

Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Josephson critical current of long SNS junctions in the presence of a magnetic field HENDRIK MEIER, Department of Physics, Yale University, VLADIMIR I. FAL'KO, National Graphene Institute, University of Manchester, United Kingdom, LEONID I. GLAZMAN, Department of Physics, Yale University — We evaluate the Josephson critical current of a long and wide two-dimensional superconductor-normal metal-superconductor (SNS) junction, taking into account the effect of electron reflection off the side edges of the junction. Considering clean junctions, we find that the effect of edges alters the usual Fraunhofer-like dependence of the Josephson critical current I_c on the magnetic flux Φ . At relatively weak fields, $B\Phi_0/W^2$, the edge effect lifts zeros of the $I_c(\Phi)$ dependence and gradually shifts the maxima of that function by $\Phi_0/2$. (Here W is the width of the junction and Φ_0 the magnetic flux quantum.) At higher fields, $B\Phi_0/W^2$, the edge effect leads to an accelerated decay of the critical current $I_c(\Phi)$ with increasing Φ . Our results are robust with respect to the roughness of realistic boundaries. Finally, we discuss the role of mesoscopic fluctuations of $I_c(\Phi)$ originating from the scattering off the edges, and compare our findings to recent experiments.

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Date submitted: 06 Nov 2015

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