

Locally gauge-invariant incorporation of Regge-trajectory exchanges into effective Lagrangian descriptions of photoproduction processes

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Collaboration

Abstract content

It is well known that in effective Lagrangian formulations of photon-induced meson-production processes simply replacing standard Feynman-type t -channel exchanges by exchanges of Regge trajectories violates gauge invariance. We point out that the usual procedure for remedying this defect is flawed, and we show how to construct a contact current whose four-divergence cancels the gauge-invariance-violating contributions resulting from all states above the base state on the Regge trajectory. By construction, the corresponding complete production current satisfies the appropriate (off-shell) generalized Ward-Takahashi identity and thus preserves full local gauge invariance as a matter of course. An application to recent Jefferson Lab data for the process $\gamma + n \rightarrow K^+ + \Sigma^*(1385)^-$ at photon energies between 1.5 and 2.5 GeV is discussed as well.

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