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Deciphering the mechanism of J/\psi-nucleon scattering

The low-energy $J/\psi N$ scattering is important for various reasons: it is related to the hidden-charm P_c pentaquark states, provides insights into the role of gluons in nucleon structures, and is relevant to the J/ψ properties in nuclear medium. The scattering can happen through two distinct mechanisms: the coupled-channel mechanism via open-charm meson-baryon intermediate states, and the soft-gluon exchange mechanism. We investigate the $J/\psi N$ S-wave scattering length through both mechanisms, and find that the soft-gluon exchange mechanism leads to a scattering length at least one order of magnitude larger than that from the coupled-channel mechanism and thus is the predominant one.
The findings can be verified by lattice calculations and will enhance our understanding of the scattering processes breaking the Okubo-Zweig-Iizuka rule.

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