

# The Effect of Isovector Scalar Meson on Neutron Star Matter Based on a Parity Doublet Model

*Monday, October 7, 2024 3:52 PM (12 minutes)*

We study the effect of the isovector-scalar meson ( $\omega$ ) on the properties of nuclear matter and the neutron star (NS) matter by constructing a parity doublet model with including the meson based on the chiral  $SU(2)_L \times SU(2)_R$  symmetry. We also include the  $\sigma$ - $\omega$  mixing contribution to adjust the slope parameter at the saturation. We find that, when the chiral invariant mass of nucleon is smaller than about 800 MeV, the existence of  $\omega$  enlarges the symmetry energy by strengthening the repulsive meson coupling. On the other hand, for large where the Yukawa coupling of  $\omega$  to nucleon is small, the symmetry energy is reduced by the effect of  $\omega$ - $\rho$  mixing. We then construct the equation of state (EoS) of a neutron star matter to obtain the mass-radius relation of NS. We find that, in most choices of  $m_0$ , the existence of  $\omega$  stiffens the EoS and makes the radius of NS larger. We then constrain the chiral invariant mass of nucleon from the observational data of NS, and find that  $580 < m_0 < 860$  MeV for  $L_0 = 57.7$  MeV.

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