Contribution ID: **92** Type: **口头报告**

Medium-assisted enhancement of chi_c1(3872) production from small to large colliding systems

Saturday, 26 April 2025 09:00 (20 minutes)

Studies of exotic hadrons such as the χ_{c1} state provide crucial insights into the fundamental force governing the strong interaction dynamics, with an emerging frontier to investigate their production in high energy collisions where a partonic medium is present. The latest experimental measurements from the Large Hadron Collider show an intriguing evolution pattern of the χ_{c1}-to-$\psi(2⊠)$ yield ratio from proton-proton collisions with increasing multiplicities toward proton-lead and lead-lead collisions. Here we propose a mechanism of medium-assisted enhancement for the χ_{c1} production, which competes with the more conventional absorption-induced suppression and results in a nonmonotonic trend from small to large colliding systems. Realistic simulations from this model offer a quantitative description of all available data. Predictions are made for the centrality dependence of this observable in PbPb collisions as well as for its system-size dependence from OO and ArAr to XeXe and PbPb collisions. In both cases, a nonmonotonic behavior emerges as the imprint of the competition between enhancement and suppression and can be readily tested by future data.

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Session Classification: 分会场二