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Roper mass in chiral perturbation theory

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Understanding the nature of the Roper resonance is of particular interest. Its mass, for example, shows a very unusual pattern: it is lower than the negative parity state $N(1535)$. Also, the Roper is expected to play a role in low energy observables due to its closeness to the nucleon and $\Delta(1232)$.

We report on a systematic study of the nucleon, $\Delta(1232)$, and Roper masses in heavy baryon chiral perturbation theory up to next-to-next-to-leading order. For the first time, the contributions due to the mixing between the nucleon and the Roper allowed by chiral symmetry are taken into account. Recently, several lattice QCD collaborations have reported some results on the Roper mass, assuming this particle is always stable. A chiral extrapolation of these data will also be shown as an application of our results.

- This work is done in collaboration with V. Bernard, U. van Kolck, L.S. Geng, and J. Meng.

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