

# Measurement of the longitudinal spin asymmetries for weak boson production in polarized proton-proton collisions at $\sqrt{s} = 510$ GeV at RHIC

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The STAR experiment at RHIC has provided significant contributions to our understanding of the spin structure and dynamics of the proton. The production of  $W^\pm$  bosons in longitudinally polarized p-p collisions at  $\sqrt{s} = 510$  GeV provides a direct probe of the spin-flavor structure of the proton through the measurement of the parity-violating single-spin asymmetry,  $A_L$ .  $W^{-(+)}$  bosons are produced in  $\bar{u} + d$  ( $\bar{d} + u$ ) collisions and can be detected through their leptonic decays,  $e^- + \bar{\nu}_e$  ( $e^+ + \nu_e$ ), where only the respective charged lepton is measured. The STAR experiment is well equipped to measure  $W^\pm \rightarrow e^\pm + \nu$ . The main STAR detector sub-systems used in this measurement are the Time Projection Chamber and Electromagnetic Calorimeters. The published 2011 / 2012 STAR  $A_L$  results based on  $86 \text{ pb}^{-1}$  provided significant impact in constraining the helicity distributions of  $\bar{u}$  and  $\bar{d}$  quarks. In 2013, STAR collected an additional, larger data sample of  $250 \text{ pb}^{-1}$ . Final published results from the 2013 dataset for the measurement of  $W^\pm A_L$  as well as for  $W^\pm A_{LL}$  and  $Z A_L$  will be presented including a discussion of the impact on the sea-quark helicity distribution functions.