

ROCKSTAR: Towards a Roadmap of the Crucial measurements of Key observables in Strangeness reactions for neutron sTARs equation of state

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Λ hypernuclear potentials beyond linear density dependence

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In recent papers [PLB 837 (2023) 137669 and NPA 1039 (2023) 122795] we showed that all measured ($1s_\Lambda$, $1p_\Lambda$) pairs of Λ binding energies in Λ -hypernuclei $12 \leq A \leq 208$, can be obtained from a Λ -nucleus optical potential with only two adjustable ΛN and $\Lambda N N$ parameters, associated with leading linear and quadratic terms in the nuclear density. Consequences of suppressing $\Lambda N N$ interactions between 'core' nucleons and 'excess' neutrons are studied and related predictions are made for ($1s_\Lambda$, $1p_\Lambda$) binding energies in $\{40,48\}^A\text{K}$, obtainable from upcoming $\{40,48\}^A\text{Ca}(e,e'K^+)$ JLab experiments. We find Λ -nucleus partial potential depths of $D(2)_\Lambda = -38.6 \pm 0.8$ MeV (ΛN) and $D(3)_\Lambda = 11.3 \pm 1.4$ MeV ($\Lambda N N$), with a total depth $D\Lambda = -27.3 \pm 0.6$ MeV at nuclear-matter density $\rho_0 = 0.17$ fm $^{-3}$. Extrapolation to higher nuclear densities and possible relevance to the 'hyperon puzzle' in neutron-star matter are discussed.

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