The Totally Asymmetric Simple Exclusion Process with a Shortcut of Arbitrary Length

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In this work we continue the study of the totally asymmetric simple exclusion process, defined on an open network, consisting of head and tail simple chain segments with a double-chain section, inserted in-between [1, 2]. We consider the case when the two branches of the double-chain section are of different length, thus modelling a bypass on a linear track. The model was first introduced and studied in [3] for a zero length of the shortcut. However, further study [2] reveals rather different and unexpected results. We study here the interesting case which arises when the network is in the maximum current phase. Preliminary numerical simulations show how the density profile of the middle segment changes from high to low density depending on the length of the shortcut and also on the probability of taking the shortcut.

These results may have interesting implications for planning of roadway traffic as well as for better understanding of the behaviour of some processes in biological systems [3, 4].

References

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