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Generation of three-qubit entangled states using superconducting phase qubits MATTHEW NEELEY, UCSB, R. BIALCZAK, M. LENANDER, E. LUCERO, M. MARIANTONI, A. D. O'CONNELL, D. SANK, H. WANG, M. WEIDES, J. WENNER, T. YAMAMOTO[1], Y. YIN, A. N. CLELAND, J. M. MARTINIS — Entanglement is one of the crucial resources necessary for quantum computation. For three qubits, there are two fundamentally different types of entanglement, typified by the states $|\mathrm{GHZ}\rangle = |000\rangle + |111\rangle$ and $|\mathrm{W}\rangle = |100\rangle + |010\rangle + |001\rangle$. Using three capacitively-coupled phase qubits, we have implemented protocols designed for fast single-step generation of these states. The resulting states were characterized with quantum state tomography and compared with entanglement witnesses that identify true multi-partite entanglement.

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