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Custom instruction set architecture for control and readout superconducting qubits

Abstract: Growing interest in quantum computing demands application-specific electronics that would provide a flexible and scalable way to control pulse scheduling, fast signal processing, and real-time feedback capabilities. Even though many such devices already exist as commercial solutions, they often are not flexible enough to cover all user-required corner cases. This talk will present a custom design for instruction set architecture that provides complete control over the envelope, phase, scale, and frequency of microwave pulses with up to 2 ns time precision, as well as digital signal processing of recorded samples and real-time complex decision making.