

Nucleon self-energy including two-loop contributions

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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 $\mathcal{O}(q^6)$, i.e., including two-loop diagrams.

The contributions of the diagrams are expressed by a small set of (scalar) master integrals. The extended on-mass-shell (EOMS) renormalization scheme is applied, where (besides the divergent pieces) infrared regular parts of the integrals are systematically subtracted, making the renormalized expressions consistent with the power counting.

The master integrals are evaluated in two ways: Firstly, they are calculated by means of the chiral expansion in d dimensions, using the strategy of regions to differentiate between the infrared singular and regular part. This yields the physical nucleon mass in an $1/m_0$ expansion (with m_0 being the nucleon mass in the chiral limit) and is in agreement with the infrared renormalization result. Secondly, the master integrals are solved numerically using the sector decomposition method.

Parallel Session

Low-Energy Nucleon Structure

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