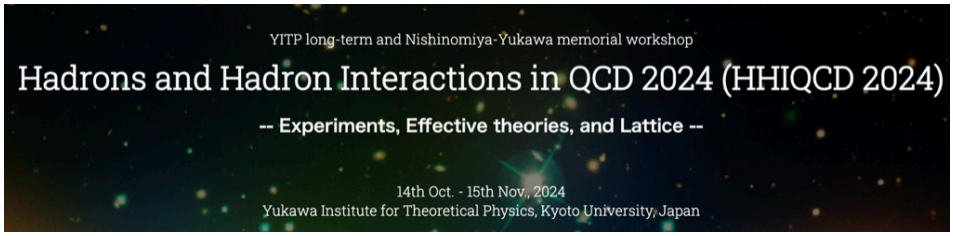

Contribution ID: **29** Type: **4th week (Nuclear matter under extreme conditions)**

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

Thursday, November 7, 2024 5:30 PM (30 minutes)

We study the effect of the isovector-scalar meson $a_0(980)$ on the properties of nuclear matter and the neutron star (NS) matter by constructing a parity doublet model with including the a_0 meson based on the chiral SU(2)$_L \times$SU(2)$_R$ symmetry.
We also include the ω-ρ mixing contribution to adjust the slope parameter at the saturation.
We find that, when the chiral invariant mass of nucleon m_0 is smaller than about 800\,MeV, the existence of $a_0(980)$ enlarges the symmetry energy by strengthening the repulsive ρ meson coupling. On the other hand, for large m_0 where the Yukawa coupling of $a_0(980)$ to nucleon is small, the symmetry energy is reduced by the effect of ω-ρ 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 $a_0(980)$ 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 MeV
$lesssim m_0$
$lesssim 860$ MeV for $L_0 = 57.7$ MeV.

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Session Classification: 1-day workshop (4th week)