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Baryon-baryon scattering in manifestly Lorentz-invariant formulation of chiral perturbation theory

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We study baryon-baryon scattering by applying time-ordered perturbation theory to the manifestly Lorentzinvariant formulation of chiral perturbation theory. The diagrammatic rules, for the first time, are worked out for the momentum-dependent interactions and propagators of particles with non-zero spin. We define the effective potential as a sum of two-baryon irreducible contributions of time-ordered diagrams and derive a system of integral equations for the scattering amplitude, which provides a coupled-channel generalization of the Kadyshevsky equation. The obtained leading-order baryon-baryon potentials are perturbatively renormalizable, and the corresponding integral equations have unique solutions in all partial waves. We also discuss the issue of additional finite subtractions required, e.g., in the ${}^{3}P_{0}$ partial waves to improve the ultraviolet convergence of (finite) loop integrals on the nucleon-nucleon and hyperon-nucleon scatterings.

V.Baru, E.Epelbaum, J. Gegelia, X.-L. Ren, arXiv:1905.02116

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