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Nuclear symmetry energy slope and its impact on exotic magnetized matter

In this study, we investigate the influence of the nuclear symmetry energy slope on the equation of state (EoS) of dense matter with Δ -admixed exotic matter in neutron stars and its consequences for neutron star (NS) observable properties such as mass-radius

relationships and tidal responses. The equation of state is formulated within the framework of covariant density functional theory, incorporating coupling schemes that involve nonlinear and density-dependent models [1] while accommodating the existence of non-nucleonic degrees of freedom in heavier systems. The slope of the symmetry energy parameter (Lsym) is adjusted based on the density-dependent behavior of isovector meson coupling to baryons. Our findings indicate that lower values of Lsym at saturation promote the early emergence of Δ -resonances relative to hyperons, resulting in a higher threshold for the latter at increased densities of matter [2]. Consequently, this influences the threshold densities at which nucleonic direct Urca processes occur, thereby impacting the cooling mechanisms of neutron stars. Additionally, due to the significant high NS surface magnetic fields we also investigate the impact of strong magnetic fields on the exotic matter and found that the strong magnetic fields influences the (anti)kaons to delay its appearance ultimately stiffening the EoS [3].

References:

- [1] Yang, J. and Piekarewicz, J., Annual Review of Nuclear and Particle Science 70, 21 (2020)
- [2] Thapa, V. B. and Sinha, M., Physical Review C 105, 015802 (2022)
- [3] Kundu, D., Thapa, V. B. and Sinha, M., Physical Review C 107, 035807 (2023)

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