

Dynamic characteristics of strongly coupled plasmas

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A self-consistent version of the method of moments was suggested recently in [1], where it was applied to the direct determination of dynamic properties of one-component classical strongly coupled Coulomb and Yukawa systems in terms of their static characteristics reduced to two frequencies defined by the power frequency moments of the inverse dielectric function. The first of them is related to the static dielectric function by the Kramers-Kronig relations, while the second one is rigorously determined by the system static structure factor charge-charge $S(k)$, which can be calculated for each case independently. The aim of the presentation is to expand the approach to partly degenerate multicomponent Coulomb systems. To this end a novel expression is derived for the static dielectric function in terms of $S(k)$ that simultaneously takes into account degeneracy and satisfies known asymptotic expansions. Thus, the knowledge of the dynamic characteristics is effectively reduced to that of $S(k)$ without any further adjustment to the dynamic data. The validity of the present approach is confirmed by favorable comparison with available theoretical and simulation data and its robustness is ultimately verified by engaging several schemes for evaluating the static structure factor.

REFERENCES

- [1] Yu.V. Arkhipov, et al, “*Direct Determination of Dynamic Properties of Coulomb and Yukawa Classical One – Component Plasmas*”, Phys. Rev. Lett., **119**, 045001 (2017); I.M. Tkachenko et al, Intl. Conf. “Strongly Coupled Coulomb Systems”, 30 July – 4 August 2017, Kiel, Germany, Book of abstracts, p. 81; Yu.V. Arkhipov et al, “*Sum rules and exact inequalities for strongly coupled one-component plasmas*”, Contrib. Plasma Phys., 2018, submitted.