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Tetraquark equations

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In a recent publication [Few Body Syst. 65 (2024) , 59] we derived covariant equations describing the tetraquark in terms of an admixture of two-body states DD^- (diquark-antidiquark) and MM (meson-meson), with three-body-like states (where two of the quarks are spectators while the other two are interacting), and $q\bar{q}$ annihilation taken into account exactly. These equations have the feature of being exact in that all neglected terms are taken into account in a clear way through the inclusion of a single $q\bar{q}$ potential Δ. In addition, it was shown that the two-body t matrix Ta, describing the interaction of particle-pair a, enters the theory in terms of sums T + = Ta + Ta′ and products T× = TaTa′, and that by treating T+ perturbatively, one can unify separate well-established models of tetraquarks. However, the presence of poles (associated with the formation of diquarks and mesons) in the single terms Ta and Ta′ is a disadvantage of such a perturbative expansion. In the present work, by extracting the full information on the single-term poles contained within Δ, we are able to take into account T + in full, at once enabling us to propose a more practical expansion where the pole parts of Ta and Ta′ are treated non-perturbatively.

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