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Simultaneous single-shot readout of multi-qubit circuits using a traveling-wave parametric amplifier¹

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Observing and controlling the state of ever larger quantum systems is critical for advancing quantum computation. Utilizing a Josephson traveling wave parametric amplifier (JTWPA), we demonstrate simultaneous multiplexed single shot readout of 10 transmon qubits in a planar architecture. We employ digital image sideband rejection to eliminate noise at the image frequencies. We quantify crosstalk and infidelity due to simultaneous readout and control of multiple qubits. Based on current amplifier technology, this approach can scale to simultaneous readout of at least 20 qubits.

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