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The effect of intermediate resonances in the quark interaction kernel on the time-like electromagnetic pion form factor

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An exploratory study of the time-like pion electromagnetic form factor in a Poincaré-covariant bound state formalism in the isospin symmetric limit is presented. Starting from a quark interaction kernel representing gluon-intermediated interactions for valence-type quarks, non-valence effects are included by introducing pions as explicit degrees of freedom. The two most important qualitative aspects are, in view of the presented study, the opening of the dominant rho-meson decay channel and the presence of a multi-particle branch cut setting in when the two-pion threshold is crossed. Based on a recent respective computation of the quark-photon vertex, the pion electromagnetic form factor for space-like and time-like kinematics is calculated. The obtained results for its absolute value and its phase compare favourably to the available experimental data, and they are analysed in detail by confronting them to the expectations based on an isospin-symmetric version of a vector-meson dominance model.

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