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CALCULATIONS OF AZIMUTHAL FLOWS IN RELATIVISTIC COLLISIONS OF HEAVY IONS WITH THE REACTION PLANE AND TWO-PARTICLE CUMULANT METHODS AT THE MONTE-CARLO GENERATOR HYDJET++ FOR LHC ENERGIES

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Today, Monte-Carlo models are actively used to study relativistic collisions of heavy ions. Scientists obtain a large amount of information about structure and properties of matter at extreme conditions in such collisions by studying the azimuthal distribution of secondary charged particles. The so-called azimuthal flows can provide information about the evolution of nuclear matter.

There are many models of relativistic collisions of heavy ions, describing both the collision process and the further evolution of the system. One of these models is the Monte-Carlo model of HYDJET++[1]. It consists of two independent components: a soft hydrodynamic part for low-energy particles and a hard part for jets and hadrons, taking into account the effect of their quenching due to energy losses in a dense matter. Currently, HYDJET++ is actively used worldwide in heavy ion collision research.

During collision analysis, one can get information about the process mainly from azimuthal flows. In experiments and in models, flows are calculated differently. For example, in the HYDJET++ model, the flows were initially calculated using the true reaction plane method [2], which is hardly applicable in practice. Our task is to expand the capabilities of the HYDJET++ generator and add to it the possibilities of calculating azimuthal particle flows by other methods actually used, for example, by the CMS Collaboration [3]. These are the reaction plane methods and the method of two- and four-particle cumulants, used for example in [4,5]

As a result of the work, collisions of lead nuclei at energies of √sNN = 5.02 and √sNN = 5.36 TeV per nucleon pair and xenon at energies of √sNN = 5.44 TeV per nucleon pair were generated. Elliptical v2 and triangular v3 flows of charged particles were calculated using three different methods –the true reaction plane, the reaction plane and the two-particle cumulant. The calculation results were compared with the CMS Collaboration data. This work will allow us to deepen the configuration of the generator and understand which areas of energy and which centralities need to be improved, as well as to deduce new methods of working with the model and increase its applicability.

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