Contribution ID: **293** Type: **Parallel**

Cold-QCD Physics of the STAR Forward Upgrade

Wednesday, 30 May 2018 17:10 (30 minutes)

For almost twenty years, the STAR experiment at RHIC has played a leading role in expanding the frontier of nucleus-nucleus collisions and the interaction of spin-polarized beams of protons. In coming years, the STAR forward upgrade will enable new insight into cold nuclear matter, probing this physics at high and low regions of x. The proposed detector upgrades consist of electromagnetic and hadronic calorimetry as well as a charged-particle tracking system, each spanning the pseudorapidity range of $2.5 < \eta < 4.5$. Building upon existing STAR measurements, the upgrade will enable improved and precision measurements of probes such as neutral pions, direct photons, and Drell-Yan. Simultaneously, the upgrade will unlock a suite of new observables, such as charged-particle tagged jets at forward pseudorapidity. These measurements will provide new insights into the multidimensional imaging of quarks and gluons within the nucleon, nuclear parton distributions, and hadronization in a nuclear environment. As such, the STAR forward upgrade will provide information crucial to realizing the full potential of the approaching era of the electron-ion collider.

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Session Classification: PGDNN / QMHI

Track Classification: PGDNN