Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Stark effect and generalized Bloch-Siegert shift in a strongly driven two-level system MATTI SILVERI, JANI TUORILA, University of Oulu, MIKA SILLANPÄÄ, Aalto University, School of Science, YURIY MAKHLIN, Landau Institute for Theoretical Physics, ERKKI THUNEBERG, University of Oulu, PERTTI HAKONEN, Aalto University, School of Science — A superconducting qubit was driven in an ultrastrong fashion by an oscillatory microwave field, which was created by coupling via the nonlinear Josephson energy. The observed Stark shifts of the "atomic" levels are so pronounced that one has to go beyond the rotating wave approximation to properly explain the measurements. The difference between the prediction of the rotating wave approximation and the full calculation including all higher orders constitutes the generalized Bloch-Siegert shift which was verified in the measurement. Based on the Floquet approach for the driven two-level system, we calculate the landscape of the quasienergy splitting and the matrix elements of the probe transition, which were probed by resonant absorption via a cavity. The calculation taking into account both the resonance condition and the magnitude of the probe absorption agrees well with the measurement results.

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Date submitted: 14 Dec 2010 Electronic form version 1.4