Contribution ID: **65** Type: **Oral Presentation**

Computation of ion potential for simulation of nonequilibrium warm dense matter

Wednesday, 13 July 2016 14:20 (20 minutes)

Abstract content
   (Max 300 words)
Formatting &
Special chars

In this work we consider stationary nonequilibrium warm dense states where electrons move relative to the ions. A situation that is ubiquitous in dense plasmas including electron or ion beams, laser accelerated electrons, or ions penetrating a dense quantum plasma or a metal (ion stopping). For the computer simulation of ions in such system the ion-ion potential is starting point. To compute the effective dynamically screened ion potential a linear response description of the electrons via the Mermin dielectric function is utilized with electron-electron collisions taken into account in the relaxation time approximation [1, 2]. The ion potential strongly deviates from the static Yukawa potential [3] exhibiting the familiar oscillatory structure with attractive minima between ions. The results of the investigation show the importance of finite temperature effects even when the electron thermal energy is lower than the Fermi energy. Finally, we obtain the minimal electron streaming velocity for which attraction between ions occurs. The observed effects should be of high relevance for transport under warm dense matter conditions, in particular for laser-matter interaction, electron-ion temperature equilibration and for stopping power. The dynamically screened effective potential can be directly used for MD simulations of classical ions on the background of streaming quantum electrons as discussed in Ref. [4]. This allows to obtain first principle static and dynamic results for the ion component, including the range of strong ion coupling.

[1] Zh. Moldabekov, P. Ludwig, M. Bonitz, T. Ramazanov, Phys .Rev. E 91, 023102 (2015)
[2] Zh. A. Moldabekov, P. Ludwig, J.-P. Joost, M. Bonitz, and T. S. Ramazanov, Contrib. Plasma Phys. 55, 186 (2015)
[3] T. S. Ramazanov, Zh. A. Moldabekov, M. T. Gabdullin, and T. N. Ismagambetova, Phys. Plasmas 21, 012706 (2014)
[4] P. Ludwig, M. Bonitz, and H. Kahlert, J. Phys.: Conf.Series 220, 012003 (2010).

Primary author: Prof. RAMAZANOV, Tlekkabul (IETP, Al Farabi Kazakh National University)

Co-authors: Prof. BONITZ, Michael (ITAP CAU); Dr LUDWIG, Patrick (ITAP CAU); Mr MOLDABEKOV, Zhandos (IETP, Al Farabi Kazakh National University)

Presenter: Prof. RAMAZANOV, Tlekkabul (IETP, Al Farabi Kazakh National University)

Session Classification: Parallel Track A: Astrophysics and Space Physics, Plasma, Gravitation and Cosmology

Track Classification: Plasma Physics