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Macroscopic quantum tunneling in high-T_c superconducting rings with intrinsic Josephson junction stacks X.Y. JIN, J. LISENFELD, Y. KOVAL, A.V. USTINOV, P. MÜLLER, Physikalisches Institut III, University of Erlangen — The properties of $Bi_2Sr_2CaCu_2O_{8+\delta}$ superconducting rings broken by intrinsic Josephson junction stacks were studied. The stack height was in between 4 and 50 junctions. SQUID behavior was observed in all devices. The modulation depth of critical currents increased with decreasing number of junctions in the stack, and conformed to the β_L values. Furthermore, switching current distributions were investigated as a function of magnetic field and temperature. Crossover temperatures were in the range of 300 to 600 mK. Whereas the small stacks behaved like series arrays of independent junctions, the larger stacks were uniform and showed anomalous enhancement of escape rates. An unconventional coherent retrapping was observed, i.e., the retrapping probability decayed exponentially with the trapped flux. Possible implications for the realization of high-T_c phase qubits are discussed.

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