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Gauge dependence of $c\bar{c}$ potential from Nambu-Bethe-Salpeter wave function in Lattice QCD

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We calculate $c\bar{c}$ potential from the equal-time Nambu-Bethe-Salpeter wave function in Lattice QCD to consider its gauge dependence, i.e., we compare the results with Coulomb gauge and Landau gauge. In previous works by Kawanai, Sasaki and Watanabe, Coulomb gauge is employed. However, the renormalizability of Coulomb gauge is controversial so that we desire to change it to some renormalizable gauge such as Landau gauge. To construct the $c\bar{c}$ potential, we need to determine the charm quark mass for which we employ both the original formalism proposed by Kawanai and Sasaki and a modified one proposed by Watanabe. In this talk, we compare the charm quark masses and $c\bar{c}$ potentials obtained in different gauges and different formalisms employing $2 + 1$ flavor QCD gauge configurations with almost physical pion mass (156 MeV) generated by PACS-CS Collaboration.

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