EIC studies on small systems

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Cold nuclear matter(CNM) effects can be studied in proton-nucleus (pA) collisions, where the Quark-Gluon Plasma (QGP) is not expected to be formed. The effects related to the presence of CNM also modify the production of quarkonia in A+A collisions. Due to the larger mass of the bottomonium states compared to the charmonium ones, the measurement of bottomonia production in proton-nucleus collisions allows a study of CNM effects in a different kinematic regime, therefore complementing the J/Ψ studies [1]. For smaller systems like p+A and p+p we have less deeply bound bottomonia states and thus a comparatively larger chance to escape. This means that more states become measurable, which is a positive feature. On the other hand, it also means that the escape mechanism which underlies the anisotropic flow of bottomonia may become largely ineffective, in particular for the $\Upsilon(1S)$. Accordingly, the measurement of a sizable flow for $\Upsilon(1S)$ in small systems would probably hint at the importance of initial-state correlations.

As the elliptic gluon distribution can be well studied in hard diffractive dijet production at the EIC [2], the comparison between the two particle elliptic flow in p+p and p+A collisions and further observables in e+A collisions will be paramount towards the understanding of the gluon dynamics under extreme conditions.

References

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