Sorting Category: 1.2.5 (C)

Dynamics and Melting of Finite Plasma Crystals

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Interacting few-particle systems in external trapping potentials are of
strong current interest since they allow to realize and control strong
correlation and quantum effects [1]. Here, we present our recent re-
sults on the structural and thermodynamic properties of the crystal-like
Wigner phase of complex plasma confined in a 3D harmonic potential.
We discuss the linear response of the strongly correlated system to ex-
ternal excitations, which can be described in terms of normal modes [2].
By means of first-principle simulations the details of the melting phase
transitions of these mesoscopic systems are systematically analysed with
the melting temperatures being determined by a modified Lindemann
parameter for the pair distance fluctuations [3]. The critical tempera-
tures turn out to be utmost sensitive to finite size effects (i.e., the exact
particle number), and form of the (screened) interaction potential.

[1] PhD Thesis, P. Ludwig, U Rostock (2008)
[2] C. Henning et al., J. Phys. A 42, 214023 (2009)
[3] Böning et al., Phys. Rev. Lett. 100, 113401 (2008)

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Date submitted: 20 Jul 2009

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