# Measurements of $J/\psi$ polarization and global spin alignment in Ru+Ru and Zr+Zr collisions at $\sqrt{s_{NN}} = 200$ GeV from the STAR experiment

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**Abstract**

$J/\psi$ is an important probe to study the properties of the quark-gluon plasma (QGP) created in heavy-ion collisions. Its strong suppression and zero second order flow coefficient have been observed in the isobar (Ru+Ru and Zr+Zr) collision systems at STAR experiment, which indicates a strong coupling of $J/\psi$ with QGP and potentially a small regeneration effect. The $J/\psi$ polarization could provide additional information about QGP properties and $J/\psi$ production mechanism in heavy-ion collisions. It has been predicted that $J/\psi$ spin could align in the direction of large angular momentum produced in non-central heavy-ion collisions due to the spin-orbit coupling. The early production of $J/\psi$ could make its polarization sensitive to the strong magnetic field produced at early stage.

In this talk, we will present the first $J/\psi$ polarization measurement in heavy-ion collisions at the top RHIC energy. The polarization results in the Helicity frame, Collins-Soper frame as well as the polarization with respect to the second-order event-plane in isobar collisions at $\sqrt{s_{NN}} = 200$ GeV are reported and their physics implications are also to be discussed.