New Closed Expression of Interaction Kernel in Bethe-Salpeter Equation for Quark-Antiquark Bound States

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Abstract: The interaction kernel in the Bethe-Salpeter equation for quark-antiquark bound states is derived newly from QCD in the case where the quark and the antiquark are of different flavors. The technique of the derivation is the usage of the irreducible decomposition of the Green's functions involved in the Bethe-Salpeter equation satisfied by the quark-antiquark four-point Green's function. The interaction kernel derived is given a closed and explicit expression which shows a specific structure of the kernel since the kernel is represented in terms of the quark, antiquark and gluon propagators and some kinds of quark, antiquark and/or gluon three, four, five and six-point vertices. Therefore, the expression of the kernel is not only convenient for perturbative calculations, but also suitable for nonperturbative investigations.

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