

APR13-2013-000540

Abstract for an Invited Paper  
for the APR13 Meeting of  
the American Physical Society

**George E Valley Prize Talk: Measurements of phi-meson production and the observation of antihypertriton in Au+Au collisions at RHIC**  
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Collisions of heavy nuclei at the Relativistic Heavy-Ion Collider (RHIC) at Brookhaven National Laboratory (BNL) briefly produce hot and dense matter that has been interpreted as a quark gluon plasma (QGP). The energy density of the plasma is similar to that of the universe a few microseconds after the Big Bang. This plasma contains roughly equal numbers of quarks and antiquarks. As a result of the high energy density of the QGP phase, many strange-antistrange quark pairs are liberated from the quantum vacuum. The plasma cools and transitions into a hadron gas, producing nucleons, hyperons, mesons, and their antiparticles. The phi-mesons are ideal experimental probe to explore the QGP evolution dynamics. They are predicted to have relatively small hadronic interaction cross sections. Thus those phi-mesons carry the information directly from the hadronization stage with little or no distortion due to hadronic rescattering. In this talk, I will present the phi-meson production in Au+Au collisions at center-of-mass energy of 200GeV. Energy and system size dependence of the phi yields at mid-rapidity will be discussed. Centrality and transverse momentum dependence of the phi elliptic flow and nuclear modification factor will be presented. Properties of strange quarks in the bulk matter at hadron formation will be discussed. I will also present the details of the antihypertriton observation from the STAR experiment. Physics implication related to the QGP formation and hyperon-nucleon interaction from the data will be discussed.