Contribution ID: **66** Type: **oral presentation**

Hypernuclear Structure and Hyperon Star Properties with Relativistic Density Functional Theory

Tuesday 26 August 2025 17:04 (12 minutes)

Hypernuclear systems and neutron stars offer complementary environments for exploring baryon interactions across a wide range of densities. This report investigates Ξ^- hypernuclear structure and the equation of state (EOS) of hyperon-rich matter using relativistic density functional theory. The structure of selected light Ξ^- hypernuclei, such as $^{15}_{\Xi^-}$C and $^{13}_{\Xi^-}$B, are described within the density-dependent relativistic mean-field (DDRMF) framework, where the in-medium behavior of meson-hyperon couplings and the role of the isovector scalar δ meson are analyzed in detail. To extend the constraints toward supranuclear densities, experimental information from hypernuclei is incorporated into a Bayesian inference scheme. A statistically significant linear correlation between scalar and vector ΞN coupling strengths is established and used as a nuclear-physics prior. When combined with multimessenger astrophysical observations, including neutron star masses, radii, and tidal deformabilities, the resulting posterior distribution enables a more constrained and realistic description of hyperonic matter. This approach improves the stiffness of the EOS and supports the existence of $2M_\odot$ hyperon stars, offering new insights into the hyperon puzzle from a joint nuclear and astrophysical perspective.

Research field of your presentation

Theoretical Low-energy nuclear physics

Author: DING, ShiYuan (Lanzhou University)

Co-authors: Prof. SUN, BaoYuan (Lanzhou University); Prof. SUN, TingTing (Zhengzhou University); Dr SUN, XiangDong (Xiamen University); Prof. LI, Ang (Xiamen University)

Presenter: DING, ShiYuan (Lanzhou University)

Session Classification: Young Scientist Session 3