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Initial electromagnetic field dependence of photon-induced production in isobaric collisions at STAR

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Strong electromagnetic field arising from the Lorentz-contraction and a large number of charges (Z) in the colliding nuclei at ultrarelativistic speeds can generate a large flux of quasi-real photons. Consequent photon-induced interactions could reasonably explain the observed enhancements of J/ψ and e^+e^- pair productions at very low transverse momenta (p_T) in peripheral high-energy heavy-ion collisions, via photonuclear ($\propto Z^2$) and photon-photon ($\propto Z^4$) processes. The STAR experiment has collected a large sample of $^{96}_{44}$Ru+$^{96}_{44}$Ru and $^{96}_{40}$Zr+$^{96}_{40}$Zr collisions at $\sqrt{s_{\rm NN}}$ = 200 GeV in 2018. The isobaric collisions, with different number of charges and same number of nucleons in the colliding nuclei, provide a unique opportunity to test the electromagnetic field dependence of photon-induced production.

In this presentation, we will present the first measurement of the electromagnetic field dependence of J/ψ and e^+e^- pair productions at very low p_T, via comparisons between the new measurements in isobaric collisions as well as to the published results in Au+Au collisions at $\sqrt{s_{\rm NN}}$ = 200 GeV. Besides, the angular modulation of dielectron pairs in isobaric collisions which is related to vacuum birefringence will also be presented. The physical implications of these results will be discussed.

Present via

Online

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