Collective excitations in fluids of soft interacting particles

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The purpose of this presentation is to introduce very simple practical analytical expressions, which describe dispersion relations of collective modes in fluids composed of soft interacting particles, including strongly coupled plasmas. The expressions are derived within the framework of the quasi-crystalline approximation (QCA) also known as the quasi-localized charge approximation (QLCA), combined with a simple excluded-volume-based approximation for the radial distribution function *g(r)*.

Fully analytical expressions without free parameters have been derived for strongly coupled Yukawa and Coulomb (one-component plasma) systems in three dimensions, as well as one-component plasma fluids with Coulomb and logarithmic interactions in two-dimensions [1-3]. The accuracy of these expressions will be demonstrated using the comparison with the results from numerical simulations (available numerical results have been complemented by new simulations).

The approach appears to be particularly useful for soft long-ranged interactions operating in plasma-related systems, but is not limited to the plasma-related context. As an example, its application to dipole-like interactions in two-dimensions [4] will be demonstrated.

Possible applications of the obtained results will be briefly discussed.

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