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Traffic jams in driven intracellular transport on parallel lanes THOMAS FRANOSCH, TOBIAS REICHENBACH, ERWIN FREY, Arnold Sommerfeld Center for Theoretical Physics (ASC) and Center for NanoScience (CeNS), LMU Munich, Germany — Microtubules, the intracellular tracks for molecular motors like dynein or kinesin, are built of 12-14 parallel lanes. Although it has been revealed that the motor proteins typically remain on one track while proceeding on the microtubule, the statistics of deviations (random lane changes) is so far unknown. We investigate the effects of a small, but finite number of such lane changes by studying driven transport on two parallel lanes with simple site exclusion [1]. As a result, traffic jams emerge in the stationary density profiles, their location can be controlled by the particle fluxes at the boundaries. We obtain analytical results on the shape of the density profiles as well as resulting phase diagrams by a mean-field approximation and a continuum limit.

[1] T. Reichenbach, T. Franosch, E. Frey, Phys. Rev. Lett. 97, 050603 (2006)

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