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### Pair Correlations for Charges in a Harmonic Trap

JEFFREY WRIGHTON, JAMES DUFTY, University of Florida, HANNO KÄHLERT, TORBEN OTT, PATRICK LUDWIG, MICHAEL BONITZ, Christian-Albrechts-Universität zu Kiel — A classical system of  $N$  identical charges in a harmonic trap exhibits both shell structure and orientational ordering due to Coulomb correlations. The shell structure can be reproduced accurately using approximate correlations from the bulk OCP [1]. Here we report additional relationships between correlations in the trap and those for the bulk OCP: 1) pair correlations calculated without reference to their location in the trap agree with those of the bulk OCP, 2) orientational pair correlations among particles within a shell are represented by those of the bulk OCP, when Euclidean distance is replaced by arc length (qualitative agreement using 3D OCP; quantitative agreement using 2D OCP). At stronger coupling, the correlations induce an ordering within the shells (spherical Wigner crystal). It is shown that the orientational correlations for this phase are described by those for the single sphere Thomson problem, i.e. the Thomson sites represent the “lattice” for the spherical crystal. Finite temperature effects for this phase are described as well. Research supported by DOE award DE-FG02-07ER54946, and by the Deutsche Forschungsgemeinschaft via SFB-TRR24.

1. J. Wrighton, J. Dufty, H. Kaehlert, and M. Bonitz, Phys. Rev. E **80**, 038912 (2009); Contrib. Plasma Phys. **50**, 26-30 (2010).

- Prefer Oral Session  
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