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Measurements of Electrical Noise at the Interface between Bi2Se3 and a Superconductor J.S. LEE, D.M. ZHANG, A.R. RICHARDELLA, NITIN SAMARTH, Physics Dept., Penn State University, University Park PA 16802 — The narrow band gap semiconductor Bi_2Se_3 is a promising candidate for exploring exotic quantum states that might arise at the interface between topological insulators and superconductors (Phys. Rev. Lett. **100**, 096407 (2008)). Motivated by proposed approaches for detecting such states (Phys. Rev. B **79**, R161408 (2009)), we have embarked on measurements of electrical noise in mesoscopic Bi_2Se_3 devices with superconducting electrodes. Present measurements focus on CVD-grown Bi_2Se_3 nanoribbons which show proximity-induced superconductivity below ~ 5 K when contacted by (dirty) W electrodes. The measurements are carried out using a balanced bridge technique over a temperature range of $0.5\text{K} \leq \text{T} \leq 40$ K and in magnetic fields up to 80 kOe. We observe 1/f noise over a wide range of temperature and discuss the variation in noise spectral density across the normal-superconductor transition as well as its dependence upon excitation current and magnetic field. We will also describe extensions of these studies to mesoscopic devices lithographically patterned from thin films of Bi_2Se_3 grown by molecular beam epitaxy. Supported by NSF and ONR.

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