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Chiral nuclear force with vector mesons

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We extend chiral perturbation theory to include vector mesons as well as pions and nucleons. By counting the vector meson mass as heavy while treating the associated momentum as light, a consistent scheme can be obtained with a well-defined power counting rule. We find that the extended theory can describe the electric form factors of pions and nucleons far better than the conventional ChPT does, achieving the so-called vector-meson dominance in a systematic way. We then apply the theory to nuclear forces up to next-to-next-to-leading order (N2LO), which in general shows better accuracy, revealing the role of vector mesons in low-energy nuclear dynamics.

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