

# Limiting distribution of interacting particle systems

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May 27, 2024

## **ABSTRACT**

This thesis establishes and rigorously proves the scaling limit of the distribution for the geometric  $q$ -PushTASEP with particle creation. The work begins with an overview of the Kardar-Parisi-Zhang (KPZ) equation, highlighting its importance in random polymer models and interacting particle systems, which are pivotal in understanding complex physical dynamics.

The study introduces the  $q$ -PushTASEP and its half-space variant, linking them to random polymer models. The main theorem demonstrates that, under specific conditions, the scaling limit of both the geometric  $q$ -PushTASEP with particle creation and the half-space Log Gamma polymer models converge to the Baik-Rains crossover distribution or the normal distribution.

Employing saddle point analysis techniques, the thesis proves the convergence of Pfaffian formulas, thereby confirming the proposed scaling limit. This comprehensive analysis enhances our understanding of stochastic interacting particle systems and their relevance in explaining complex physical phenomena.