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Critical Current Statistics of a Graphene-Based Josephson Junction Infrared Single Photon Detector EVAN D WALSH, Massachusetts Institute of Technology, Raytheon BBN Technologies, Harvard University, GIL-HO LEE, Harvard University, DMITRI K EFETOV, MIKKEL HEUCK, Massachusetts Institute of Technology, JESSE CROSSNO, Harvard University, TAKASHI TANIGUCHI, KENJI WATANABE, National Institute for Materials Science, Japan, THOMAS A OHKI, Raytheon BBN Technologies, PHILIP KIM, Harvard University, DIRK ENGLUND, Massachusetts Institute of Technology, KIN CHUNG FONG, Raytheon BBN Technologies — Graphene is a promising material for single photon detection due to its broadband absorption and exceptionally low specific heat. We present a photon detector using a graphene sheet as the weak link in a Josephson junction (JJ) to form a threshold detector for single infrared photons. Calculations show that such a device could experience temperature changes of a few hundred percent leading to sub-Hz dark count rates and internal efficiencies approaching unity. We have fabricated the graphene-based JJ (gJJ) detector and measure switching events that are consistent with single photon detection under illumination by an attenuated laser. We study the physical mechanism for these events through the critical current behavior of the gJJ as a function of incident photon flux.

Evan D Walsh
Massachusetts Institute of Technology, Raytheon BBN Technologies, Harvard University

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