Contribution ID: **18** Type: **Poster**

Antikaon condensed dense matter in neutron star with SU(3) flavour symmetry

Massive pulsar observations indicate that compact stars' central densities can significantly surpass nuclear saturation densities, which could lead to the formation of exotic matter such as quark matter, meson condensates, and hyperons. One important contender among meson condensates, anti-kaon (K^-) condensation, is not well understood in terms of kaon-meson interactions. We refine previous quark model approaches by calculating hadronic couplings in the mesonic sector using SU(3) flavor symmetry. The symmetric-antisymmetric weight factor (α_v), octet-to-singlet coupling ratio (z), and mixing angle (θ_v) are identified as key parameters, with α_v being considered as a free parameter. According to our findings, greater α_v values increase neutron star masses, delay K^- condensation, and stiffen the equation of state. The onset of K^- condensation is extremely sensitive to α_v and happens through a second-order phase transition.

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Session Classification: Poster session

Track Classification: Nuclear Astrophysics