

P5.2004 Dynamical structure factor of non-ideal ions in dense quantum plasmas

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Advances on dense plasma diagnostics using X-ray scattering techniques [1] have allowed one to gain insight into the ionic dynamics at extreme conditions. As a result, properties such as the ion acoustic dispersion and corresponding sound velocity in dense plasmas and warm dense matter can be probed experimentally. This development of experimental diagnostic capabilities has motivated the theoretical investigation of the ionic dynamical structure factor (DSF) [2, 3, 4]. For the understanding of the DSF of strongly coupled ions in dense plasmas and in warm dense matter, an accurate analysis of the effects related to quantum degeneracy and electronic correlations is needed. Therefore, in this work, we present the results of an investigation of the impact of electronic correlations on the DSF of non-ideal ions.

The DSF of ions was computed using a screened ion potential in molecular dynamics simulation, where the screening by electrons was calculated on the basis of linear response theory. In order to take into account the electronic correlations, we used the Singwi-Tosi-Land-Sjölander ansatz (STLS) [5, 6]. The range of plasma parameters at which the STLS approximation is applicable for the description of the screening was defined in our recent work [7]. The analysis of the impact of the electronic correlations on the ionic DSF has been done by comparing the STLS potential based results to the MD data obtained using the screened ion potential in random phase approximation (i.e., neglecting electronic correlations). Additionally, the applicability of the Yukawa model for the description of the ionic DSF in dense quantum plasmas is discussed.

References

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