# GLAST calibration run at SPS

GLAST has been a "recognized experiment" at CERN (RE7) thanks to Patrick Fleury (LLR) since 2001.
Status is reconsidered every 3 years, renewed last year by the Research Board:

Excerpt from the Minutes of the CERN Research Board meeting, July 22, 2004:
"P. Baillon then gave his report as CERN rapporteur for the experiment. He pointed out that there is a substantial involvement of European laboratories in the experiment, which is using the same techniques for cosmic ray studies as are used in particle physics. The experiment has a rich potential for the discovery of new phenomena. The collaboration is only making little use of CERN resources, and occasional use of test beam (in particular for the test of the calorimeter).
The Research Board approved the continuation of the Recognized Experiment status of GLAST for a further three years, as RE7."

There is already substantial experience by the GLAST members at SPS
Calorimeter: 2000, 2002, 2003
ACD: 2002

# SPS

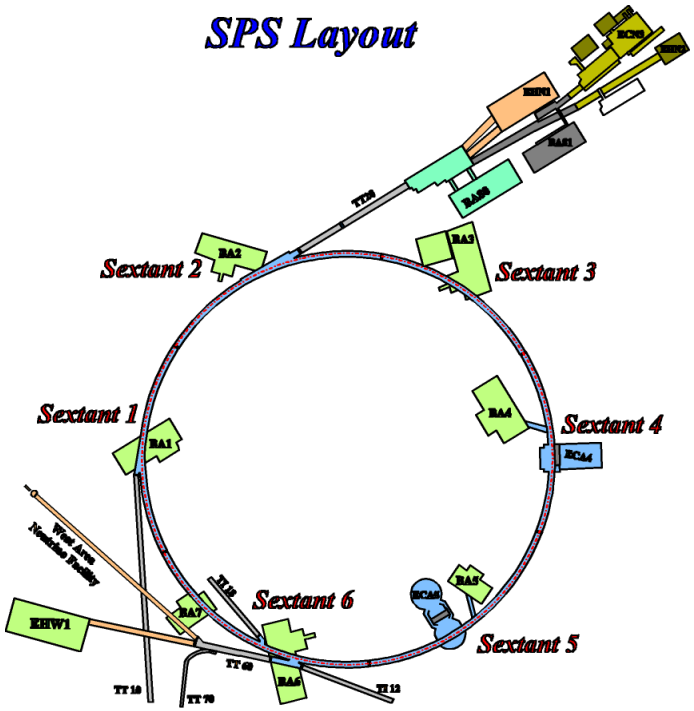
Running period: June 15 - November 5, 2006

Primary beam: 450 GeV protons, intensity up to $10^{12}$ p/s
Master cycle: 14 s, spill duration 2-4 s

North Area (France)

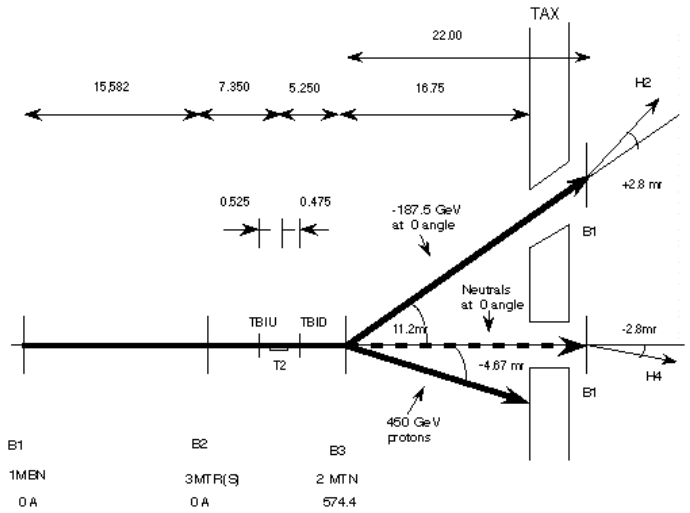
SPS North Area:
2 target positions
3 “general-purpose” beam lines
H2-H4-H6, H4 is best

All lines provide:
• electrons
• pions/protons
• muons
with different levels of contamination



# H4 (calorimeter & ACD runs in 2002)

Maximum energy: 300 GeV/c electrons ("0 degree wobbling mode")
Minimum energy: ~8 GeV/c




"0 degree wobbling mode"
protons → neutral pions → γ rays → electrons

Contamination: pions from Λ decay
a few % at E< 50 GeV , < 1% at high energy

Flux per spill : $10^6$ $e^{\pm}$ at 150 GeV/c, > $10^7$ $pi^{\pm}$ at 200 GeV/c
a few hundreds at 280 GeV/c
Momentum bite: defined by slits (3 mm corresponds to $\Delta p/p=1‰$)
Lateral extension: ~1 cm + possible tails

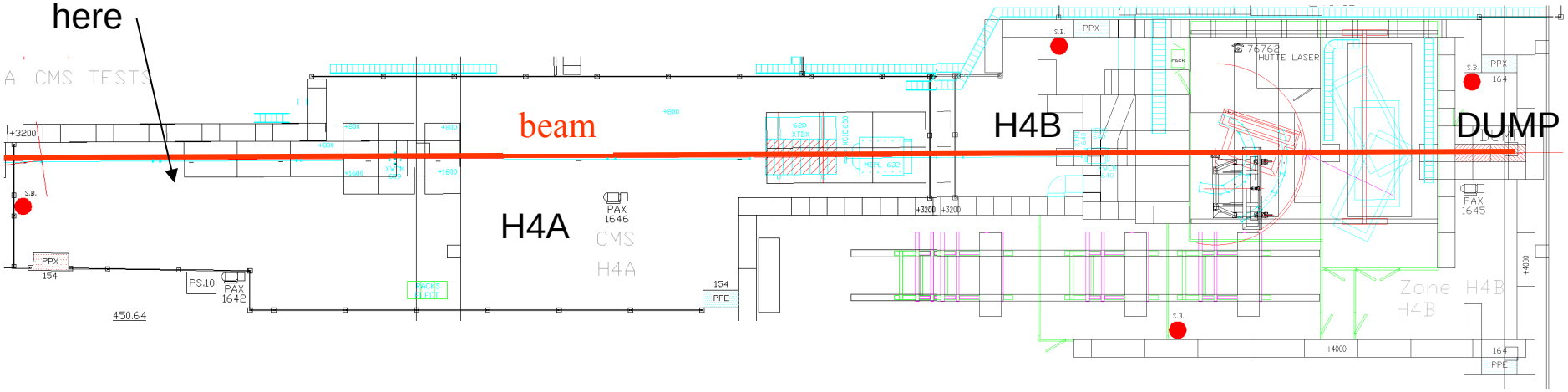
Use of a secondary beam allows for great flexibility in changing energy, particles…

# H4 layout

## H4A: CMS area, used in 2006
(M. Haguenauer, LLR)

## H4B: “all-purpose”
PAMELA…

there is also room here

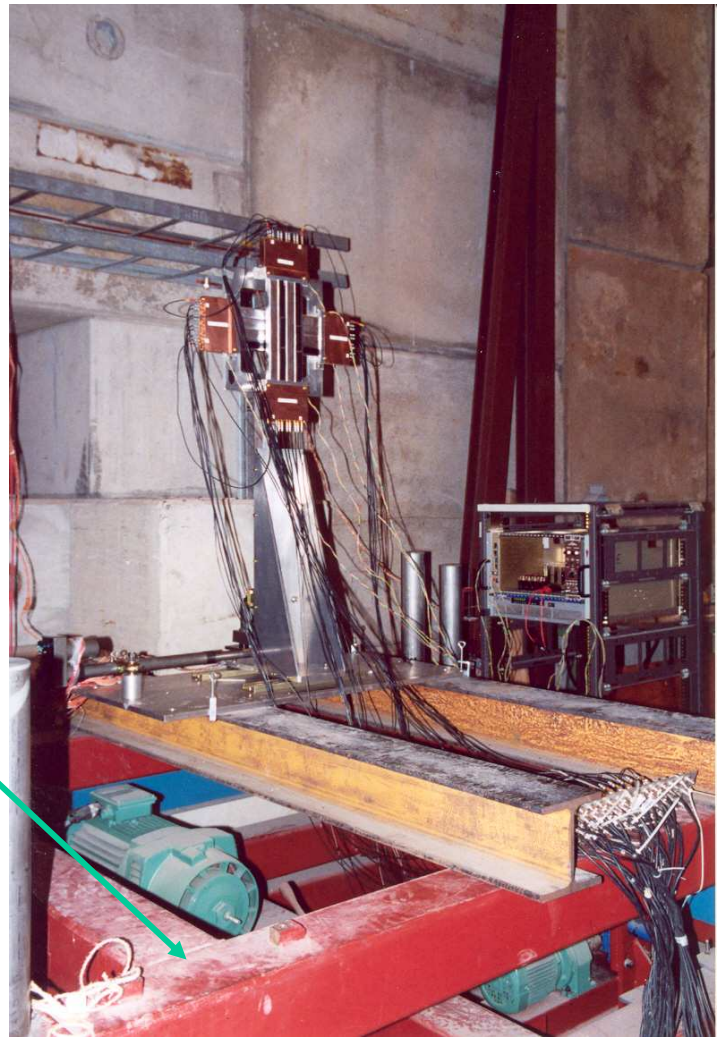



### Beam diagnostics

- MWPCs
- “trigger” (plastic scintillator) detectors.
- threshold-Cerenkov counters  (low energy)

# H4B (June 2002)

large XY, remotely-controlled moving table



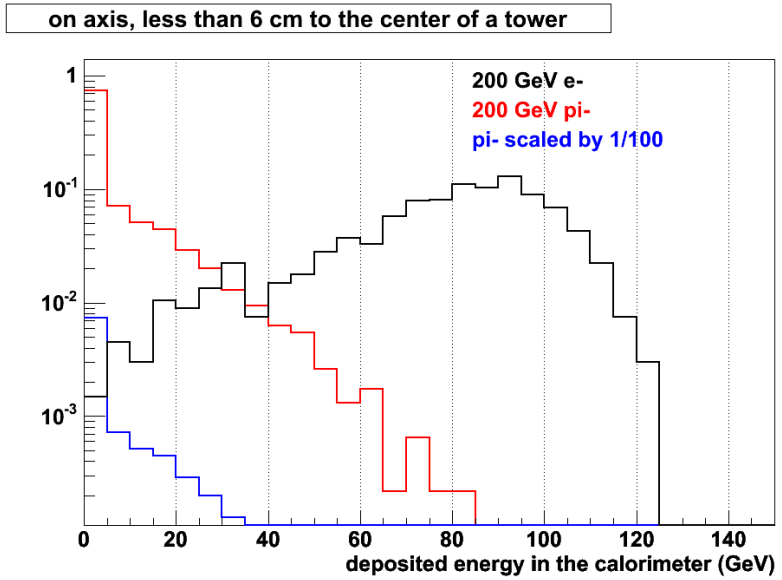
# More on contamination

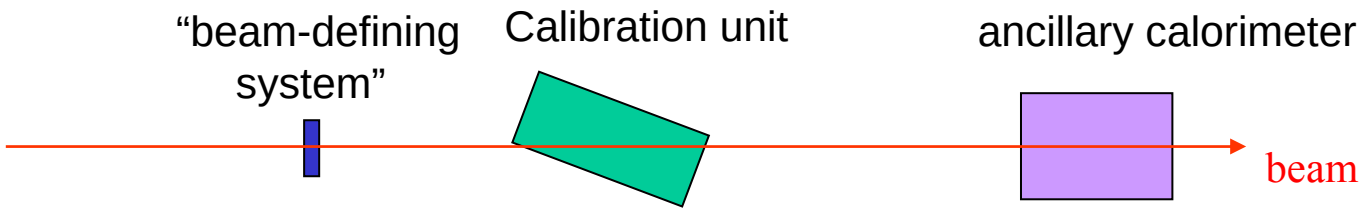
Critically depends on running conditions: target, angle, slits, tuning…

Electrons in pion beam: ~ $10^{-4}$

Pions in electron beam: <1% at high ene
(information from several concording sources)
The CAL is less than 0.5 $\lambda_I$ thick.

At high energy, the best discrimination is achieved through calorimetry.
The CAL is "only" 8.5 $X_0$ thick, it can be supplemented by an additional "calorime
(ex: PbW read out by PMT) sitting behind it.



# Assets

- Little beam time used so far by GLAST
  main (and final) request will be in 2006
- Strong existing infrastructure: INFN, CEA, IN2P2
- High-speed line between CERN and the IN2P3/CEA computing center
- Close connection with the CMS team on H4 (LLR, INFN)
- Strong motivation from many members of the GLAST team

# Issue: getting the beam time approved with H4

From an E-mail by Christoph Rembser (SPS coordinator) to Ronaldo:

"Main user of the H4 line will be CMS (ECAL). The LHC experiments have priority.
The calibration will last the entire year, but mounting-dismounting operations will take up half the time."
"As it is technically possible to have GLAST upstream of CMS, your tests could always fall into time slots, where CMS does not need the beam. This would have the effect, that you will not get 3 weeks in a row, but in different slots."

The call for beam requests will most probably go out in September.
Beam requests for more than a week usually have to go via the SPSC.
If the beam time is split into different periods, our proposal can be presented by the PS/SPS coordinator to the committee.
PS/SPS coordinator: "I suggest to follow this way."

Otherwise, request to the SPSC are due about three weeks before the SPSC meeting (15th November 2005).
The committee will discuss/recommend the request, and the final decision will be made by the Research Board (December 1st 2005).

# Short-term action items

The experiment is not a test, but a “characterization” or “calibration” experiment. This must be clear to CERN.

- Decide whether we go with the SPSC
- Define a preliminary, brief experiment plan with beam requirements
- Write up proposal
- Meet with Christoph Rembser (SPS coordinator)
  Ilias Eftymiopoulos(H4 and H6 liaison physicist)
  to make our case for GLAST in H4 (?)
- Asses the mechanical constraints if we run upstream of (before) CMS (space available, X-Y table?) in H4

If H4 not available, establish backup plan with H6.

Additional costs
What is free: beam, electricity, CERN computer accounts
What is not: most the rest, including phone, access to electronic pool, other fluids…

Setting up
The beam is generally granted for a given number of weeks (6 days ON +1 day OFF for maintenance). Depending on the schedule, the setup time may be taken from our allocated beam time, if it exceeds one day.

A common procedure is to have everything mounted/tested in a non-beam area, and then transferred to the beam area.