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Thouless energy in Josephson junctions with the barrier composed of strongly correlated materials near the Mott transition[1] A.N. TAHVILDAR-ZADEH, J.K. FREERICKS, Department of Physics, Georgetown University, B.K. NIKOLIĆ, Department of Physics and Astronomy, University of Delaware — The Thouless energy was originally introduced as the inverse of the electron dwell time (mod $\hbar$) in a finite-sized piece of diffusive conductor, where the dimensionless conductivity is determined by the ratio of the Thouless energy to the quantum energy level spacing of the wire. The Thouless energy is also useful in characterizing the proximity-effect coupling in Josephson junctions, consisting of two superconductors separated by a barrier layer of diffusive normal metal; the characteristic voltage across the junction I_cR_N is described by a universal function of the Thouless energy. In this talk, we present a generalized form of the Thouless energy for Josephson junctions made of a strongly correlated metal (insulator) as the barrier layer and use it to illustrate how the quasiclassical picture of transport breaks down as the strongly correlated barrier passes through the Mott metal-insulator transition.

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