

LHC setup: topics for discussion

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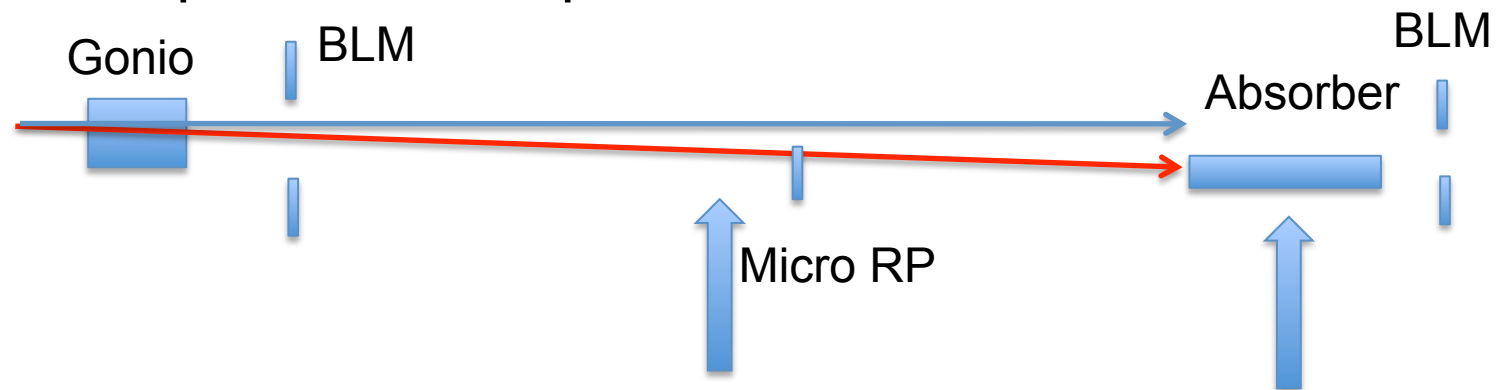
Feb 24th 2011

UA9 Roma workshop

Basic layout

From SPS UA9 layout experience

- Goniometer
- Special beam line monitor
 - Close to goniometer and absorber
 - Sensitive to secondaries
- Micro-RomanPot
 - Intercept channeled particles



I assume standard LHC BLM are much better than standard SPS

Goniometer spec for LHC

- Total angular range : >10 mrad
- “Resolution”: <0.1 μ rad
 - Minimum step of motor
- “Accuracy”: < 1 μ rad
 - How precisely the motor goes to a given ang. Position
 - Related to channeling critical angle scale
- Maximum tilt inaccuracy: < 1 μ rad
 - Linear-angular coupling,...
- Linear resolution: 5 μ m
- Total linear range: 40 mm

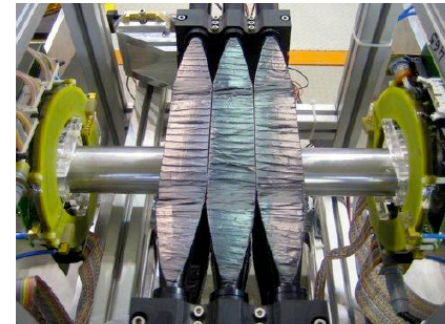
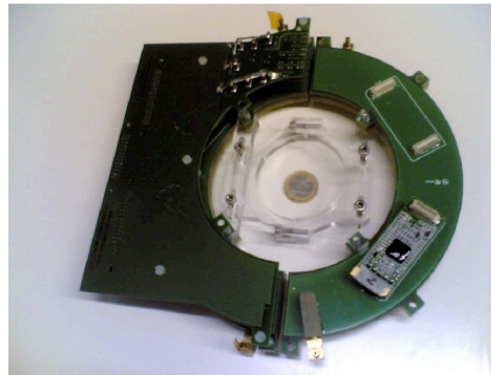
UA9 BLM

- In SPS currently using scintillators, Cerenkov detectors, gas detector (SPS BLM and GEM)
- Sensitive to secondaries (inelastic interaction)
- Fundamental tool to see channeling dip.
 - Need to count particles crossing a given surface/volume at some angle wrt to beam
 - Stand high rate
 - Relatively small size
 - Linear
 - Measured rate scale with true rate
 - Low threshold on number of mip
 - Sensitive to charge part. and neutrals (?)
 - Gate-able with RF signal (?)

BLM based on GEM

- Sustain high rate (100 KHz/cm²)
 - Limit given by spacing of GEM foil holes
- Linear (sensitive to mip)
- Measure rate on small element (0.5x1cm² pads)
- Already used in LHCb

New compact DAQ board
(see F.Murtas) can avoid
problem with long cable



LUMI GEM detector
Dafne (LNF) luminometer

SPS 2010 shows they reproduce standard SPS BLMs.

Detector for miniRP

- Intercept channeled protons.
 - $O(100 \text{ proton})$ in few ns [SPS] on a fraction of mm^2
- Should give a signal proportional to crossing protons
 - Good knowledge of calibration and efficiency
 - Not saturate
- High spatial resolution
 - “image” of beam (shape)
- If two RP at different $s \rightarrow$ beam direction?
- Trigger from machine timing ?

Positive experience with Medipix

But calibration is not completely understood

Timing is possible...

Not clear if it can stand high dose

Other more robust Si
Pixel/strip ?

Want to test a scint fiber odoscope in SPS

Tools to make progress

- Simulation.
 - Proton Tracking
 - Aperture model
 - Inelastic interaction
 - Crystal simulation
 - Detector simulation (GEANT4, FLUKA, ...)
- Use of mixed tool
 - ICOSIM

Obviously we need this to make a conceptual design (next months?)
A detailed simulation can come later