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Quantum gates by qubit frequency modulation in circuit QED FELIX BEAUDOIN, Universite de Sherbrooke, MARCUS P. DA SILVA, BLAKE R. JOHNSON, THOMAS A. OHKI, ZACHARY DUTTON, Disruptive Information Processing Technologies Group, Raytheon BBN Technologies, ALEXANDRE BLAIS, Universite de Sherbrooke — Several types of two-qubit gates have been realized experimentally in circuit QED. These are based, for example, on tuning the pair of qubits in resonance with each other [Majer, Nature 449, 443-447 (2007)] or on a microwave pulse on one qubit at the transition frequency of a second qubit [Chow, Phys. Rev. Lett. 107, 080502 (2011)]. Another realization is based on a sequence of blue-sideband transitions generated by microwave pulses [Leek, Phys. Rev. B 79, 180511(R) (2009)]. Here, we propose a different approach relying on oscillations of the qubit frequency using a flux-bias line. We explain how frequency modulation leads to tunable qubit-resonator and qubit-qubit interactions. We also show how this form of quantum control leads to faster (first-order) sideband transitions and consider applications to two-qubit gates.

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[X] Prefer Oral Session
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