ABSTRACT

THESIS: An Analysis of Zero Degree Calorimeter Shower Maximum Detector Data for Polarimetry at STAR

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PAGES: 42

The Zero Degree Calorimeter at STAR was used to calculate an asymmetry from small-angle scattering of neutral particles from proton-proton collisions at a center-of-mass energy of 500 GeV. An energy-centroid method was used to define hit positions of the neutral particles for each Shower Maximum Detector plane. An angular asymmetry analysis was done using these positions to measure both a left-right and a top-bottom asymmetry. The asymmetries were then used to calculate transversely-normal and sideways beam-polarization components for both of RHIC’s polarized-proton beams. The results of this analysis show that the Zero Degree Calorimeter Shower Maximum Detectors can be used as effective polarimeters at high beam energies, and can check the functionality of the spin rotators for longitudinally-polarized beams. The results of this analysis will be used in measurements that further the understanding of the source of a proton’s spin.