

Charmonium and Bottomonium Hybrid States

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We have calculated the correlation functions of heavy quarkonium hybrid operators with various J^{PC} quantum numbers to include QCD condensates up to dimension six.

As observed before, the dimension six condensates could stabilize the hybrid sum rules and permit reliable mass predictions. After performing the QCD sum rule analysis, we extract the masses of charmonium and bottomonium hybrids with exotic and non-exotic quantum numbers.

We have confirmed the supermultiplet structures of the hybrid states predicted in the MIT bag model. We identify that the negative-parity states with $J^{PC} = (0, 1, 2)^{-+}, 1^{--}$ form the lightest hybrid supermultiplet while the positive-parity states with $J^{PC} = (0, 1)^{+-}, (0, 1, 2)^{++}$ form a heavier hybrid supermultiplet. The mass of the hybrid with $J^{PC} = 0^{--}$ is very high, which may suggest a different excitation of the gluonic field compared to other channels.

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