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Quarkonium measurements in heavy-ion collisions at $\sqrt{s_{NN}}$ = 200 GeV with the STAR experiment

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Measurements of quarkonium production are an important tool to study the properties of the Quark-Gluon Plasma (QGP) formed in relativistic heavy-ion collisions. Quarkonium suppression due to the color-screening effect was proposed as a direct evidence of the QGP formation. However, other effects, such as cold nuclear matter effects and regeneration, add additional complications to the interpretation of the observed suppression. Different bottomonium states with different binding energies are expected to dissociate at different temperatures, and therefore measurement of this "sequential melting" can help constrain the temperature of the medium. J/ψ polarization provides a valuable insights into the J/ψ production mechanism, which can further deepen our understanding of quarkonium behavior in the QGP.

In this talk, we will present measurements of Υ and J/ψ production in p+p, p+Au and Au+Au collisions at $\sqrt{s_{NN}}$ = 200 GeV by the STAR experiment. Compared to previous results in Au+Au collisions, the latest Υ measurements reach higher precision by combining the data sets taken in 2011, 2014 and 2016. The nuclear modification factors for the ground and excited Υ states will be shown as a function of transverse momentum and centrality, and compared to those measured at the LHC as well as to theoretical calculations. Besides, measurements of the nuclear modification factor for J/ψ in p+Au collisions over a broad kinematic range will be shown to quantify the cold nuclear matter effects. Measurements of the J/ψ polarization parameters in p+p and for the first time in p+Au collisions will also be presented. The polarization parameters are extracted in the transverse momentum range of 0-5 GeV/c in both helicity and Collins-Soper reference frames.

Summary

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