

Abstract: We consider the Gibbs measure on the configurations of  $N$  particles on a real line with one fixed particle at one end. The potential includes

pair-wise Coulomb interactions between any particle and its  $2K$  neighbors. When  $K = 1$ , the model is within the rank-one operators. For the case  $K \geq 2$ , exponentially fast convergence of density distribution for the spacings between particles is proved when  $N$  goes to infinity. We discuss when this result provides sufficient conditions to derive CLT for the position of the particle at the free end. The model under consideration is a typical example in statistical physics, and the result is applicable for a general class of Gibbs ensembles.