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Derivation of a Closed Expression of the B-S Interaction Kernel for Quark-Antiquark Bound States

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Abstract: The interaction kernel in the Bethe-Salpeter (B-S) equation for quark-antiquark bound states is derived from B-S equations satisfied by the quark-antiquark four-point Green's function. The latter equations are established based on the equations of motion obeyed by the quark and antiquark propagators, the four-point Green's function and some other kinds of Green's functions, which follow directly from the QCD generating functional. The derived B-S kernel is given by a closed and explicit expression which contains only a few types of Green's functions. This expression is not only convenient for perturbative calculations, but also applicable for nonperturbative investigations. Since the kernel contains all the interactions taking place in the quark-antiquark bound states, it actually appears to be the most suitable starting point of studying the QCD nonperturbative effect and quark confinement.

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Key words: B-S equation, interaction kernel, $q\bar{q}$ bound state

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