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## Cold Nuclear Matter Effects on $J/\psi$ and $D$ Meson Production at High Baryon Densities

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Open heavy flavors and quarkonium have played important roles in the understanding of the QCD matter produced at high temperatures and low baryon densities. However, they could also provide crucial information about QCD at the low center of mass energies employed to probe high baryon density matter at existing or planned facilities.

For example, a nonperturbative contribution to charm production, intrinsic charm, has long been speculated, with much contradictory empirical evidence. LHCb recently reported evidence for intrinsic charm in  $Z + \text{jet}$  events at  $\sqrt{s} = 13 \text{ TeV}$  [1]. While  $J/\psi$  production by intrinsic charm would normally only manifest itself outside the range of the LHC detectors, even at forward rapidity, the high  $Q^2$  of these events allowed for their detection.

On the other hand, at low center of mass energies,  $J/\psi$  and  $D$  meson production by intrinsic charm could manifest itself at midrapidity, as described for the SeaQuest experiment at Fermilab [2]. This talk will explore the rapidity and  $p_T$  dependence of an intrinsic charm signature for laboratory beams of 40 GeV and higher, both in  $p + p$  and  $p + A$  interactions and place the results in context of previous experimental evidence [3].

[1] <https://lhcb-public.web.cern.ch/Welcome.html\#IC>, 27 July 2021.

[2] R. Vogt, Limits on Intrinsic Charm Production from the SeaQuest Experiment, *Phys. Rev. C* **103**, 035204 (2021).

[3] R. Vogt, in preparation, to be submitted to *Phys. Rev. C*.

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