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## **Transverse Single Spin Asymmetry in Heavy-flavor Muon Production in Polarized $p + p$ and $p + Au$ Collision at $\sqrt{s} = 200$ GeV**

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Transverse single spin asymmetries (SSAs) quantify the asymmetry of particle production relative to the transverse spin axis of a polarized hadron. SSAs have come to be recognized as a means of accessing QCD dynamics, both within initial-state hadrons and in the process of hadronization from partons. At  $\sqrt{s} = 200$  GeV, heavy flavor single-spin asymmetries in proton proton collisions provide access to gluon dynamics within the nucleon. Previous measurements of  $J/\psi$  and heavy flavor to single muon SSAs have been performed at RHIC with 2006, 2008 and 2012 datasets at both central and forward rapidities. In 2015, PHENIX collected data from transverse polarized  $p + p$  collision data at  $\sqrt{s} = 200$  GeV with a total integrated luminosity of  $50 \text{ pb}^{-1}$ , about 2 times as large as the datasets in 2006, 2008, and 2012 combined. Furthermore, analysis of  $p + Au$  collisions from 2015 offers good opportunities for tests of saturation physics. The status of the  $J/\psi$  and heavy flavor to single muon SSA measurement will be presented.

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