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## Experimental studies on the high-energy spin physics in collider experiments at RHIC

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The Relativistic Heavy Ion Collider (RHIC) is the world's only polarized proton+proton collider, capable of reaching center of mass energies up to 510 GeV. RHIC's experiments, PHENIX and STAR, have been carrying out a cold QCD program in order to gain deeper insight into the proton's spin structure and dynamics.

Data from longitudinally polarized  $p + p$  collisions allow one to study the gluon helicity distribution function ( $\Delta g(x)$ ), by measuring the longitudinal double-spin asymmetry ( $A_{LL}$ ) of pions and jets. On the other side, the transversely polarized proton collisions at RHIC enable the studies of the transverse spin structure, such as the transversity and Sivers distributions, as well as polarized fragmentation functions. These studies can be used to test universality of transverse-momentum dependent distributions (TMDs) with respect to  $e+p$  processes, and constrain their evolution effects. Furthermore, unpolarized measurements of differential cross sections of weak bosons at RHIC provide important constraints on the scale dependence of unpolarized TMDs in an  $x$  range ( $0.1 < x < 0.3$ ) that naturally complements the phase space accessed at the LHC.

In this talk, we present the recent measurements for longitudinal and transverse polarization, besides selected unpolarized results. PHENIX newly redesigned detector, sPHENIX is being installed while STAR is currently installing a suite of new sub detectors in the forward region ( $2.5 < \eta < 4$ ). How those upgrades will supplement previous Spin measurements at RHIC will also be briefly discussed.

**Primary author:** FAZIO, Salvatore (University of Calabria & INFN Cosenza - Italy)

**Presenter:** FAZIO, Salvatore (University of Calabria & INFN Cosenza - Italy)

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