Accurate understanding of the dynamics of nuclear collisions at relativistic energies is one of the main challenges of present-day high-energy physics, as it deals with matter under the conditions as extreme as in the early Universe, where the quark-gluon plasma (QGP) was formed. QGP is a new state of matter where the matter constituents: quarks and gluons move freely in the whole volume of the considered system. Fluctuations of physical observables in collisions of relativistic ions have become in recent years one of the main topics of interest, as they can provide some important signals for the formation of QGP. Indeed, the different characteristics of the collision and their energy dependence suggests that the phase transition between standard nuclear matter and QGP takes place at relatively low collision energies.

One of the most straightforward observables in the collision of relativistic ions which may be registered experimentally is the number of newly produced, electrically charged particles. Such a number is called *multiplicity* of the collision. Multiplicity changes from one event to another event of collision. Some changes of multiplicity are caused by effects connected with geometry of collision, and thus are less interesting but multiplicity changes also event by event due to effects connected with the collision dynamics and mechanism of multiparticle production.

The principal purpose of the project is to provide new results on *multiplicity fluctuations* in collisions of ions at relativistic energies. These results will be obtained in the novel experimental conditions offered by the Multi Purpose Detector (MPD) experiment at Nuclotron-based Ion Collider fAcility (NICA) build at the Joint Institute for Nuclear Research (JINR) in Dubna, Russian Federation. The planned energy range of the colliding ions and the broad range of available ions (from hydrogen to gold nuclei) allows for detailed study of the dynamical fluctuations and correlations in the unique experimental conditions.

The expected impact of the research project on the development of science, civilization and society will be a deep understanding of multiparticle production processes in relativistic ion collisions at energies available at newly constructed NICA accelerator. We expect that such studies done with use of the new and unique experimental possibilities offered by MPD detector provide a very valuable new information in the question of the onset of deconfinement in collisions of relativistic ions where quarks and gluons start to move freely, forming QGP.