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Nuclear Theory

Effect of Coulomb Forces on the Position of the Pole in the Scattering Amplitude and on Its Residue

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(Submitted on 23 Jun 2011)

Explicit expressions of the vertex constant for the decay of a nucleus into two charged particles for an arbitrary orbital momentum l are derived for the standard expansion of the effective-range function $K_l(k^2)$, as well as when the function $K_0(k^2)$ has a pole. As physical examples, we consider the bound state of the nucleus ${}^3\rm{He}$ and the resonant states of the nuclei ^{2}He and ^{3}He in the s-wave, and those of ${}^5\rm{He}$ and ${}^5\rm{Li}$ in the p-wave. For the systems Np and Nd the pole trajectories are constructed in the complex planes of the momentum and of the renormalized vertex constant. They correspond to a transition from the resonance state to the virtual state while the Coulomb forces gradually decrease to zero.

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