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A concept of the transition radiation detector for a hadron separation in a forward direction of the LHC experiments

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Studying of hadron production in forward direction at the LHC energy has a great interest both for understanding of the fundamental QCD processes and also in applied areas such as the description of ultra-high energy cosmic particle interactions. Since the energies of secondary hadrons in such studies almost reaches the maximum energy available at the LHC of $\sim$6 TeV, the most effective technique for particle identification is based on the transition radiation detectors (TRD). We propose a concept of TRD based on straw proportional tubes with specially designed radiators and suitable for identification of hadrons with Lorentz γ-factor up to 10^4 and above. A prototypes of such kind of detector were built and tested at the CERN SPS accelerator. Some experimental results obtained are shortly observed here as well as corresponding Monte Carlo simulation model showing perfect agreement with the experiment. On this basis the concept of full-scale TRD was developed and tuned for hadron identification in TeV energy region. Different particle identification techniques were proposed and tested. Finally, we present the expected detector performance in composition reconstruction of secondary hadrons produced in forward direction at the LHC.

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