Abstract Submitted
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Long range attraction between two different likely charged macroions B. I. SHKLOVSKII, RUI ZHANG, William I. Fine Theoretical Physics Institute, University of Minnesota — It is known that in a water solution two likely charged macroions can attract each other due to correlations of multivalent counterions adsorbed on their surfaces [1]. This attraction is short-ranged and decays exponentially with distance between macroions. In this work, we show that a longer range attraction exists when the bare surface charge densities of the two macroions have the same sign but different in absolute values. The key idea is that with adsorbed multivalent counterions, two such macroions can be considered as conductors with fixed but different electric potentials. Each potential is determined by the difference between the entropic bulk chemical potential of a multivalent counterion and its correlation chemical potential determined by the bare surface charge density of the macroion. When the two macroions are close enough, their adjacent spots form a charged capacitor, which leads to attraction. This attraction is long-ranged: it decays with distance as a power law. This attractive force may play a important role in gene delivery, in which poly-cations are used to invert the charge of negative DNA so that it is not repelled by negative charged cell membrane. The attraction discussed above makes sure that even the charge of the membrane is also inverted, DNA may still be attracted to it. [1] I. Rouzina and V. A. Bloomfield, J. Phys. Chem. **100**, 9977 (1996).

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