Abstract Submitted
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Macroscopic Quantum Cotunneling of Phase Slips[1] ANDREY BELKIN, MAXIM BELKIN, University of Illinois at Urbana-Champaign, VICTOR VAKARYUK, Johns Hopkins University, SERGEI KHLEBNIKOV, Purdue University, ALEXEY BEZRYADIN, University of Illinois at Urbana-Champaign — Quantum phenomena that do not have analogues in the classical world include quantum superposition and tunneling. Despite significant efforts invested into demonstration of quantum effects at the macroscopic level, the main principles that govern the transition from classical to quantum are not well understood. Here we report a study of macroscopic quantum tunneling of phase slips that involve both superconducting and normal degrees of freedom in a superconducting nanowire loop. We discover that in addition to single phase slips that unwind the phase difference along the loop by 2π, there are transitions that change the phase by 4π. Experimentally we identify the regime in which, surprisingly, 4π phase slips are more likely than 2π ones. We interpret our observations in terms of macroscopic cotunneling effect defined as an exact synchronization of two macroscopic phase slip events.

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