# Frenkel line calculation for strongly coupled Yukawa plasma through the analysis of the roton minimum within the self-consistent relaxation theory

**Fairushin I.I.**[1,@] **and Mokshin A.V.**[1]

[1] Kazan Federal University, Kremlyovskaya Street 18, Kazan, Tatarstan, 420008, Russia

[@] fairushin_ilnaz@mail.ru

For strongly coupled Yukawa plasma, the condition for dynamic crossover, known as the Frenkel line, is defined. The condition is related to the fact that the roton minimum in the dispersion relation of longitudinal acoustic-like excitations exists only when the collective vibrational dynamics of particles dominates in the liquid-like system. Based on the self-consistent relaxation theory for the strongly coupled Yukawa plasma, thermodynamic states are determined in which the roton minimum disappears. The obtained values of the state parameters for the Frenkel line are consistent with the results of studies in which the position of this line on the phase diagram of the Yukawa system was determined using molecular dynamics simulations. It is shown that the Frenkel line in this system can be determined directly from the structural characteristic—the static structure factor. A physical interpretation of the roton minimum frequency for the simple liquids near the Frenkel line is proposed.