Contribution ID: **28** Type: **not specified**

Electrical conductivity of warm neutron star crust in magnetic fields: Neutron-drip regime

Wednesday 13 September 2023 15:00 (45 minutes)

We compute the anisotropic electrical conductivity tensor of the inner crust of a compact star at non-zero temperature by extending a previous work on the conductivity of the outer crust. The physical scenarios, where such crust is formed, involve proto-neutron stars born in supernova explosions, binary neutron star mergers and accreting neutron stars. The temperature-density range studied covers the transition from a non-degenerate to a highly degenerate electron gas and assumes that the nuclei form a liquid, i.e., the temperature is above the melting temperature of the lattice of nuclei. The electronic transition probabilities include (a) the dynamical screening of electron-ion interaction in the hard-thermal-loop approximation for the QED plasma, (b) the correlations of the ionic component in a one-component plasma, and (c) finite nuclear size effects. The conductivity tensor is obtained from the Boltzmann kinetic equation in relaxation time approximation accounting for the anisotropies introduced by a magnetic field. The sensitivity of the results towards the matter composition of the inner crust is explored by using several compositions of the inner crust which were obtained using different nuclear interactions and methods of solving the many-body problem. The standard deviation of relaxation time and components of the conductivity tensor from the average are below $\leq 10\%$ except close to crust-core transition, where non-spherical nuclear structures are expected. Our results can be used in dissipative magneto-hydrodynamics (MHD) simulations of warm compact stars.

Authors: Dr HARUTYUNYAN, Arus (Byurakan Astrophysical Observatory, Yerevan State University); Prof. SEDRAKIAN, Armen; GEVORGYAN, Narine; HAYRAPETYAN , Mekhak (Yerevan State University)

Presenter: Dr HARUTYUNYAN, Arus (Byurakan Astrophysical Observatory, Yerevan State University)