Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Quantized energy levels in quantum and classical regimes in current-biased intrinsic Josephson junction MYUNG-HO BAE, MITRABHANU SAHU, Department of Physics, University of Illinois at Urbana-Champaign, Urbana, Illinois 61801-3080, USA, HU-JONG LEE, Department of Physics, Pohang University of Science and Technology, Pohang 790-784, Republic of Korea, ALEXEY BEZRYADIN, Department of Physics, University of Illinois at Urbana-Champaign, Urbana, Illinois 61801-3080, USA, HU-JONG LEE COLLABORATION — The multiphoton transitions between quantized energy levels in the current-biased $Bi_2Sr_2SrCaCu_2O_{8+x}$ intrinsic Josephson junctions (IJJs) in the quantum and classical regimes are studied through the switching current distributions. The system shows the saturation behavior of the switching current distributions near T^* $\sim$0.8 K, which is the crossover temperature between classical and quantum nature of the system. We observe the multiphoton transitions between quantized energy levels in the quantum regime, which is manifested by the enhancement of the escape rate in the microwave radiation with frequencies of 12-16 GHz. This enhancement behavior keeps even in the classical regime and is washed out near T$\sim$2 K, of which thermal energy corresponds to the energy level spacing at the switching currents. This means that the existence of the quantized energy levels even in the classical regime of IJJs, due to the relatively large plasma frequency in the IJJs.

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Date submitted: 05 Dec 2007 Electronic form version 1.4