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Switching Current Distributions of Superconducting Nanowires: Evidence for Individual Quantum Phase Slips MITRABHANU SAHU, MYUNG-HO BAE, UIUC, ANDREY ROGACHEV, University of Utah, DAVID PEKKER , Harvard University, NAYANA SHAH, UIUC, TZU-CHIEH WEI, University of Waterloo, PAUL GOLDBART, ALEXEY BEZRYADIN, UIUC — Phase slip fluctuations cause premature stochastic switching of the state of a current biased quasi-one-dimensional nanowire from superconducting to normal at sub-critical currents. Here, we report on measurement of the distributions of switching currents performed on amorphous superconducting $Mo_{79}Ge_{21}$ nanowires over a range of temperatures. The measured widths of the switching current distributions are observed to increase with decreasing temperature. We explain this counterintuitive result by considering a microscopic stochastic model of heating caused by each phase slip event. The measured rates of escape from the superconducting state agree well with the predictions of the stochastic model under the assumption of phase slippage by thermal activation at relatively high temperatures and macroscopic quantum tunneling at sufficiently low temperatures. We identify and explore a region in which a *single* quantum phase slip is all that is necessary to trigger switching from the superconducting to the normal state.

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