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Development of Transition Radiation Detectors for hadron identification at TeV energy scale.

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Possible study of hadron production at small angles with respect to beam at the Large Hadron Collider (LHC) is being actively discussed now. Apart from a better understanding of the fundamental QCD processes, the study of high energy particle production in the forward direction is an extremely important topic for cosmic ray physics. Such measurements could remove uncertainties in physics models explaining particle production with energies up to 10ˆ17 eV in the Universe. The energy range of the particles explored in the proposed Small-Angle-Spectrometer (SAS) experiments at the LHC extends from ˜1 TeV to ˜6 TeV that corresponds for protons, kaons and pions to Lorentz gamma-factor value from ˜10ˆ3 to ˜4*10ˆ4. The only particle identification technique able to effectively separate hadrons with these gamma-factors is based on the properties of the X-ray transition radiation (TR) production. In order to study this possibility, a dedicated set-ups based on straw proportional tube arrays were built and tested at the CERN SPS accelerator. Dedicated Monte Carlo (MC) simulations were also performed and compared with the experimental data. Then this proved MC was used for simulation of possible construction of full-scale Transition Radiation Detectors (TRD) for SAS experiments at the LHC. Some test beam results, comparison with MC simulations and abilities of proposed full-scale TRD are presented.

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