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Study of transverse single-spin asymmetries in heavy flavor production in $p + p$ collisions using the PHENIX Forward Vertex Detector

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Transverse single-spin asymmetries provide valuable information on the spin structure of the nucleon. At RHIC energies, heavy flavor production is dominated by gluon-gluon fusion, and the transverse single-spin asymmetry is sensitive to the tri-gluon correlations in the twist-3 collinear factorization. Study of this asymmetry for single muons from heavy flavor decays in the PHENIX experiment serves as a clean probe for this process. In 2012, PHENIX presented the first measurement of the transverse single-spin asymmetries of muons from semi leptonic decays of heavy mesons in the forward rapidity region $1.2 < |\eta| < 2.0$ in transversely polarized $p + p$ collisions at $\sqrt{s} = 200$ GeV. In the 2015 data from transversely polarized collisions, the Forward Vertex Detector, FVTX, allowed us to measure the Distance of Closest Approach (DCA) of displaced vertices, exploiting the different lifetimes of muons from $\Lambda^\pm$ or $\Sigma^\pm$ and muons from charm and bottom mesons. By DCA measurement and track matching between the PHENIX Muon Tracker and the FVTX, we expect to be able to study separately the contributions from charm and bottom, in addition to removing the background from light mesons. In this poster, we present the status of the study of transverse single-spin asymmetries of single muons from heavy flavor decay at forward-rapidity. In addition, we report on the progress in the work on charm/bottom separation using the FVTX detector.

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