

Understanding the nature of the controversial $\rho(1250)$ meson through the covariant representation of hadrons

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Recently, performing a reanalysis of elastic P -wave $\pi\pi$ phase shifts and inelasticities [1], it is argued strongly that there existed an isovector vector meson with a mass around 1.26 GeV, that is $\rho(1250)$. Its existence has a long history and is still in a long-standing controversy both experimentally and theoretically, so that its entry to the PDG listings has not yet been accepted and the relevant observations are listed under the $\rho(1450)$ [2]. In the conventional constituent quark potential models, it is difficult to make the predicted mass of the 2^3S_1 state smaller than that of the Godfrey and Isgur model [3], and therefore the nature of the $\rho(1250)$ state and its properties have not been clarified yet.

In this work we study strong decays with one pion emission of the excited ρ meson states in a framework of the covariant representation scheme for hadrons. In this scheme negative energy components of constituent quarks can be incorporated into the covariant spin wave functions of $q\bar{q}$ states. We discuss a possibility of understanding the properties of the excited ρ mesons, including the controversial $\rho(1250)$, by considering a mixing with states containing negative energy components.

References

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