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GEANT4 simulation of a pixelized GaAs transition radiation detector.

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Test experiments with several prototypes of a transition radiation detector were carried out in accelerator beams. The detector is based on a GaAs crystal coupled to a pixel chip with a pixel size of 55 μm . Such a detector makes it possible to efficiently distinguish the signals produced by the ionizing particle from those produced by transition radiation photons, thereby significantly improving the detector's rejection capability for particle identification based on their different masses. A GEANT4-based simulation program was developed for detailed modeling of the detector. The program simulates in detail the primary processes of transition radiation photon production and absorption, the ionization energy losses of beam particles, as well as the detector response, including charge collection processes in the GaAs volume and signal formation in the pixel chip. The simulation results are presented and compared with the experimental data.

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