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Extending the baryon ChPT beyond the low-energy region

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We suggest an extension of the one-nucleon sector of baryon chiral perturbation theory beyond the low-energy region. Applicability of the proposed approach for higher energies is restricted to small scattering angles, i.e. the kinematical region where the quark structure of hadrons cannot be resolved. The main idea is to re-arrange the low-energy effective Lagrangian according to a new power counting and for loop diagrams exploit the freedom of the choice of the renormalization condition. We generalize the extended on-mass-shell scheme for the one-nucleon sector of the baryon chiral perturbation theory by choosing a sliding scale, i.e. expand the physical amplitudes around kinematical points far beyond the threshold. This requires an introduction of complex-valued renormalized coupling constants which can be either extracted from experimental data, or calculated using the renormalization group evolution of coupling constants fixed in threshold region.

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