MAGNETIC AND THERMAL EFFECTS IN NEUTRINO SCATTERING IN HOT AND DENSE NUCLEAR MATTER

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Neutrino nuclear scattering in ultramagnetized matter relevant for supernovae, neutron star mergers, magnetar crusts and heavy-ion collisions is considered. At finite temperature neutrino exhibits exo- and endo-energetic scattering on nuclear species due to the neutral-current Gamow-Teller interaction component. From an analysis of energy transfer and straggling cross sections it is demonstrated that additional noticeable mechanisms in equilibrating neutrinos with matter originate from magnetic effects. Average energy transfer, i.e., ratio of energy transfer and scattering cross sections, depends nearly linearly on neutrino energy and changes from positive to negative value. For hot nuclear material such cross over between acceleration and stopping regimes occurs when neutrino energy is about factor four of a temperature. Similar features are revealed for neutrino scattering on hot atomic nuclei. Possible effects in neutrino spectra are discussed.