Manning condensation in two dimensions

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Abstract:

We consider a macroion confined to a cylindrical cell and neutralized by oppositely charged counterions. Exact results are obtained for the two-dimensional version of this problem, in which ion-ion and ion-macroion interactions are logarithmic. In particular, the threshold for counterion condensation is found to be the same as predicted by mean-field theory. With further increase of the macroion charge, a series of single-ion condensation transitions takes place. Our analytical results are expected to be exact in the vicinity of these transitions and are in very good agreement with recent Monte Carlo simulation data.

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