

Abstract Submitted
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Theoretical approach to the ground state of spherically confined Yukawa plasmas¹ CHRISTIAN HENNING, MICHAEL BONITZ, ITAP, University of Kiel, ALEXANDER PIEL, IEAP, University of Kiel, PATRICK LUDWIG, HENNING BAUMGARTNER, ITAP, University of Kiel — Recently spherical 3D dust crystals (aka Yukawa balls) were discovered [1], which allow direct observation of strong correlation phenomena and the structure of which is well explained by computer simulations of charged Yukawa interacting particles within an external parabolic confinement [2]. Here we present an analytical approach to the ground state of these systems using the minimization of the system's energy. Applying the non-local mean-field approximation we show that screening has a dramatic effect on the density profile, which can be derived explicitly [3]. In addition the local density approximation allows for the inclusion of correlations, which further improves the results in the regime of large screening [4]. Comparisons with MD simulations of Yukawa balls show excellent agreement.

[1] O. Arp et al. Phys. Rev. Lett. 93, 165004 (2004)

[2] M. Bonitz et al., Phys. Rev. Lett. 96, 075001 (2006)

[3] C. Henning et al., Phys. Rev. E 74, 056403 (2006)

[4] C. Henning et al., Phys. Rev. E (2007)

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