



**S N BOSE NATIONAL CENTRE
FOR BASIC SCIENCES**

Block JD, Sector III, Salt Lake, Kolkata 700 106

DEPARTMENTAL SEMINAR

Physics of Complex Systems

03rd January, 2023

3.00 PM

ONLINE / FERMION

SPEAKER

**Dr. Amit Kumar Chatterjee,
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TITLE OF THE TALK

Multi-species ASEP with impurities: matrix product state, clustering and negative mobility

ABSTRACT

The asymmetric simple exclusion process (ASEP) is broadly regarded as a paradigmatic model for non-equilibrium transport processes. Motivated by a simplistic description of multi lane traffic flow, we present a multi species generalization of ASEP along with impurities. The impurities can activate flips between different species, imitating the lane change dynamics in multi lane traffic flow. This model, being disordered and non-ergodic, is of intrinsic interest. The exact non-equilibrium steady state probability distribution is obtained using the technique of matrix product ansatz [1]. For special choices of the microscopic dynamics, the model exhibits (i) cluster formation as a result of counter-flow of different species [2], (ii) negative differential mobility where current can decrease with increasing bias [1]. We briefly discuss plausible connections of this model with run-and-tumble particles (used to model active matter) and enzymatic chemical reactions.

References:

- [1] A. K. Chatterjee and H. Hayakawa, arXiv:2205.03082 (2022).
- [2] A. K. Chatterjee and H. Hayakawa, arXiv:2208.03297 (2022).

HOST FACULTY

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