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# Implications of PREX-II and CREX experiments for relativistic nuclear energy density functionals

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The nuclear energy density functional (NEDF) theory represents a unified approach to studying properties of nuclei along the nuclide map and the equation of state of nuclear matter. Significant progress has been made in constructing NEDFs using both relativistic and non-relativistic frameworks. NEDFs have primarily been parameterized using experimental data related to ground-state properties (e.g., masses, charge radii, spin-orbit splitting) of nuclei. However, these observables are insufficient to fully constrain the effective interaction, particularly its isovector component. The isovector part of the EDFs is crucial for understanding neutron-rich drip line nuclei and determining the density dependence of the nuclear symmetry energy.

Recently, we have constrained new NEDFs based on the relativistic density-dependent point coupling model. While optimizing these new functionals, we have incorporated not only nuclear ground-state properties but also weak-charge form factors from the PREX-II [1] and CREX [2] experiments. By integrating weak-charge form factor data into the optimization procedure, we have uniquely constrained the isovector channels of the effective interactions for each functional for the first time [3]. In this talk, I will first discuss the importance of the symmetry energy in nuclear physics studies, with a primary focus on the neutron-rich side of the nuclear landscape and drip lines [4]. Then, I will discuss the contradictory findings arising from these new functionals and their implications for predictions of nuclear properties [3].

[1] D. Adhikari and PREX Collaboration, Phys. Rev. Lett. 126, 172502 (2021).
[2] D. Adhikari and CREX Collaboration, Phys. Rev. Lett. 129, 042501 (2022)
[3] E. Yüksel and N. Paar, Physics Letters B, 836, 137622, (2023).
[4] A. Ravlić, E. Yüksel, T. Nikšić, N. Paar, Physical Review C 108 (5), 054305 (2023).

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