ALICE TRD: Results from Prototype Tests

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Abstract

The Transition Radiation Detector (TRD) was designed to improve the pion rejection capability of the ALICE detector at LHC by a factor of at least one hundred for momenta above 2 GeV/c [1]. It will allow, in conjunction with other ALICE detectors [2], to study various aspects of dielectron physics, among them the production of quarkonia like J/ψ, ψ' and the members of the Υ family, as well as the production of open charm and beauty [1,3]. Apart from good electron identification, the ALICE TRD shall be used to provide a trigger for high momentum electrons [1]. The TRD should work in the environment of unprecedented multiplicities expected in Pb+Pb collisions at LHC. Under such tough conditions, the required parameters of the detector are no less impressive: up to 1.2 million channels will be readout via Flash-ADCs in a specially developed data chain.

We have tested a prototype of the TRD composed of a radiator (different types have been studied, made of foils, fibres or foams) and a drift chamber with pad readout. The detection gas is Xe,CH_4(10%). The tests have been performed using the pion beam (with natural electron contamination) at GSI Darmstadt with momenta between 0.6 and 2.5 GeV/c. Different methods of analysis are used for pion rejection studies and for position reconstruction, with the goal to optimize the final configuration of the detector. Exploiting the information on energy deposit over the drift region of 3 cm in a bidimensional likelihood method, we have achieved pion rejection factors of about 500 for momenta above 2 GeV/c. We discuss the difficult implementation of the full-size detector, which, with six layers covering the interaction point at radial distances between 2.9 and 3.7 meters, will be the largest of such detectors for a collider experiment.

[1] TRD Proposal, CERN/LHCC 99-13, available at: *http://www.gsi.de/~alice* [2] ALICE Technical Proposal, CERN/LHCC 95-71 [3] P. Braun-Munzinger, QM'99, Nucl. Phys. A661 (1999) 261c

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