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Measurements of charm meson production in p+p, p+Au and Au+Au collisions by the STAR experiment

Charm quarks possess large masses and thus they are expected to be primarily produced at the initial stages of heavy-ion collisions. Hot and dense nuclear matter, usually referred to as the Quark-Gluon Plasma (QGP), can also be created in these collisions. Therefore, the QGP can be studied using charm quarks as penetrating probes via the in-medium energy loss, which is deeply related to the intrinsic properties of the medium. In particular, a mass ordering of the parton energy loss in the hot medium is predicted, i.e. heavy-flavour quarks are expected to lose less energy than light quarks and gluons. Measurements of charm meson production in heavy-ion collisions provide a great opportunity to study the charm quark energy loss in the medium, and thus the QGP properties.

In this presentation, we will report the most recent measurements of D^0, $D^{\pm}$ and $D^{*\pm}$ production in p+p, p+Au and Au+Au collisions at $\sqrt{s_{NN}} = 200$ GeV. These mesons are reconstructed via their hadronic decay channels, where the daughter particles can be tracked and identified with excellent precision by the STAR experiment at RHIC. Measurements of D meson production in p+p collisions provide a baseline for the similar measurements in p+Au and Au+Au collisions to quantify the cold and hot nuclear matter effects. At high transverse momentum region and in central Au+Au collisions, D meson production is strongly suppressed compared to that in p+p collisions, indicating substantial charm quark energy loss in the medium. These results will be compared to those of light hadrons as well as theoretical calculations.

Experimental Collaboration

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