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A SiGe Quadrature Pulse Modulator for Superconducting Qubit State Manipulation RANDY KWENDE, JOSEPH BARDIN, Univ of Mass - Amherst — Manipulation of the quantum states of microwave superconducting qubits typically requires the generation of coherent modulated microwave pulses. While many off-the-shelf instruments are capable of generating such pulses, a more integrated approach is likely required if fault-tolerant quantum computing architectures are to be implemented. In this work, we present progress towards a pulse generator specifically designed to drive superconducing qubits. The device is implemented in a commercial silicon process and has been designed with energy-efficiency and scalability in mind. Pulse generation is carried out using a unique approach in which modulation is applied directly to the in-phase and quadrature components of a carrier signal in the 1-10 GHz frequency range through a unique digital-analog conversion process designed specifically for this application. The prototype pulse generator can be digitally programmed and supports sequencing of pulses with independent amplitude and phase waveforms. These amplitude and phase waveforms can be digitally programmed through a serial programming interface. Detailed performance of the pulse generator at room temperature and 4 K will be presented.

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