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Detector and physics simulation using heavy ion collisions at NICA-SPD

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The space-time picture of hadron formation in high-energy collisions with nuclear targets is still poorly known. The tests of hadron formation was suggested for the first stage of SPD running. They will require measuring charged pion and proton spectra with the precision better than 10%. A research has been carried out to check feasibility of such studies at SPD. In this work, $^{12}C - {}^{12}C$ and $^{40}Ca - {}^{40}Ca$ heavy ion collisions at center of mass energy of 11 GeV/nucleon were simulated using the SMASH event generator. Firstly, the generator-level events were studied. The distribution of track multiplicities and momentum distributions of different types of charged particles were obtained. Secondly, the generated events passed through the full reconstruction using the SpdRoot framework. At this stage particles were identified using dE/dx measurement and time-of-flight information. It allowed us to estimate charge track multiplicities in the tracking system and purities of charge particles spectra. The results on multiplicity are important to estimate occupancies in the tracking system, while the results on the pion and proton momentum spectra show that particle identification should be acceptable for validation of hadron formation models. This is the first study of moderate ion collisions for the SPD Collaboration.

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