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Subtractive renormalization of the chiral potentials up to next-to-next-to-leading order I: Higher NN partial waves[1] CHIEH JEN YANG, CHARLOTTE ELSTER, DANIEL PHILLIPS, Ohio University — We develop a subtractive renormalization scheme to evaluate the p-wave NN scattering phase shifts using chiral effective theory (ChiET) potentials. This allows us to consider arbitrarily high cutoffs when solving the Lippmann-Schwinger equation. We employ NN potentials computed up to next-to-next-to-leading order (NNLO) in ChiET, using both dimensional regularization and spectral-function regularization. When used in our subtracted p-wave Lippmann-Schwinger equation the NNLO potential yields cutoff-independent predictions. This shows that renormalization of the NNLO potential can be achieved by using the generalized NN scattering lengths as input—an alternative to fitting the constant that multiplies the p-wave contact interaction in the ChiET NN force. However, in order to obtain the best fit to the NN data at NNLO the generalized scattering lengths must be varied away from the values extracted from the so-called high-precision potentials. The situation at NNLO is in contrast to the situation with the LO and NLO ChiET potentials, where only two p-waves require renormalization. Attempts to incorporate the contact interactions that occur in the NLO potential then lead to difficulties at cutoffs larger than 1-1.2 GeV.

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