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Novel phases in an accelerated exclusion process[1] JIAJIA DONG, Bucknell University, STEFAN KLUMPP, Max Planck Institute of Colloids and Interfaces, ROYCE K.P. ZIA, Physics Department, Virginia Tech, Department of Physics and Astronomy, Iowa State University — We introduce a class of distance-dependent interactions in an accelerated exclusion process (AEP) inspired by the cooperative speed-up observed in transcribing RNA polymerases. In the simplest scenario, each particle hops to the neighboring site if vacant *and* when joining a cluster of particles, triggers the frontmost particle to hop. Through both simulation and theoretical work, we discover that the steady state of AEP displays a discontinuous transition with periodic boundary condition. The system transitions from being homogeneous (with augmented currents) to phase-segregated. More surprisingly, the current-density relation in the phase-segregated state is simply $J = 1 - \rho$, indicating the particles (or holes) are moving at unit velocity despite the inclusion of long-range interactions.

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