

A Measurement of the Open Charm Cross-Section in $\sqrt{s_{NN}} = 200$ GeV Cu+Cu Collisions at the STAR Experiment at RHIC

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In relativistic heavy-ion collisions, charm quarks are probably produced in gluon fusion reactions during the early, pre-thermalization stages of the system [1]. If charm is indeed produced in initial hard processes, one will observe that charm production scales with the number of binary (nucleon-nucleon) collisions. The charm production cross-section can be calculated in perturbative QCD by summing up Feynman diagrams at the "Next-to-Leading Order (NLO)" level [2].

The binary scaling of charm production as well as the predicted cross-section can be experimentally tested by the STAR experiment. Charm quarks are usually studied by looking at semi-leptonic decays to non-photonic electrons (or muons): $D^0 \rightarrow e^- + X$ and $D^0 \rightarrow \mu^+ + X$. However, those measurements are indirect and can lead to a significant loss of information. The STAR experiment is the only one at RHIC currently capable of directly reconstructing D^0 mesons via their hadronic decay products (thanks to the STAR Time Projection Chamber and the Time of Flight detector) in minimum bias heavy-ion collisions.

We report on a measurement of the open charm cross-section in $\sqrt{s_{NN}} = 200$ GeV Cu+Cu collisions at the STAR experiment at RHIC. The cross-section was measured through a direct reconstruction of the $D^0 \rightarrow K + \pi$ decay at mid-rapidity and then extrapolated to calculate a total cross-section. The charm cross-section as measured in $\sqrt{s_{NN}} = 200$ GeV Cu+Cu collision is compared to previous experimental results from both the STAR and PHENIX experiments at RHIC and to theoretical predictions.

References

- [1] Z. Lin and M. Gyulassy Phys. Rev. C **51** 2177 (1995).
- [2] R. Vogt, e-print Arxiv: hep-ph/0709.2531v1.