ICPDP

9th INTERNATIONAL CONFERENCE ON THE PHYSICS OF DUSTY PLASMAS

SPACE RESEARCH INSTITUTE (IKI)
MOSCOW · RUSSIA
MAY 23–27
2022

ICPDP

9th INTERNATIONAL CONFERENCE ON THE PHYSICS OF DUSTY PLASMAS

SPACE RESEARCH INSTITUTE (IKI)
MOSCOW · RUSSIA
MAY 23–27
2022

edited by:
L.M. Zelenyi, S.I. Popel

SELF-CONSISTENT RELAXATION THEORY OF COLLECTIVE PARTICLE DYNAMICS IN ONE-COMPONENT YUKAWA LIQUID

A.V. Mokshin [1], **I.I. Fairushin** [1,2]

[1] *Kazan Federal University, 420008, Kremlyovskaya st. 18, Kazan, Russia*

[2] *Joint Institute for High Temperatures of the Russian Academy of Sciences, 125412, Izhorskaya st. 13 Bd.2, Moscow, Russia*

A one-component plasma is the most suitable multiparticle system for the development of the microscopic theory of liquids. This is mainly due to the specific potential of interparticle interaction, as well as due to available experimental data and the results of molecular dynamics simulations, which can be used to verify the correctness of theoretical conclusions. In this work, we will present the microscopic theory of the collective dynamics of particles (ions) of a single-component plasma, where only the interaction potential – the Yukawa potential – and the structural characteristics – the particle pair distribution function and the structure factor – are used as input parameters. It will be shown that the microscopic theory is realized on a wide range of wave vectors; it generalizes the hydrodynamic theory and reproduces the known hydrodynamic expressions in the long-wavelength limit. The theory correctly reproduces all the known features of the spectra of the dynamic structure factor for a wide range of wave numbers, as well as the dispersion law of acoustic-like collective excitations. The theoretical results obtained are compared with the results of known theoretical models and approaches.

A.V. Mokshin acknowledges the Foundation for the Development of Theoretical Physics and Mathematics "BASIS" (project No. 20-1-2-38-1).