First thoughts on BLM's for the LHC collimator tests in 2004 in SPS and TT40

- **Existing BLM infrastructure in SPS and TT40**
- **What can we learn for the LHC BLM system**
  - Hardware
  - Calibration factors for LHC
    - Arc monitors
    - Collimation region monitors
- **Possibilities to address the questions on particle flux and shower distribution?**
- **What does the collimation test need from the BLM system?**
- **Summary**

Existing BLM infrastructure in SPS and TT40

- One monitor installed next to each quadrupole magnet.
- Electronics, chambers and supports exist for temporary installation of additional monitors.
- Cables for the readout need to be installed during this shut-down.

BUT:

Existing ionization chambers (and electronics) will be saturated by the proposed intensities of $3*10^{13}$ protons.

What can we learn for the LHC BLM system?

Tests on BLM hardware, which can be addressed:

- Test high flux BLM monitors (SEM's) if available in time.
- Measure the maximum current of the ionization chambers > input to design the protection of the readout electronics.

Uncertainties on the calibrations for arc monitors:

- Quench level uncertainty (e.g. different coil configuration for MB, MQ, …) - NO
- Estimation of particle flux outside of the cryostats (GEANT simulations for LHC)
  - Uncertainty from physics model used in simulation - can be addressed in the collimation tests.
  - Accuracy of geometry - NO
- Topology of losses, distance between proton impact location and detector as well as longitudinal distribution of losses - NO

Uncertainties on the calibrations for collimation region monitors:

- Cross-talk and background between different collimators and the two beams - NO
- Shower distribution (transversal and longitudinal), particle flux (MARS simulations for LHC) - can be addressed in the collimation tests.

According to experts there are about 20% uncertainties on the hadron shower energy deposition at LHC energies.

Possibilities to address the questions on particle flux and shower distribution?

- Dedicated test measurements (simple geometry) in TT40 of hadronic shower development at 450 GeV to improve model uncertainties.
- Relative flux measurement (transversal and longitudinal shower distribution) in SPS and TT40: Simulations of full geometry of the collimation test set-ups.
- Absolute flux measurement (normalized to number of protons on collimator) in TT40 (full beam on collimator front): same as above.
- Absolute flux measurement in SPS: Simulation of the collimation factor - particle tracking in SPS with all apertures. What is the achievable accuracy in such simulations?

What are the requirements from the BLM system for the collimation test?

What measurements are foreseen?

> How many detectors? Where?

> What kind of simulations are needed?

Is manpower available for simulations (GEANT, MARS, FLUKA, collimation factor) and analysis?

Summary

Hardware BLM test:

- Very useful and feasible

Problems on the flux measurements and simulation cross checks:

- Manpower for simulations
- Availability of SEM detectors for the flux measurements
- MD time sufficient for accurate measurements?
- With all constraints and uncertainties: Results versus efforts?