Probing the ηN interactions with η production reactions

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Meson production reactions are considered and related to the modeling of short-range two- and three-nucleon interactions.

In particular, calculations are presented for the cross-section of the $np \to \eta d$ reaction in the region near threshold, within a three-body framework. Both the η and π rescattering diagrams are included through the S_{11} resonance. As it was already the case for the $pp \to \eta pp$ reaction, the results show the dominance of the η-exchange mechanism.

The enhancement of the $np \to \eta d$ cross section experimentally observed in the near-threshold region is seen to be due to the ηd final-state interaction, provided that the underlying short-range nucleon-nucleon correlations are realistic. Henceforth, the results do not support the conjecture of a quasi-bound ηNN bound state, even when the considered phenomenological models for the ηN interaction correspond to a large ηN scattering length.