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The role of dissipation in quantum phase slip production in superconducting nanowires DIMA MOZYRSKY, Los Alamos National Laboratory — We study dynamics of quantum phase slips (QPS) in ultrathin superconducting wires. At sufficiently low temperatures momentum conservation is known to pose a constraint on QPS creation, which can be lifted due to inhomogeneous external potential or due to production of quasiparticles. We argue that while the former mechanism is weak in nanowires with diameters significantly exceeding the Fermi wavelength (which is the case for most up-to-date QPS experiments), the dissipation caused by quasiparticles is likely to be the major source for the QPS generation. We argue that dissipation can be enhanced in superconductors with broken time reversal symmetry, and therefore such systems are likely to exhibit phase slips at ultralow temperatures. Our studies may clarify recent experiments (Nature Physics 5, 503 (2009)) showing the evidence of QPS at sufficiently high values of bias-current.

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