

Abstract Submitted
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Quantum dynamics of a d-wave YBCO Josephson junction FLORIANA LOMBARDI, Chalmers University of Technology, THILO BAUCH, TOBIAS LINDSTRÖM, FRANCESCO TAFURI, GIACOMO ROTOLI, TORD CLAESON — We present direct observation of macroscopic quantum properties in an all high critical temperature superconductor d-wave Josephson junction. Although dissipation caused by low energy excitations is expected to strongly suppress macroscopic quantum effects we demonstrate macroscopic quantum tunneling [1] and energy level quantization [2] in our d-wave Josephson junction. We have investigated specific YBCO grain boundary Josephson junction's geometry, where tunneling in the node of the order parameter sensibly contributes to the transport properties. In such a case the Josephson current-phase relation is significantly modified and we have found that the fundamental state of the junction is doubly degenerate. The results indicate that the role of dissipation mechanisms in high temperature superconductors has to be revised, and may also have consequences for the class of solid state “quiet” quantum bit with superior coherence time. [1] T. Bauch *et al.*, *Phys. Rev. Lett.* **94**, 087003 (2005). [2] accepted for publication in Science

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