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Two-dimensional simulations of the superconducting proximity in superconductor-semiconductor junctions VICTOR CHUA, University of Illinois at Urbana-Champaign, MICHAEL VISSERS, The National Institute of Standards and Technology (NIST), STEPHANIE A. LAW, University of Delaware, SMITHA VISHVESHWARA, JAMES N. ECKSTEIN, University of Illinois at Urbana-Champaign — We simulate the consequences of the superconducting proximity effect on the DC current response of a semiconductor-superconductor proximity device within the quasiclassical formalism in the diffusively disordered limit. The device is modeled on in-situ fabricated NS junctions of superconducting Nb films on metallic doped InAs films, with electrical terminals placed in an N-S-N T-junction configuration. Due to the non-collinear configuration of this three terminal device, a theoretical model based on coupled two dimensional spectral and distributional Usadel equations was constructed and numerically solved using Finite-Elements methods. In the regime of high junction conductance, our numerical results demonstrate strong temperature and spatial dependencies of the proximity induced modifications to spectral and transport properties. Such characteristics deviate strongly from usual tunnel junction behavior and aspects of this have been observed in prior experiments[arXiv:1402.6055].

Victor Chua
University of Illinois at Urbana-Champaign

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