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Understanding Charmonia production using a modified version of Non-Relativistic Quantum Chromodynamics

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There is serious disagreement between the predictions of Non-Relativistic Quantum Chromodynamics (NRQCD) and the data on J/ψ polarisation which has persisted for almost a quarter of a century. We find that if we account for the effect of perturbative soft gluons on the intermediate charm-anticharm octet states in NRQCD then the polarisation problem can be resolved. In addition, this model, when used to fit the Run 1 data on J/ψ , ψ' and χ_c production from the CDF experiment at Tevatron, gives good fits and yields values of (energy-independent) non-perturbative parameters. These, in turn, can be used to make parameter-free predictions for J/ψ and ψ' data from the CMS experiment at the Large Hadron Collider and the predictions are in excellent agreement with then CMS data. We have also made the predictions for both χ_c^1 and χ_c^2 production at $\sqrt{s} = 7$ TeV and find excellent agreement with data from the ATLAS experiment. Furthermore, we have extended our work for η_c and made the comparison with LHCb experimental data using the non-perturbative parameter for J/ψ production from the CDF experiment at Tevatron. It also gives a very good agreement with the data from LHCb experiment for $\sqrt{s} = 7$ TeV, 8 TeV, 13 TeV.

References :

- [1] Sudhansu S. Biswal, Sushree S. Mishra and K. Sridhar, Phys. Lett. B **832**, 137221 (2022) [arXiv:2201.09393 [hep-ph]].
- [2] Sudhansu S. Biswal, Sushree S. Mishra and K. Sridhar, [arXiv:2206.15252 [hep-ph]]; Communicated to journal.

Session

Heavy Ions and QCD

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