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Two-loop calculation of the nucleon self-energy

The nucleon-self energy

is calculated in SU(2) covariant chiral perturbation theory to study the pion mass dependence of the nucleon mass up to chiral order $O(q^6)$, i.e., including all two-loop diagrams.

Applying an algorithm from Tarasov (1997), the mathematical expressions of the diagrams were expressed by a small set of (scalar) master integrals.

These master integrals are solved as a chiral expansion in d dimensions, using the strategy of regions to differentiate the infrared singular and regular part.

Extended on-mass-shell renormalization is applied, making the renormalized expressions consistent with the power counting.

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