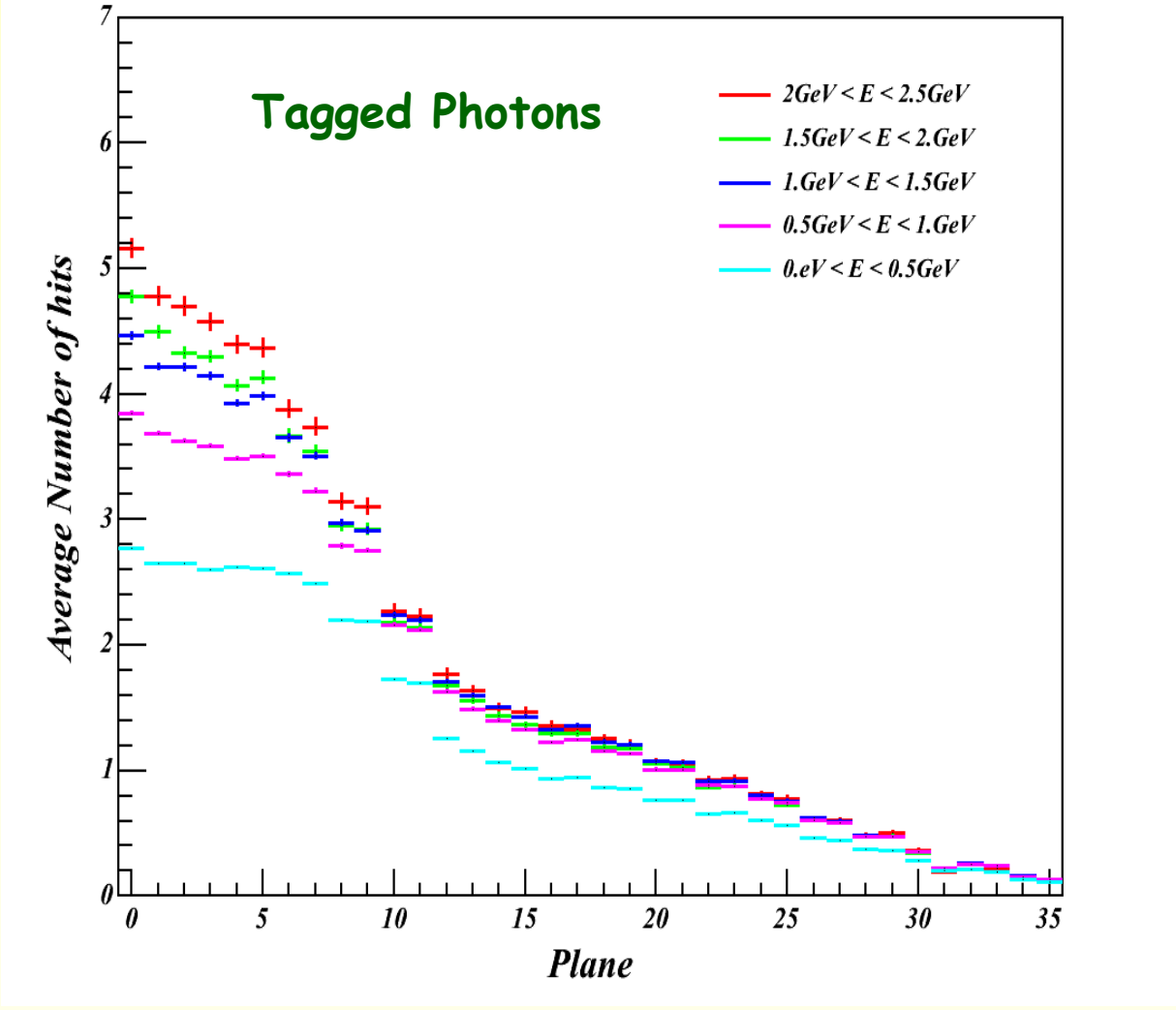
Hit Multiplicity layer by layer for electrons runs at different energies and comparison with photons and protons runs



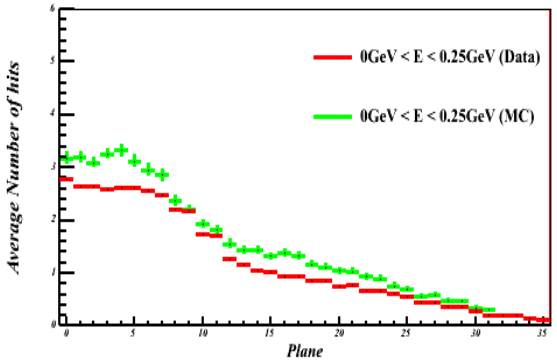


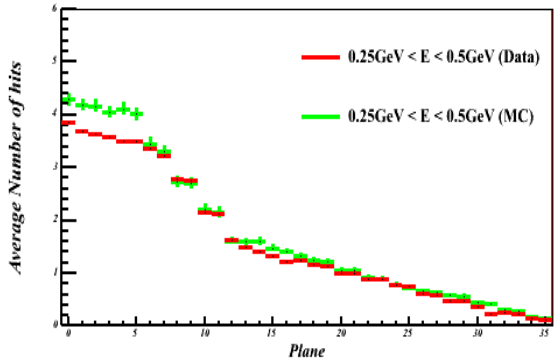
Preliminary results

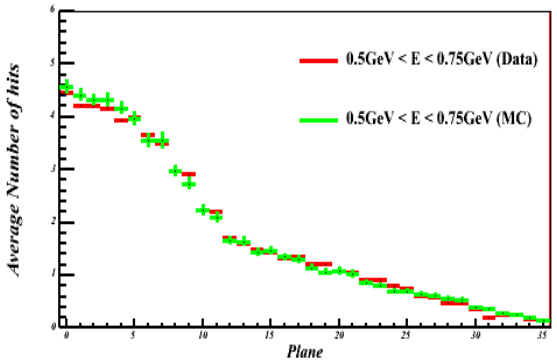
Hit Multiplicity layer by layer for tagged photons runs at different energies

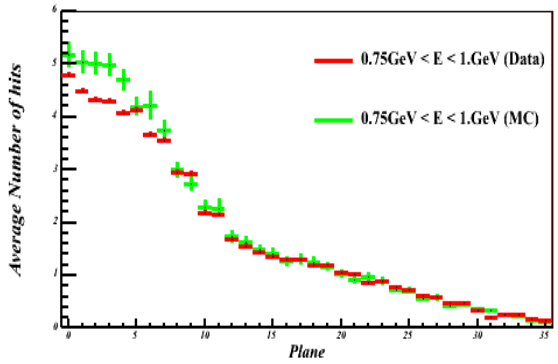


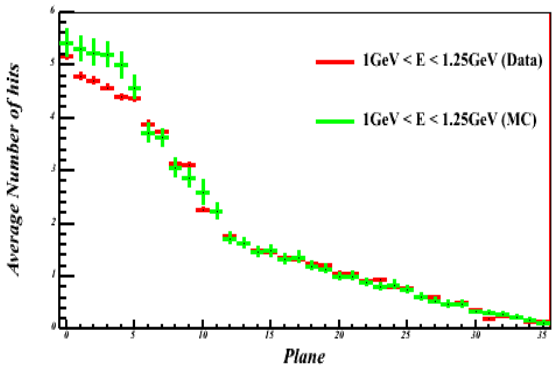
Preliminary results

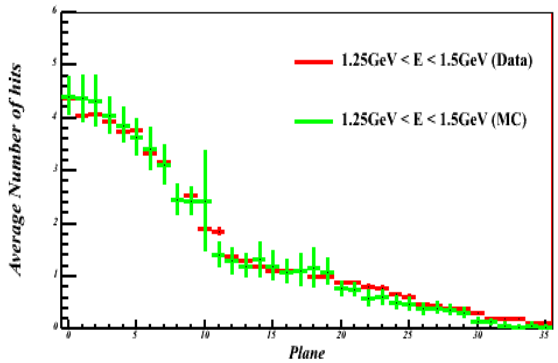












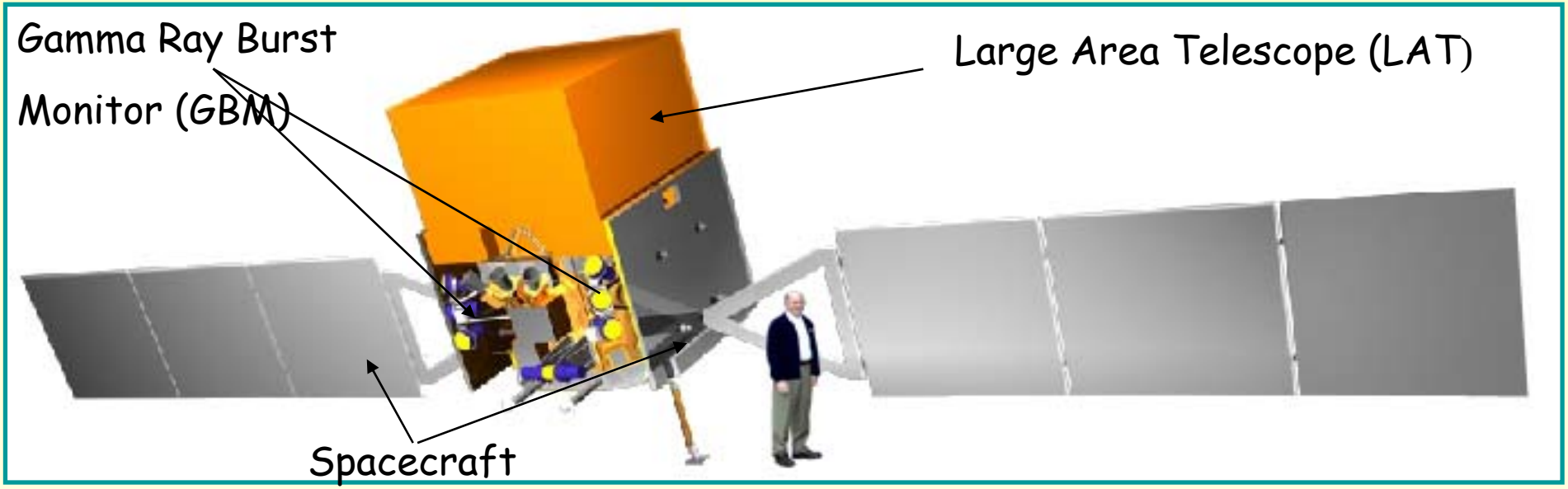
Hit Multiplicity layer by layer for tagged gamma runs and MC comparison

Conclusions

- High statistics data taking with different CU configurations
  - gamma in 500MeV-2.5GeV range
  - e- at 1,2.5, 5GeV
  - e+ at 1GeV
  - p at 6, 10GeV
  - Pions …
- High energy e and p at SPS

- Preliminary analysis show good agreement between data and MC
- More analysis are on going

The GLAST Observatory



Launch Vehicle	Delta II – 2920-10H
Launch Location Kennedy	Space Center
Orbit Altitude	575 Km
Orbit Inclination	28.5 degrees
Orbit Period	95 Minutes
Orientation	+X to the Sun

LAT Overview

A_{eff} ≈ 8000 cm² (E > 100 MeV)
Ang. Res. < 3.5^0 @ E=100MeV
< 0.15^0 @ E>10 GeV

F.O.V.	≈ 2.4 sr
Source Loc.	< 0.5'
Energy Res.	< 10%
Dead time	< 100 μs
Time Res.	≈ 2 μs
Power	500 W