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SPACE RESEARCH INSTITUTE (IKI)
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DESCRIPTION OF THE CHARACTERISTICS OF A YUKAWA LIQUID BASED ON A TWO-STEP APPROXIMATION FOR THE RADIAL DISTRIBUTION FUNCTION

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In this paper we proposed two-step approximation to a radial distribution function (RDF) of particles of one-component Yukawa liquid, which is determined by basic parameters of the system: nonideality parameter and structure parameter. This approximation allows one to calculate many physical properties based on the corresponding microscopic expressions, where the characteristic parameters of the Yukawa system (non-ideality parameter and structure parameter) are used as input parameters. The two-step approximation proposed in this work for the RDF produces good agreement with the simulation results for such quantities as total internal energy, internal pressure, excess entropy, and dispersion dependences of longitudinal acoustic-like collective excitations. It turns out that in the case of low-temperature states, detailed information on the local structure is not essential for the correct reproduction of the dispersion law $\omega_L(k)$ of the Yukawa liquid.

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