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Properties of a High-T_c Intrinsic Phase Qubit X. Y. JIN, J. LISENFELD, Y. KOVAL, A. V. USTINOV, P. MÜLLER, Physics Department, Universität Erlangen-Nürnberg, Erwin-Rommel-Str. 1, D-91058, Erlangen, Germany — We discuss the properties of high-T_c intrinsic phase qubits. An intrinsic phase qubit is a superconducting ring made of a $Bi_2Sr_2CaCu_2O_{8+\delta}$ single crystal, intercepted by two intrinsic Josephson junction stacks. As a stack consists of many intrinsic Josephson junctions, an intrinsic phase qubit can be regarded as a multi-junction system, i.e. a system of many degrees of freedom in phase space. However, I-V characteristics and switching current distributions of our samples show that an intrinsic phase qubit behaves like a system with only two degrees of freedom, independent of the number of junctions in the stacks, as long as the two stacks are uniform. Due to the large self-inductance, the potential of an intrinsic phase qubit has several minima. In order to perform quantum operations from a single well, a technique using low-frequency microwaves is presented.

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