

Weak radiative hyperon decays in covariant baryon chiral perturbation theory

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Weak radiative hyperon decays, important to test the strong interaction and relevant in searches for beyond the standard model physics, have remained puzzling both experimentally and theoretically for a long time. The recently updated branching fraction and first measurement of the asymmetry parameter of $\Lambda \rightarrow n\gamma$ by the BESIII Collaboration further exacerbate the issue, as none of the existing predictions can describe the data. We show in this letter that the covariant baryon chiral perturbation theory, with constraints from the latest measurements of hyperon non-leptonic decays, can well describe the BESIII data. The predicted branching fraction and asymmetry parameter for $\Xi^- \rightarrow \Sigma^-\gamma$ are also in agreement with the experimental data. We note that a more precise measurement of the asymmetry parameter, which is strongly constrained by chiral symmetry and related with that of $\Sigma^+ \rightarrow p\gamma$, is crucial to test Hara's theorem. We further predict the branching fraction and asymmetry parameter of $\Sigma^0 \rightarrow n\gamma$, whose future measurement can serve as a highly nontrivial check on our understanding of weak radiative hyperon decay and on the covariant baryon chiral perturbation theory.

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