Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Macroscopic quantum tunneling in d-wave high-TC superconductor KUNIHIRO INOMATA, SHIGEO SATO, KOJI NAKAJIMA, Research Institute of Electrical Communication (RIEC), Tohoku University, AKIHIRO TANAKA, YOSHIHIKO TAKANO, HUABING WANG, MASANORI NAGAO, National Institute for Materials Science (NIMS), SIRO KAWABATA, National Institute of Advanced Industrial Science and Technology (AIST), TAKESHI HATANO, National Institute for Materials Science (NIMS) — We report the first successful observation of the macroscopic quantum tunneling (MQT) in d-wave high-T_C superconductor (HTSC). Although, MQT, i.e. the quantum mechanical tunneling of the phase variable of the macroscopic wave function through the potential barrier of a Josephson junction, has been observed at around 300 mK in a conventional s-wave low-T_C superconductor, it has appeared at approximately 1 K in HTSC because of its higher plasma frequency. On the other hand the d-wave pairing symmetry, the other hallmark of HTSC, allows for dissipative quasiparticles excitations within the superconducting energy gap, which may severely interfere with the occurrence of MQT. We also show a feasibility of MQT in spite of an existence of the dissipative quasiparticles.

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Date submitted: 06 Dec 2004 Electronic form version 1.4