Contribution ID: **11**   Type: **1st and 2nd weeks (Hadron structure and interactions)**

Pions in nuclear and neutron star matter and the effective chiral Lagrangian.

Wednesday, October 23, 2024 3:00 PM (30 minutes)

In most equations of state, the electron chemical potential in neutron star (NS) matter reaches the value of the free pion mass at rather moderate baryon densities. This would lead to pionization of NS matter when negative pions replace electrons. The repulsive s-wave pion-neutron interaction could prevent this.
We apply the effective chiral Lagrangian at the second chiral order to construct the s-and p-wave pion scattering amplitudes constrained by the on-threshold scattering data. The pion polarization operator including the nucleon short-range correlations is derived, and the pion spectrum is calculated. The importance of using the unitarized amplitudes is emphasized. The possibility of pionization of NS matter is analyzed for different forms of nuclear symmetry energy. Also, the possibility of the p-wave (pi+) and (p+-pi-) condensation is re-examined.
As has been known for decades, the p-wave piN scattering produces new branches in the pion spectrum at finite pion momenta in the NS matter. Taking into account the mean-field potentials acting on the nucleons we show that these new branches continue up to the vanishing pion momentum. The influence of these branches on the possibility of pion condensation is discussed.
strong text

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