SFB/TRR 21 - Seminar
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Macroscopic quantum tunneling in $Bi_2Sr_2CaCu_2O_y$ intrinsic Josephson junctions

We investigated macroscopic quantum tunneling (MQT) of $Bi_2Sr_2CaCu_2O_y$ intrinsic Josephson junctions (IJJs) for two device structures. One is a small mesa, which is a few nanometers thick with only two or three IJJs, and the other is a stack of a few hundred IJJs in a narrow bridge structure. The experimental results regarding the switching current distribution for the first switch from the zero-voltage state were in good agreement with the conventional theory for a single Josephson junction, indicating that the crossover temperature from thermal activation to the MQT regime for the former device structure was similar to that for the latter device structure. Together with the observation of multiphoton transitions between quantized energy levels in the MQT regime, these results strongly suggest that the observed MQT behavior is intrinsic to a single IJJ in high-Tc cuprates and is independent of the device structure.

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