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Investigations of the Few-Nucleon Systems \newline within the LENPIC Project

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Results presented in this contribution are obtained within the Low Energy Nuclear Physics International Collaboration (LENPIC). In the project manifesto [1], it has been stated that LENPIC aims to develop chiral effective field theory nucleon-nucleon and many-nucleon interactions complete through at least fourth order in the chiral expansion (N³LO). Using these interactions, LENPIC's intent is to solve the structure and reactions of light and medium-mass nuclei including electroweak observables with consistent treatment of the corresponding exchange currents. Further plans include high precision calculations of heavier nuclei and infinite nuclear matter with various versions of nuclear interactions derived from chiral effective field theory.

In the contribution the current status of the chiral nuclear forces [2-4] and current operators [5-6] will be briefly discussed. A special emphasis will be put on recent calculations of the elastic nucleon-deuteron scattering and nucleon-induced deuteron breakup processes [7]. Fully consistent results for ground and low-lying excited states of light nuclei ($A \leq 16$) at next-to-next-to-leading order in chiral effective field theory using semilocal coordinate-space regularized two- and three-nucleon forces [8,9] will also be presented.

Finally, calculations performed with various chiral potentials for selected electroweak processes [10] will be reported.

References

- [1] The LENPIC website: <http://www.lenpic.org/>
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