

Exploring Timelike Region for the Meson-Photon Transitions in the Light-Front Quark Model

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We investigate $(\pi^0, \eta, \eta^0) \rightarrow \gamma^* \gamma$ transition form factors (TFFs) for both space- and timelike regions using the light-front quark model. For the low energy regime, we compare our LFQM results of the TFFs for low timelike momentum transfer region and the slope parameters at $q^2 = 0$ with the recent experimental data from the Dalize decays of (π^0, η, η^0) . For the high energy regime, we show the asymptotic behavior of TFFs for both space- and time-like regions and compare them with the available experimental data. Especially, we develop the new direct method to explore the timelike region without resorting to mere analytic continuation from space- to time-like region. Our direct calculation in timelike region shows the complete agreement with not only the analytic continuation result from spacelike region but also the result from the dispersion relation between the real and imaginary parts of the form factor.

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