Contribution ID : **172**   Type : **Oral talk**

Elliptic flow of π^0 in ^{3}He+Au and U+U collisions

Friday, 25 October 2024 09:30 (15)

Hadronic matter in heavy-ion collisions can reach extreme energy densities and undergo a phase transition into quark-gluon plasma (QGP) consisting of asymptotically free partons. One of the main ways to investigate QGP's properties is to measure the azimuthal particle anisotropy in momentum space. This anisotropy can be characterized by the elliptic flow (v_2).

The elliptic flow for charged hadrons was measured by PHENIX experiment at RHIC in small collision systems (p/d/^{3}He+Au). In the most central collisions, azimuthal anisotropy can be described by relativistic hydrodynamics, as in heavy-ion collisions. However, v_2 of charged hadrons in more peripheral collisions cannot be interpreted only as flow, but has significant nonflow contribution, which also depends on transverse momentum (p_T). Since the production of π^0 mesons can be measured up to high values of p_T, the measurement of the v_2 values for π^0 in ^{3}He+Au collisions is considered unique tool to study the interplay between flow and nonflow effects in small systems.

The second part of this report is devoted to the measurement of v_2 values for π^0 mesons in U+U collision system – the largest system at RHIC. Since the ^{238}U nucleus is highly deformed, the study of collisions of uranium nuclei is especially interesting from the point of view of studying jet-quenching effect. In heavy-ion collisions nonzero values of v_2 at high p_T can be associated with partonic energy loss. This makes the elliptic flow of π^0 meson, which is measurable up to high p_T, effective tool to study jet-quenching effect in U+U collisions.

Thus, the current report is dedicated to the measurement of π^0 mesons elliptic flow in ^{3}He+Au and U+U collisions at $\sqrt{s_{NN}}$=200 GeV and $\sqrt{s_{NN}}$=193 GeV, respectively, as a function of transverse momentum and centrality.

The report can be considered as a prototype of the research planned in the MPD experiment of the megaproject NICA.

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Session Classification : Heavy Ion

Track Classification : Heavy ion physics