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Transport coefficients of magnetized neutron star cores

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Neutron stars are considered as natural laboratories for testing the properties of cold and dense nuclear matter. Knowledge of various microphysical properties of such matter is necessary to link the nuclear matter theory with the astrophysical observations.
In this talk we consider kinetic coefficients (thermal conductivity, shear viscosity, momentum transfer rates) of the magnetized neutron star cores within the framework of the Landau Fermi-liquid theory [1]. We restrict ourselves to the case of normal (i.e. non-superfluid) matter and nucleonic composition. The magnetic field is taken to be non-quantizing. The presence of magnetic field leads to the tensor structure of kinetic coefficients. We find that the moderate ($B < 10^{12}$ G) magnetic field do not affect considerably thermal conductivity of neutron star core matter, since the latter is mainly governed by the electrically neutral neutrons. In contrast, shear viscosity is affected even by the moderate $B \sim 10^8$–10^{10} G.
The uncertainties in the results are illustrated utilizing 39 equations of state from the CompOSE database and several models of the in-medium nucleon interactions treated via the Brueckner-Hartree-Fock calculations of the in-medium scattering matrices.
We also provide a "poor man" approximation for the transport coefficients based on the in-vacuum nucleon cross-sections which allow to obtain qualitatively correct results for any given nucleonic equation of state of the neutron star core.
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[1] P.S. Shternin, D.D. Ofengeim, EPJA 2022, 58, id. 42.

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