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Energy dependent forward $B \to J/\psi$ measurements in $p+p$ collisions at PHENIX

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Heavy quark measurements in hadronic collisions are useful tests of perturbative Quantum Chromodynamics (pQCD) calculations given their large mass ($m_{c,b} \gg \Lambda_{\rm QCD}$). These measurements can also probe the gluon distribution in protons at a relatively large Q^2. At RHIC energies, b-quark production is dominated by the leading order gluon-gluon fusion in contrast of the production mechanism at Tevatron and LHC which are dominated by next-to-leading order processes. Different kinematic region of the nucleon parton distribution function is also accessed by RHIC measurements.

PHENIX has measured the production of B-mesons through the $B \to J/\psi \to \mu^+\mu^-$ decays in $1.2 < |y| < 2.2$ rapidity at 200 and 510 GeV $p+p$ collisions, by the analysis of displaced vertex of muons with the Forward Silicon Vertex Detector (FVTX). These measurements can access B-mesons with $p_{\rm T} > 0$ allowing a direct measurement of $b\bar{b}$ total cross section. The PHENIX $p+p$ measurements will be presented in comparison to Tevatron and LHC results, providing a understanding of the energy dependent B hadron production and the transition between LO to NLO dominant b-quark production.

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