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Controllable Coherent Population Transfers in Superconducting Qubits for Quantum Computing L.F. WEI, RIKEN and Southwest Jiaotong University, Chengdu 610031, China , J.R. JOHANSSON, L.X. CEN, S. ASH-HAB, F. NORI — We propose an approach to coherently transfer populations between selected quantum states in one- and two-qubit systems by using controllable Stark-chirped rapid adiabatic passages. These evolution-time insensitive transfers, assisted by easily implementable single-qubit phase-shift operations, could serve as elementary logic gates for quantum computing. Specifically, this proposal could be conveniently demonstrated with existing Josephson phase qubits. Our proposal can find an immediate application in the readout of these qubits. Indeed, the broken parity symmetries of the bound states in these artificial atoms provide an efficient approach to design the required adiabatic pulses.

L.F. Wei
RIKEN and Southwest Jiaotong University, Chengdu 610031, China

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