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Simulation Study of Σ^0 Hyperons Production at the NICA-MPD Experiment

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The Multi-Purpose Detector (MPD) at the NICA facility is designed to study heavy-ion collisions at $\sqrt{s_{NN}} = 4\text{--}11$ GeV, providing access to the baryon-rich region of the QCD phase diagram. Measurements of strange particles and hyperons are important for studying particle production mechanisms and the properties of strongly interacting matter at high baryon density. In particular, the Σ^0 hyperon, reconstructed through its electromagnetic decay $\Sigma^0 \rightarrow \gamma\Lambda$, provides a possibility to study hyperon production as well as the reconstruction of low-energy photons in the MPD experiment.

We present a feasibility study of Σ^0 reconstruction in Bi+Bi collisions at $\sqrt{s_{NN}} = 9.2$ GeV using full MPD detector simulations. Λ candidates are reconstructed through the $\Lambda \rightarrow p\pi^-$ decay channel, while photons are reconstructed using both the Photon Conversion Method (PCM) and the Electromagnetic Calorimeter (ECal). The reconstruction techniques and performance using PCM and ECal photons are discussed and compared. The results demonstrate the current performance of Σ^0 reconstruction in MPD, providing a basis for further optimization and future experimental data analysis.

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