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Theoretical Description of Trapped Low-Dimensional Dipoles in the Strongly-Interacting Regime[1] KRISTOFOR B. NYQUIST[2], Washington State University — Recent experimental progress on trapping and cooling dipolar molecules raises the possibility of realizing strongly correlated dipole systems, where the potential energy plays the dominant role. Dipolar systems are expected to be stable if confined in effectively two-dimensional traps. Motivated by these prospects, we calculate the equilibrium positions of a classical system of dipoles at zero temperature stochastically via the Metropolis algorithm. The numerically determined equilibrium positions can be reproduced accurately and with minimal computational effort by a local density approximation using analytical expressions derived for the homogeneous system. For a sufficiently large number of particles the approximation is excellent. Both temperature and quantum mechanical effects lead to fluctuations of the dipoles around their equilibrium positions. The transition from a regular crystalline structure to a delocalized or melted liquid-like structure is investigated by analyzing the pair distribution function and the static structure factor. We specifically focus on characterizing the self-organizing of two neighboring dipolar systems.

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[2]In collaboration with Professor Doerte Blume, Department of Physics and Astronomy, Washington State University, Pullman, WA 99164.

Kristofor B. Nyquist
Washington State University

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