

Properties of hypothetical quark-hadron lattices in the cores of neutron stars

Tuesday 11 September 2018 11:50 (20 minutes)

In this talk, we investigate the effect a crystalline quark-hadron mixed phase can have on the neutrino emissivity from the cores of neutron stars. To this end we use relativistic mean-field equations of state to model hadronic matter and a nonlocal extension of the three-flavor Nambu-Jona-Lasinio model for quark matter. The extent of the quark-hadron mixed phase and its crystalline structure is determined using the Glendenning construction, which allows for the formation of spherical blob, rod, and slab rare phase geometries. The neutrino emissivity due to electron-lattice interactions are calculated utilizing the formalism developed for the analogous process in neutron star crusts. It is found that the contribution to the neutrino emissivity due to the presence of a crystalline quark-hadron mixed phase is substantial compared to other mechanisms at fairly low temperatures ($< 10^9$ K) and quark fractions ($< 30\%$), and that contributions due to lattice vibrations are insignificant compared to static-lattice contributions.

Authors: WEBER, Fridolin (Department of Physics, San Diego State University and Center for Astrophysics and Space Sciences, University of California, San Diego); SPINELLA, William (Wentworth Institute of Technology)

Presenter: WEBER, Fridolin (Department of Physics, San Diego State University and Center for Astrophysics and Space Sciences, University of California, San Diego)