

Is the Hyperon Puzzle Still An Open Problem ?

The solution requires a mechanism (or mechanisms) that could eventually provide the additional pressure at high densities needed to make the EoS stiffer and, therefore, M_{\max} compatible with current observational limits.

▪ Is it the solution unique ?

➤ Two-body YN & YY interactions

- Chiral forces: YN from χ EFT predicts Λ s.p. potential more repulsive than those from meson exchange
- YY vector meson repulsion: ϕ meson coupled only to hyperons yielding strong repulsion at high ρ

➤ Hyperonic Three Body Forces

- BHF calculations with χ EFT NN, NNN, NY NNY forces by Weise et al., indicate the appearance of Λ in NS energetically unfavorable \longrightarrow NS are made only of nucleons ?
- Previous BHF calculations with χ EFT (NN, NNN, NNA) + meson-exchange (NY) showed that even if the concentration of Λ 's is strongly reduced they are still present in the interior of a $2M_{\odot}$ NS
- Only Λ NN is usually considered but what about Σ NN, Ξ NN, YYN & YYY ?

➤ Quark Matter Core: Phase transition to deconfined QM at densities lower than hyperon threshold

- Which astrophysical observables could in an unambiguous way tell us whether hyperons are or are not definitely present in NSs ?: GW post-merger signal, Cooling,