replacing MAR17-2016-005864

Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Exploring the strongly driven spin-boson model in the nonperturbative coupling regime using a superconducting circuit POL FORN-DIAZ, Institute for Quantum Computing, Univ of Waterloo, Waterloo, Canada, LUCA MAGAZZU, University of Augsburg, Augsburg, Germany, RON BELYANSKY, JEAN-LUC ORGIAZZI, ALI YURTALAN, Institute for Quantum Computing, Univ of Waterloo, Waterloo, Canada, BORJA PEROPADRE, Raytheon BBN Technologies, Cambridge MA, JUAN JOSE GARCIA-RIPOLL, IFF-CSIC, Madrid, Spain, MILENA GRIFONI, University of Regensburg, Regensburg, Germany, ADRIAN LUPASCU, CHRIS WILSON, Institute for Quantum Computing, Univ of Waterloo, Waterloo, Canada — The spin-boson model describes the interaction between a two-level system and its environment, modeled as a bosonic bath. This model is particularly important in the study of decoherence, especially in solid-state qubits. Interestingly, when the interaction between the qubit and the environment crosses a threshold, the qubit dynamics cease to be dominated by coherent tunneling between its two eigenstates and transition into an incoherent tunneling regime. At stronger coupling, tunneling is quenched and the qubit wavefunction becomes localized. We have experimentally explored the transition from coherent to incoherent tunneling in the spin-boson model using a superconducting flux qubit coupled to an open transmission line. A strong pump tone added to our probe reveals the internal dynamics of the system with the appearance of photon-assisted tunneling resonances. We developed a theoretical model based on the noninteracting blip approximation (NIBA), which is in good agreement with our experimental observations.

Pol Forn-Diaz
Institute for Quantum Computing, Univ of Waterloo, Waterloo, Canada

Date submitted: 11 Nov 2016 Electronic form version 1.4