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UA9, a device for crystal assisted collimation in large hadron colliders

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The use of bent crystals for beam manipulation in particle accelerators is a well-assessed concept rapidly evolving into practical application. Charged particles interacting with a bent crystal can be trapped in channeling states and deflected by the atomic planes of the crystal lattice. One of the possible applications is “smart” collimation system for particle accelerators. The experiments of the UA9 Collaboration at the CERN-SPS have played a key role for a quantitative understanding of channeling and volume reflection mechanisms. The extension of previous experiment to the Large Hadron Collider has received full support from CERN.

Investigation of the channeling process close to a circulating beam ideally requires in vacuum detectors resolving the single particle, which should be located inside the vacuum pipe itself.

We designed a detection chain, the CpFM (Cherenkov detector for proton Flux Measurement) composed by a fused silica radiator, a long quartz fibers bundle and a photomultiplier readout by the WaveCatcher electronics. All the components except for the electronics have to withstand very high rate of radiations.

The layout of the UA9 detectors in the SPS and LHC, both including CpFM detectors, will be presented and the key tests demonstrating crystal assisted collimation concept thoroughly discussed.

Collaboration

UA9 Collaboration

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