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## The nucleon-nucleon interaction up to sixth order in the chiral expansion

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We have calculated the nucleon-nucleon (NN) interaction up to sixth order (N5LO) of chiral perturbation theory [1,2]. Previous calculations [3] extended only up to N3LO (fourth order) and typically showed a surplus of attraction, particularly, when the  $\pi$ N LECs from  $\pi$ N analysis were applied consistently. Furthermore, the contributions at N2LO and N3LO are both fairly sizeable, thus, raising concerns about the convergence of the chiral expansion. We show that the N4LO contribution is repulsive and, essentially, cancels the excessive attraction of N3LO. The N5LO contribution turns out to be considerably smaller than the N4LO one, hence establishing the desired trend of convergence. The predictions at N5LO are in excellent agreement with the empirical phase shifts of peripheral partial waves (cf. Fig. 1).

### References

1. D. R. Entem, N. Kaiser, R. Machleidt, and Y. Nosyk, Phys. Rev. C 91, 014002 (2015).
2. D. R. Entem, N. Kaiser, R. Machleidt, and Y. Nosyk, to be published.
3. R. Machleidt and D. R. Entem, Phys. Reports 503, 1 (2011).

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