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# Double-Spin Asymmetry in Neutral Pion Production in Longitudinally Polarized $p + p$

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1 Double-Spin Asymmetry in Neutral Pion ( $\pi^0$ )  
2 Production in Longitudinally Polarized  $p + p$   
3 Collisions

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7 Beyond the valence quarks' spin contribution to the total spin of a pro-  
8 ton, gluon and sea quark contributions are becoming clear as well. For pro-  
9 ton+proton collisions at a center of mass energy of 510 GeV, neutral pion  
10 production is dominated by gluon-gluon and gluon-quark scattering. An  
11 avenue to constrain the gluon polarization is the asymmetry,  $A_{LL}$ , in the  
12 production of neutral pions from collisions of longitudinally spin-polarized  
13 proton beams. Our experiment was performed with the STAR detector at  
14 the Relativistic Heavy Ion Collider (RHIC), unique for its ability to col-  
15 lide spin-polarized proton beams. The Endcap Electromagnetic Calorimeter  
16 (EMC) of the STAR detector with its pseudorapidity ( $\eta$ ) range between  
17 1.09 and 2.00 and full azimuthal coverage measures energies of photons from  
18  $\pi^0$  decays. We consider the invariant mass of all photon pairs in the EMC  
19 as we identify  $\pi^0$  candidates. We will present the current status of the anal-  
20 ysis of the  $\pi^0$   $A_{LL}$  as measured by the EMC at STAR in 2012 data with  
center-of-mass energy of 510 GeV.