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Measurements of Upsilon and very low pT J/psi production in Au+Au collisions at 200 GeV at STAR

Heavy quarkonium states, predominantly generated via initial hard scatterings, traverse the evolution of the Quark-Gluon Plasma (QGP), thus serving as ideal probes to study the properties of the QGP. The suppression of these states due to color screening suggests direct evidence of QGP formation. In heavy-ion collisions, the strong electromagnetic fields produced by colliding nuclei can be represented by a spectrum of photons, leading to photon-induced interactions. While such interactions are traditionally studied in ultra-peripheral collisions (UPC) without any nuclear overlap, significant enhancements of J/ψ production at very low transverse momentum (p_{T} < 0.3 GeV/c) above the expected hadronic interaction yields have been observed experimentally in non-UPC events, likely due to coherent photon interactions. Studies of very low p_{T} J/ψ production in peripheral collisions offer a chance to investigate photoproduction under more defined and confined conditions compared to UPC. Moreover, different Υ states are expected to dissociate at different temperatures depending on their binding energies. Measurement of such sequential suppression of the Υ states can be used to study the modification of the QCD force in the medium and the QGP's thermodynamic properties.

In this presentation, we will present heavy quarkonium states measurements in Au+Au collisions at $\sqrt{s_{\mathrm{NN}}}$ = 200 GeV by the STAR experiment at RHIC. The Υ yields and nuclear modification factors are presented as a function of centrality and p_{T}. The J/ψ yields and nuclear modification factors are presented as a function of p_{T}. The excess yields of very low p_{T} J/ψ are shown as a function of p_{T}^2 and N_{part}. Physics implications will also be discussed together with model comparisons.

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