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The quality assessment of the MPD tracking system for the detection of charmed particles in Au-Au collisions at the NICA collider

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The Multi-Purpose Detector(MPD) is being constructed to study the properties of extremely dense nuclear matter formed in relativistic nucleus-nucleus collisions at the NICA collider energies.The yields of strange and charmed particles are the important observables sensitive to critical phenomena in phase transitions of the QGP-matter at high net-baryon density. Highly efficient registration of such short-lived products of nuclear interactions using a vertex silicon detectors will play a key role in the analysis of the possible onset of deconfinement in nuclear matter.
The Time Projection Chamber (TPC) is considered as a main detector of the MPD tracking system. Its performance will be further enhanced with a vertex inner tracking system (ITS) based on the Monolithic Active Pixel Sensors (MAPS) to provide reliable identification of short-lived hadrons. The identification ability of the ITS+TPC tracking system, when reconstructing the decays of D^0 and D^+ produced in central Au+Au collisions at $\sqrt{s_{NN}}$ = 9 GeV has been studied in the course of computer simulation in the object-oriented software framework Mpdroot. The selection of D-meson signals in the invariant mass spectrum of their decay products was performed by using a toolkit for multivariate data analysis.
Two variants of the ITS layout of the MAPS layers were considered: 5-layer configurations adopted for a beam pipe diameter of 40 and 64 mm respectively. The results of simulation show that the study of the heavy-flavour physics in the MPD experiment is promising if the diameter of the MPD beam pipe is reduced to an optimum value of 40mm.

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