Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Evidence for Multi-photon transitions between energy levels in a large Current-Biased Magnesium Diboride Josephson Heterojunction ROBERTO RAMOS, Indiana Wesleyan University, STEVEN CARABELLO, JOSEPH LAMBERT, Drexel University, DANIEL CUNNANE, Temple University, WENQING DAI, The Penn State University, KE CHEN, Temple University, QI LI, The Penn State University, XIAOXING XI, Temple University — When photons are strongly coupled to a quantum system, multiphoton transitions can be observed between two energy levels when the quantum energy of the exciting radiation, multiplied by an integer, matches the level spacing. This phenomenon can be observed in Josephson junction qubits exposed to weak microwave radiation at very low temperatures. At microwave resonance, the transition probability of a junction from superconducting to normal state is enhanced and these are used to map multiphoton transitions. We report observation of single- and multi-photon transitions between ground and first excited states in current-biased MgB2 thin film junctions by applying RF with frequencies between 0.5 and 3 Ghz. These large (up to 0.2mm x 0.3 mm) junctions consist of an MgB2 electrode insulated by native oxide from a lead (Pb) or tin (Sn) counter-electrode, and have areas at least 600 times bigger than Nb junctions previously shown to exhibit multiphoton transitions. The data is consistent with theoretical models of junctions behaving in the quantum limit and show anharmonicity of the junction potential when biased near the critical current.

Roberto Ramos
Indiana Wesleyan University

Date submitted: 09 Nov 2012 Electronic form version 1.4