MAR07-2006-001777

Abstract for an Invited Paper
for the MAR07 Meeting of
the American Physical Society

A quantum trajectory approach to circuit QED

JAY GAMBETTA, Yale University

Circuit QED is a promising area of research as it opens the possibility to realize the extreme strong coupling limit of cavity QED using superconducting electrical circuits. In this regime, quantum effects become dominant and a full quantum treatment of the system is essential. In this talk, I will show how continuous-in-time measurement theory can be used to obtain a quantum trajectory description of the qubit evolution conditioned on the measurement output. This conditional quantum trajectory describes the quantum non-demolition measurements used by the Schoelkopf group at Yale. Using this approach, we investigate measurement-induced dephasing, the effect of relaxation on measurement fidelity and the extreme strong coupling limit where effects such as number splitting occur. This description also opens the door to the investigation of non-linearities present in the Yale expriment.