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# The bosonic skin effect: boundary condensation in asymmetric transport

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We study the incoherent transport of bosonic particles through a one dimensional lattice with different left and right hopping rates, as modelled by the asymmetric simple inclusion process (ASIP). Specifically, we show that as the current passing through this system increases, a transition occurs, which is signified by the appearance of a characteristic zigzag pattern in the stationary density profile near the boundary. In this highly unusual transport phase, the local particle distribution alternates on every site between a thermal distribution and a Bose-condensed state with broken U(1)-symmetry. Furthermore, we show that the onset of this phase is closely related to the so-called non-Hermitian skin effect and coincides with an exceptional point in the spectrum of density fluctuations. Therefore, this effect establishes a direct connection between quantum transport, non-equilibrium condensation phenomena and non-Hermitian topology, which can be probed in cold-atom experiments or in systems with long-lived photonic, polaritonic and plasmonic excitations.

## Abstract category

Quantum Optics

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