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Study heavy quark production mechanisms and hadronization in p+p and p+Au collisions in PHENIX

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Heavy quarks are produced predominantly in the initial hard scatterings of high-energy hadronic collisions and therefore provide sensitive probes of heavy-flavor production mechanisms and hadronization in small collision systems. Recent measurements at RHIC and the LHC have shown a strong correlation between heavy-flavor yields and event charged-particle multiplicity in p+p and p+A collisions, suggesting contributions from multi-parton interactions and possible final-state effects. In this talk, the PHENIX experiment presents latest studies of J/ψ production as a function of event multiplicity in p+p and p+Au collisions. The charmonium yield and event activity are measured in separated rapidity regions, reducing auto-correlation effects and enabling studies of nuclear medium effects on J/ψ production and hadronization over different Bjorken-x regimes.

In addition, a precise baseline measurement of the beauty contribution to inclusive J/ψ production in p+p collisions at $\sqrt{s} = 200$ and 510 GeV is reported. J/ψ mesons from B-meson decays are statistically separated from prompt J/ψ using displaced decay vertices. The fraction of $B \to J/\psi$ is measured over wide transverse momentum and rapidity ranges and compared with results from other experiments and theoretical calculations based on FONLL combined with the color evaporation model. Together, these studies establish a comprehensive framework for understanding heavy-quark production and hadronization in heavy ion collisions.

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