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Prediction of an $I=1$ $DD\bar{b}$ state and relationship to the claimed $Z_c(3900)$, $Z_c(3885)$

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We study here the interaction of $DD\bar{b}$ in the isospin $I=1$ channel in light of recent theoretical advances that allow us to combine elements of the local hidden gauge approach with heavy quark spin symmetry. We find that the exchange of light $q\bar{q}$ is Okubo-Zweig-Iizuka (OZI) suppressed and thus we concentrate on the exchange of heavy vectors and of two pion exchange. The latter is found to be small compared to the exchange of heavy vectors, which then determines the strength of the interaction. A barely $DD\bar{b}$ bound state decaying into $\eta c\bar{p}$ and $\pi J/\psi$ is found. At the same time we reanalyze the data of the BESIII experiment on $e^+e^- \rightarrow \pi^\pm (DD\bar{b})^\mp$, from where a $Z_c(3885)$ state was claimed, associated to a peak in the $(DD\bar{b})^\mp$ invariant mass distribution close to threshold, and we find the data compatible with a resonance with mass around 3875 MeV and width around 30 MeV. We discuss the possibility that this and the $Z_c(3900)$ state found at BESIII, reconfirmed at 3894 MeV at Belle, or 3885 MeV at CLEO, could all be the same state and correspond to the one that we find theoretically.

Summary

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