Pion-to-photon transition distribution amplitudes and related form factors in the non-local chiral quark model

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Transition distribution amplitudes (TDAs) are low-energy quantities appearing in the description of certain exclusive processes, for instance hadron-antihadron annihilation $H\bar{H} \to \gamma^\star\gamma$ or backward virtual Compton scattering. They are similar to generalized parton distributions (GPDs), except that the non-diagonality concerns not only the momenta, but also the physical states (they are defined in terms of the hadron-photon matrix element of a non-local operator). For the case of hadronic states such as pions, there are two TDAs: the vector and the axial one that are related to the corresponding form factors. The normalization of the vector form factor is fixed by the axial anomaly, while this is not the case for the axial one. Moreover, the vector form factor is related to the pion-photon transition form factor which is also accessible experimentally.

We have studied the above quantities within the non-local chiral quark model using the currents satisfying Ward-Takahashi identities. We found that the value of the axial form factor at zero momentum transfer is shifted towards the experimental value due to the non-locality of the model (in the local quark models the values of both vector and axial form factors at zero are the same, what is not consistent with the data). We also analyze the pion-photon transition form factor and compare it with the BaBar data.

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