Abstract Submitted
for the APR20 Meeting of
The American Physical Society

Equation of State of Two-Flavor Chiral Perturbation Theory at Next-to-Leading-Order PRABAL ADHIKARI, Wellesley College — We study the properties of finite isospin quantum chromodynamics (QCD) using chiral perturbation theory (χPT), which is the low-energy effective theory of QCD valid at scales much smaller than the typical hadronic scale, $\sim 4\pi f_\pi$, where f_π is the pion decay constant. For isospin chemical potentials larger (in magnitude) than the pion mass (m_π), it is known that pions condense in the vacuum. The system has been studied extensively at tree-level. We extend this study of the pion-condensed phase to include leading order quantum fluctuations and show how to correctly construct the one-loop effective potential. Using the effective potential, we compute the pressure, isospin density, equation of state and the chiral and pion condensates. We compare our results with those from recent lattice calculations in $2+1$ flavor QCD with physical quark masses. We find that the agreement of tree level χPT with the lattice is good and improves through the inclusion of loop effects in χPT.

Prabal Adhikari
Wellesley College

Date submitted: 10 Jan 2020 Electronic form version 1.4