Fluctuations for the stationary q-TASEP

Takashi IMAMURA, *Chiba University*

The q-totally asymmetric simple exclusion process (q-TASEP) is a version of the exclusion processes: particles on $\mathbb{Z}$ hop to the right neighboring site under the exclusion condition. While the hopping rate of each particle is unity in the standard TASEP, it is generalized to $1 - q^{\mathrm{gap}}$ in q-TASEP, where the "gap" means the number of empty sites between the particle and the right neighboring particle.

The q-TASEP has been playing an important role in the recent progresses in the integrable probability. By clarifying the algebraic structures, it has been shown that in a particular initial condition called the step initial condition, the liming distribution of a particle position is the GUE Tracy-Widom distribution [1, 2]. However it has been known that these approaches in [1, 2] cannot be applied to the stationary case, due to the divergence of the q-moments.

In this talk, we will give our recent work on the stationary q-TASEP [3, 4]. We develop an approach to analyze the fluctuation properties for the stationary case without relying on the q-moments. We focus on the pdf of the particle position itself and utilize the Ramanujan summation formula and an elliptic version of the Cauchy determinant identity. By this approach we show that in the stationary q-TASEP, the limiting distribution of the particle position is described by the Baik-Rains distribution. This is a joint work with Tomohiro Sasamoto.

References

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