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Investigation of the properties of strongly interacting matter at energies of the NICA collider using femtoscopy and factorial moments.

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Aim of the project (No 18-02-40044) is to study the collective effects and dynamics of quark-hadron phase transitions using femtoscopic correlations of hadrons and factorial moments of particle multiplicity utilizing the Multi-Purpose Detector (MPD) experiment at NICA. The correlation femtoscopy allows one to measure the space-time characteristics of particle production processes due to the effects of quantum statistics and final state in reactions. We report on the study of the simulated Au+Au and Bi+Bi collisions using UrQMD and vHLLE at NICA energies.
Data analysis was performed using the software packages for femtoscopy and factorial moments analyses developed within the current project. The packages are integrated into the MPD software environment (MpdRoot).
The estimated pion and kaon three-dimensional femtoscopic radii were obtained for the vHLLE+UrQMD (hydrodynamics with the cross over and the first-order phase transitions with hadronic rescattering as an afterburner) and for the UrQMD models (hadron gas transport approach). The influence of the two-particle detector effects such as track-splitting and track-merging on the two-particle correlation functions will be presented. Estimated pion femtoscopic radii are compared with the measurements from the STAR experiment. The factorial moments of particle multiplicities is a sensitive tool to look for the evidence of the change in the type of the phase transition. The sensitivity of s called factorial moments of particle multiplicity on the initial conditions and properties of nuclear matter equation of state will be discussed.

Presenter: MALININA, Ludmila (SINP MSU-JINR)

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