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Macroscopic resonant tunneling in extremely asymmetric superconducting qubits PHILIP R. JOHNSON, NIST, Gaithersburg MD, WILLIAM T. PARSONS, Johns Hopkins University, FREDERICK W. STRAUCH, J.R. ANDERSON, ALEX J. DRAGT, C.J. LOBB, F.C. WELLSTOOD, University of Maryland — We predict surprisingly strong macroscopic resonant tunneling (MRT) effects in extremely asymmetric double well superconducting qubits. Observable signatures include a complex pattern of 1-100 MHz splittings in the energy level spectra, arising from the quantum coherent tunnel coupling between states in a shallow upper well and highly excited states in a very deep lower well. Probing quantum tunneling in these devices provides a new test of macroscopic quantum mechanics under extreme asymmetric conditions. Moreover, if our predictions are confirmed, they will have important implications for double well phase qubits.

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