Heavy quark production in d+Au and p+p collisions at STAR

A. A. P. Suaide, the STAR Collaboration
Instituto de Física, Universidade de São Paulo, São Paulo, Brasil.

In heavy ion collisions, heavy quark production rates are expected to be an important diagnostic of the dense system formed in the collision. In particular, comparative measurements in p+p, d+Au and Au+Au will provide important sensitivity to the initial state gluon densities in these systems [1] and medium effects such as heavy quark energy loss. The suppression of small angle gluon radiation for heavy quarks would decrease the amount of energy loss (dead cone effect) [2] and, if gluon bremsstrahlung is indeed the main mechanism of quark energy loss, the suppression of heavy quark mesons at high-p_T is expected to be smaller than that one observed for charged hadrons at RHIC [3]. This comparison is an important check of the quenching mechanism at heavy-ion collisions. Moreover, measuring open charm and beauty production at RHIC provides essential reference data for studies of color screening via quarkonium suppression [4].

Heavy quark production can be studied in relativistic heavy ion collisions through the mass reconstruction of the hadronic decay channels of D and B mesons. STAR is highly capable of such reconstruction using its high acceptance Time Projection Chamber. Moreover, the primary electron spectrum over a sufficiently broad p_T range also provides a measurement of charm and beauty production at RHIC energies by studying the semi-leptonic decay of heavy quark mesons. The combination of the STAR TPC and the Electromagnetic Calorimeter is capable of electron identification in p+p, p+A and heavy-ion collisions with high efficiency and purity.

In this work we present the first measurements of D mesons in d+Au collisions at $\sqrt{s_{NN}} = 200$ GeV using the STAR TPC. The measured D yields cover a transverse momentum region of $1.0 < p_T < 11.0$ GeV/c. Comparisons of the p_T spectra with pQCD calculations and the sensitivity to the initial gluon structure function of the colliding nuclei will be discussed. We also present preliminary measurements of electron spectra in d+Au and p+p collisions at $\sqrt{s_{NN}} = 200$ GeV for $1.5 < p_T < 8.0$ GeV/c. We describe the measurement technique used to identify electrons and compare the results for single electron spectra with Pythia based pQCD calculations for electrons from heavy-quark semi-leptonic decays.

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