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Integrated CMOS IQ Upconverter/Downconverter for an X-Band Phased-Array Radar Application

Ryan C. Johnson

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Abstract
This thesis describes the design and measurement of an X-band IQ up/down converter that has been fabricated on a 180nm RF CMOS process. This converter includes components for mixing, frequency doubling, quadrature generation, amplification, and limiting. The specific circuit topologies used include passive double-balanced mixers, RC polyphase filters, and injection locked LC oscillators.

The converter is part of a transceiver chain that will make up the dedicated circuitry for each active antenna element of a phased-array radar. An active antenna element combines a radiator with its own transceiver subsystem. A phased-array radar, NetRad, is under development at the University of Massachusetts Amherst and will require thousands of active antenna elements. This motivates the need for low-cost integrated solutions. A silicon-based RF CMOS process provides a

low-cost candidate technology to fulfill this requirement.

Advisor(s) or Committee Chair
Jackson, Robert W