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First-order sideband transitions with flux-driven asymmetric transmons J.D. STRAND, M.E. WARE, Syracuse University, FELIX BEAUDOIN, McGill University, ALEXANDRE BLAIS, Sherbrooke, T. OHKI, B. JOHNSON, BBN Technologies, B.L.T. PLOURDE, Syracuse University — We present data demonstrating first-order sideband transitions between a qubit and a resonator performed with a digitally synthesized waveform coupled to the qubit loop as a magnetic flux. The resulting first-order sideband transitions are much faster (up to 85 MHz in our measurements) than second-order processes and have the potential to create fast quantum gates. The frequency of the red sideband can also be made quite low, typically a few hundred MHz in our experiment, and at these low frequencies expensive microwave generators are not required, simplifying the control electronics and making the process more scalable. We chose to test this process with asymmetric transmons in which one junction is several times larger than the other. This asymmetry creates a shallow flux modulation curve that is optimum for this flux-driven sideband process.

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