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## Measurements of J/ $\psi$ production and polarization in p+p and p+Au collisions at $\sqrt{sNN} = 200$ GeV with the STAR experiment

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Quarkonium production is an important tool to study the properties of the Quark-Gluon Plasma (QGP) formed in relativistic heavy-ion collisions. In particular, suppression of the J/ $\psi$  meson production due to the color screening effect in the medium was proposed as a direct evidence of the QGP formation. However, interpretation of the J/ $\psi$  suppression measured in heavy-ion collisions is still challenging due to the presence of other effects, such as the regeneration contribution from the coalescence of deconfined c and c quarks as well as the cold nuclear matter effects. By comparing J/ $\psi$  production cross-sections in p+p and p+Au collisions, the cold nuclear matter effects can be studied in detail. Moreover, J/ $\psi$  polarization is sensitive to the J/ $\psi$  production mechanism, and its measurement can help distinguish among different models. During the RHIC 2015 run, the STAR experiment recorded large samples of p+p and p+Au collisions at  $\sqrt{sNN} = 200$  GeV for charmonium studies via the dimuon decay channel. In this talk, we will present measurements of the nuclear matter effects. The double ratio of  $\psi(2S)$  to J/ $\psi$  production rates between p+p and p+Au collisions at mid-rapidity is measured for the first time, to study possible different final-state effects on different charmonium states. Furthermore, we will discuss the analysis status of J/ $\psi$  polarization measurements in both p+p and p+Au collisions.

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