

Abstract Submitted  
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**Charge ordering in ionic fluids mediate repulsive surface interactions**<sup>1</sup> KINJAL DASBISWAS, NICHOLAS B. LUDWIG, HAO ZHANG, DMITRI TALAPIN<sup>2</sup>, SURI VAIKUNTANATHAN, University of Chicago — Recent experiments on ionic fluids, such as surface force measurements in organic ionic liquids<sup>3</sup> and the observation of colloidal stability in inorganic molten salts<sup>4</sup>, suggest the presence of long-ranged repulsive forces. These cannot be explained within the classical Debye-Hückel theory for dilute electrolytes. We argue that such repulsive interactions can arise from long-range (several *nm*) charge density oscillations induced by a surface that preferentially binds one of the ionic species in an ionic fluid. We present a continuum theory that accounts for such charge layering based on a frustrated Ising model that incorporates both long-range Coulombic and short-range steric interactions. The mean-field analytic treatment qualitatively matches results from molecular simulations. A careful analysis of the ionic correlation functions arising from such charge ordering may also explain the long electrostatic screening lengths observed in various ionic fluids and their non-monotonic dependence on the electrolyte concentration.

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<sup>3</sup>Smith, A. M., Lee, A. A. & Perkin, S., *J. Phys. Chem. Lett.*, **7** (12), 2157 (2016)

<sup>4</sup>Zhang, H. *et al.*, accepted at *Nature* (2016)

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