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Thermal fluctuations and flux-tunable barrier in proximity Josephson junctions JIAN WEI, Peking University, P.R. China, PAUL CADDEN-ZIMANSKY, Columbia University, VENKAT CHANDRASEKHAR, Northwestern University, PAULI VIRTANEN, University of Wurzburg — The effect of thermal fluctuations in Josephson junctions is usually analysed using the Ambegaokar-Halperin (AH) theory in the context of thermal activation. We report measurements of micron-scale normal metal loops contacted with thin superconducting electrodes, where the unconventional loop geometry enables tuning of the junction barrier with applied flux. We observe stronger "enhanced" fluctuations when the flux threading the normal metal loop is near an odd half-integer flux quantum, and for devices with thinner superconducting electrodes. These findings suggest that the activation barrier, which is the Josephson coupling energy of the proximity junction, is different from that for conventional macroscopic Josephson junctions. Simple one dimensional quasiclassical theory is used to predict the interference effect due to the loop structure, but the exact magnitude of the coupling energy cannot be computed without taking into account the details of the sample dimensions. In this sense, the physics of nanoscale proximity junctions can be related to the thermally activated phase slips (TAPS) model for thin superconducting wires, and indeed our data can be better fitted with TAPS model than AH theory.

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