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Cold nuclear matter physics at low-x from d+Au collisions at PHENIX

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RHIC experiments have observed that inclusive hadron yields in the forward rapidity (deuteron) direction for $\sqrt{s_{NN}} = 200$ GeV d+Au collisions are suppressed relative to p+p collisions. The mechanism for the suppression has not been firmly established; theoretical descriptions include nuclear shadowing, initial-state parton energy loss, and gluon saturation. We present measurements by the PHENIX experiment at RHIC of di-hadron pair production in d+Au collisions where the particles in the pair are varied across a wide range of rapidity out to $|\eta| = 3.8$ using a new forward electromagnetic calorimeter, the MPC. These di-hadron measurements probe down to parton momentum fractions x ~ 10^{-3} in the gold nucleus, where the interesting possibility of observing gluon saturation effects at RHIC is the greatest. Our measurements show that the correlated yield of back-to-back pairs in d+Au collisions is suppressed by up to an order of magnitude relative to p+p collisions, and increases with greater nuclear path thickness and with decreasing parton x in the Au nucleus.

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