

Abstract Submitted  
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**Thermodynamic properties of screened Coulomb balls**<sup>1</sup> M. BONITZ, H. BAUMGARTNER, A. FILINOV — Complex plasmas in parabolic traps [1,2], especially Coulomb balls, can easily reach a strongly coupled state which is of great current interest in many fields, including trapped ions, ultracold plasmas and condensed matter. The advantage of the dust crystals is the direct experimental access to the individual particle positions, allowing for precision comparisons with theoretical models and numerical simulations. In this work the dependence of melting points of mesoscopic spherical crystals on the screening and particle number is analyzed. We present analytical results which are compared with simulation and experimental data [3,4,5]. It is shown that the influence of the screening on structural properties of these mesoscopic systems exhibits also a strong impact on the melting behavior. This analysis is based on Metropolis thermodynamic Monte Carlo simulations to obtain first principle thermodynamic properties of the strongly correlated Coulomb clusters. Finally, our results allow to propose a new non-invasive diagnostic to determine the dust temperature. [1] O. Arp, A. Piel and A. Melzer, Phys. Rev. Lett. 93, 165004 (2004). [2] P. Ludwig, S. Kosse and M. Bonitz, Phys. Rev. E 71, 046403 (2005). [3] M. Bonitz, D. Block, O. Arp, V. Golunychiy, H. Baumgartner, P. Ludwig, A. Piel and A. Filinov, Phys. Rev. Lett. 96, 075001 (2006). [4] O.S. Vaulina, S.A. Khrapak and G.E. Morfill, Phys. Rev. E 66, 016404 (2002). [5] J.P. Schiffer, Phys. Rev. Lett. 88, 205003 (2002)

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