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Supercurrent decay via quantum nucleation of phase slips in one-dimensional lattice bosons[1] IPPEI DANSHITA, RIKEN, Wako, Saitama 351-0198, Japan, ANATOLI POLKOVNIKOV, Deparment of Physics, Boston University, Boston, MA 02215 — We study transport properties of one-dimensional (1D) Bose gases in a periodic potential. In 1D, superflow at zero temperature can decay via quantum nucleation of phase slips even when the flow velocity is much smaller than the critical velocity predicted by mean-field theories. We use instanton techniques to find that the decay rate G is algebraically increases with the flow momentum p as $G/L \propto p^{2K-2}$, where L is the system size, K the Luttinger parameter. We also discuss the relation between the nucleation rate and the quantum superfluid-insulator transition in order to present a physical interpretation of the scaling formula.

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