## Abstract Submitted for the MAR15 Meeting of The American Physical Society

Classical chaos and its correspondence in superconducting qubits C. NEILL, B. CAMPBELL, Z. CHEN, B. CHIARO, A. DUNSWORTH, M. FANG, I. HOI, J. KELLY, A. MEGRANT, P. O'MALLEY, C. QUINTANA, A. VAINSENCHER, J. WENNER, T. WHITE, UC Santa Barbara, R. BARENDS, YU CHEN, A. FOWLER, E. JEFFREY, J. MUTUS, P. ROUSHAN, D. SANK, J.M. MARTINIS, Google, Santa Barbara — Advances in superconducting qubits have made it possible to experimentally investigate quantum-classical correspondence by constructing quantum systems with chaotic classical limits. We study the quantum equivalent of a classical spinning top using three fully coupled qubits that behave as a single spin-3/2 and subject the spin to a sequence of non-linear rotations. The resulting entanglement bears a striking resemblance to the classical phase space, including bifurcation, and suggests that classical chaos manifests itself as quantum entanglement. Studying the orientation of the spin-3/2 reveals that the rotations which generate chaos and entanglement are at the same time the source of disagreement between the quantum and classical trajectories. Our experiment highlights the correspondence between classical non-linear dynamics and interacting quantum systems.

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