Overview of CERN beam test

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Rationale for CERN

Beam test initially planned at SLAC Target Station A

CERN offers several advantages over SLAC:

- variety of beams (electrons, protons/pions, muons), protons difficult to accelerate at SLAC;
- maximum energy (300 GeV), allowing to cover the whole LAT range; max. available energy at SLAC is 30 GeV;
- continuous beam, beam is pulsed at 30 Hz at SLAC.

Strong previous experience at CERN
GLAST is a "recognized experiment" since 2000 (ren. 2004).
PS (low energy): AGILE tests with tagged photons
SPS (high energy): GLAST calorimeter tests in 1999/2002/2003

Collaboration meeting in last August: consideration of CERN as an alternative option to SLAC, under the joint responsibility INFN-IN2P3.

Rationale for CERN (2)

Proposal submitted in October
Spokespersons: R. Bellazzini (INFN), Benoit Lott (IN2P3)
Very well received by CERN: directly considered by J. Engelen, CERN Chief Scientific Officer, bypassing the SPSC.

March 11: Official schedule is released
4 weeks of beam time at PS-T9 (Jul. 27-Aug.22): responsability of INFN
2 weeks of beam time at SPS-H4 (Sept. 4- Sept. 17): responsibility of IN2P3

Beam test coordinators: E. do Couto e Silva, L. Latronico, BL

In December, it was decided to transfer the integration and test of the "Calibration Unit" detector to Pisa.
Beam test preparations are well under way.
First face-to-face meeting in Pisa next week.

Motivations

LAT ground calibration performed with muons only.
Flight calibration performed using cosmic rays (protons and heavy ions).

We rely on sophisticated Monte-Carlo simulations to predict the LAT performance and establish the background rejection strategy.
We crucially need to verify that:

- our Monte-Carlo model is a faithful match of the real instrument
- all physical processes at play for the particles of interest are correctly modeled in GEANT4.

Different items to be investigated at CERN

1. **Point Spread Function**
2. **Effective Area**
3. **Energy reconstruction**
4. **Backsplash**
5. **Hadronic shower modeling**
6. **Background rejection**
7. **Benchmarking of GEANT4**
8. **Characterization of electronics (trigger/timing/limitations…)**

Beams

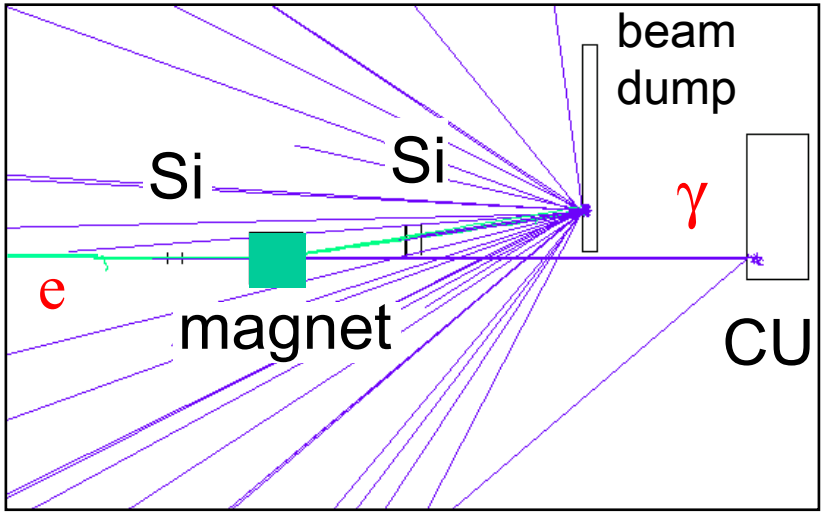
PS “beams” on T9

- tagged gamma-rays (50 MeV-2 GeV)
- electrons (600 MeV-15 GeV)
- protons (600 MeV-15 GeV)
- muons (4 GeV)

Photon tagging spectrometer

Setup similar to that used with AGILE

GEANT4 simulation



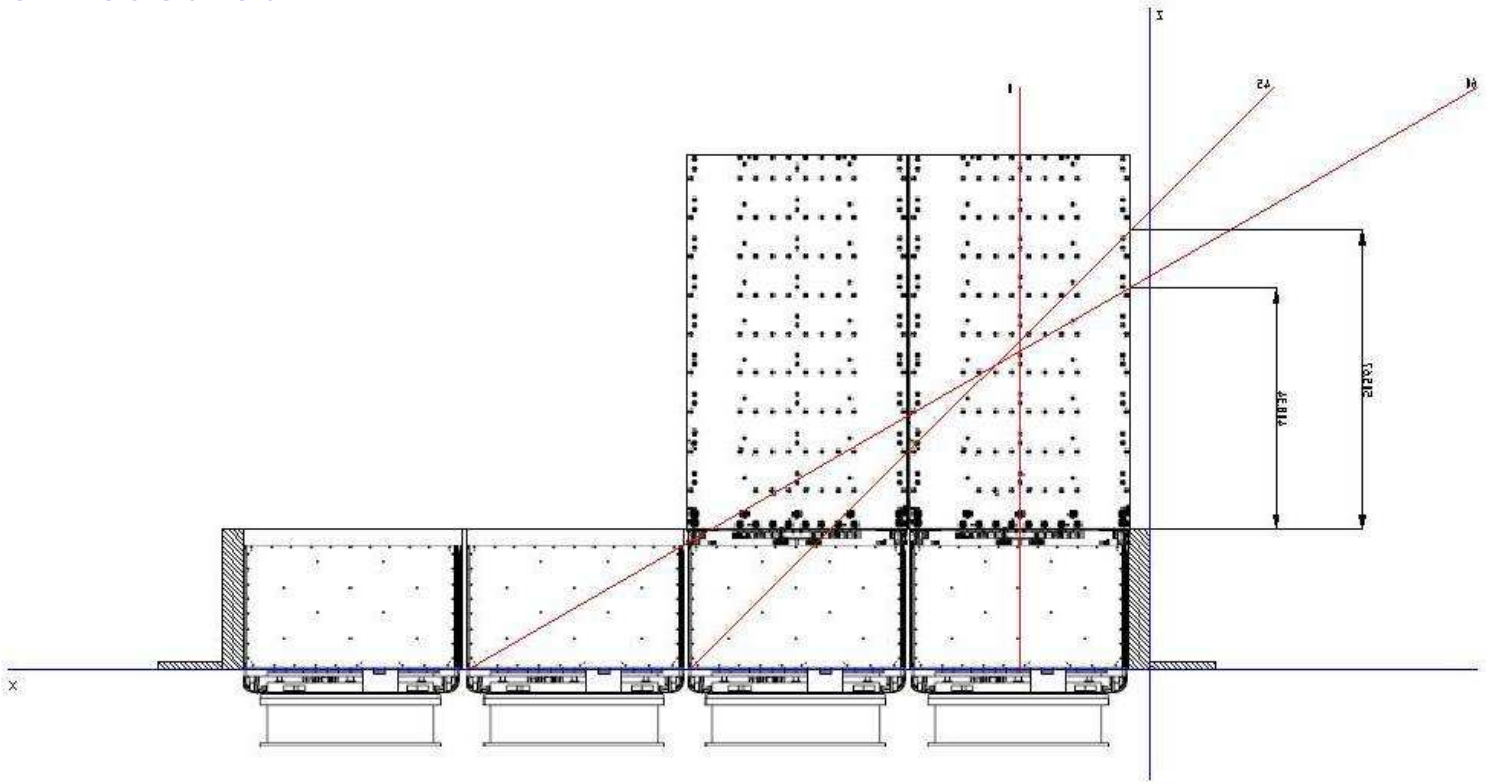
SPS beams on H4 (best beam line)

- electrons (10 GeV-300 GeV)
- protons/pions (10 GeV-300 GeV)

Calibration Unit

The Calibration Unit includes two full towers (flight spares) plus two (one?) additional calorimeters, 5 (TBD) ACD tiles and associated electronics.

The CU response at many angles, positions (effects of cracks), energies will be measured.



Activities

General

- Beam test plan: beam coordinators
- Preparation of logistics: France, Italy, USA

Mechanical equipment

- CU assembly + container: Italy
- Grid modification: USA
- Scanning table: France
- Ancillary detectors: Italy, France

Data acquisition and analysis

- CU testing and calibration: Italy
- DAQ: Italy, USA (France?)
- Simulations: Italy, France, USA
- Offline infrastructure: USA
- Analysis: France, Italy, USA, Sweden