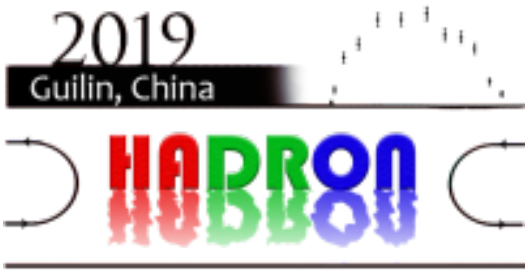

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Bethe-Salpeter wavefunctions of hybrid charmonia

The charmonium-like hybrid mesons with $J^{PC} = (0, 1, 2)^{-+}$ and 1^{--} are investigated on anisotropic lattices in the quenched approximation. For these states, we construct spatially extended operators by splitting the $\bar{c}\Gamma cB$-type operators into two parts ($c\bar{c}$ and the chromo-magnetic field strength B) with different spatial distances r. In the Coulomb gauge, the matrix elements of these operators between the vacuum and the corresponding states are interpreted as Bethe-Salpeter (BS) wave functions, which can be extracted by fitting the correlation functions at different r simultaneously. After disentangling from the conventional charmonium states in 0^{-+} ,2^{-+} and 1^{--} channels, the spectrum and the BS wave functions of the hybrid states in the four channels are obtained. It is found that the ground state, the first excited state and even the second excited states of these channels are nearly degenerate in mass and have almost the same BS wave functions. Furthermore, the BS wave functions of the ground state, the first excited state and the second excited state have zero radial node, one radial node and two radial nodes, respectively. In the non-relativistic picture, this observation implies that the hybrid states in these four channels have similar infrastructure and the separation between the $c\bar{c}$ component and gluonic component (depicted by B operator) can be taken as a meaningful dynamical variable.

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