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Has Macroscopic Superposition in Superconducting Qubits Really Been Demonstrated? ALAN M. KADIN, Princeton Junction, NJ, STEVEN B. KAPLAN, Estes Park, CO — Quantum computing depends on many qubits coupled via quantum entanglement, where each qubit must be a simultaneous superposition of two quantum states of different energies, rather than one state or the other as in classical bits. It is widely believed that observations of energy quantization and Rabi oscillations in macroscopic superconducting circuits prove that these are proper qubits with quantum superposition. But is this really the only interpretration? We propose a novel paradigm for macroscopic quantum systems, in which energies are quantized (with photon-mediated transitions), but the quantized states are realistic objects without superposition. For example, a circuit could make a transition from one quantized value of flux to another, but would never have both at the same time. We further suggest a superconducting circuit that can put this proposal to a test [1]. Without quantum superposition, most of the potential benefit of quantum computing would be lost. [1] A.M. Kadin and S.B. Kaplan (2014), "Superconducting Quantum Computing Without Entanglement?", http://arxiv.org/abs/1408.5410.

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