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### **Deterministic generation of entanglement with up to 20 superconducting qubits**

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Here I will review our recent activities on designing and fabricating superconducting circuits which integrate up to 20 qubits for scalable quantum information processing. In particular, I will introduce a superconducting quantum processor featuring 20 individually-accessible Xmon qubits that are controllably coupled to a bus resonator, based on which we deterministically produce an 18-qubit Greenberger-Horne-Zeilinger state and multi-component atomic Schrödinger cat states of up to 20 qubits. We verify genuine entanglement with simultaneous measurements of all qubits involved. With the excellent control developed in our experiment, our multiqubit superconducting circuits may provide a promising platform for simulating the intriguing physics of quantum many-body systems.

Keywords: Superconducting qubit, Entanglement, Quantum information processing