Comparing Cr-Doped $(Bi_xSb_{1-x})_2Te_3$ to Graphene as a Future Platform for Quantum Hall Resistance Standards

Albert F. Rigosi
Linsey K. Rodenbach, Alireza R. Panna, Shamith U. Payagala, Ilan T. Rosen, Joseph A. Hagmann, Peng Zhang, Lixuan Tai, Kang L. Wang, Dean G. Jarrett, Randolph E. Elmquist, Jason M. Underwood, David B. Newell, and David Goldhaber-Gordon
National Institute of Standards and Technology (NIST), Gaithersburg, MD 20899, United States
afr@nist.gov

Since 2017, epitaxial graphene has been the base material for the US national standard for resistance. A future avenue of research within electrical metrology is to remove the need for strong magnetic fields, as is currently the case for devices exhibiting the quantum Hall effect. New materials, like magnetically doped topological insulators (MTIs), offer access to the quantum anomalous Hall effect, which in its ideal form, could become a future resistance standard needing only a small permanent magnet to activate a quantized resistance value [1-3]. Furthermore, these devices could operate at zero-field for measurements, making the dissemination of the ohm more economical and portable. Here we present results on precision measurements of the h/e^2 quantized plateau of Cr-Doped $(Bi_xSb_{1-x})_2Te_3$ and give them context by comparing them to modern graphene-based resistance standards. Ultimately, MTI-based devices could be combined in a single system with magnetic-field-averse Josephson voltage standards to obtain an alternative quantum current standard.

This material is based upon work supported by the Department of Energy, Office of Science, Basic Energy Sciences, Materials Sciences and Engineering Division, under Contract DE-AC02-76SF00515.

References

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Figures

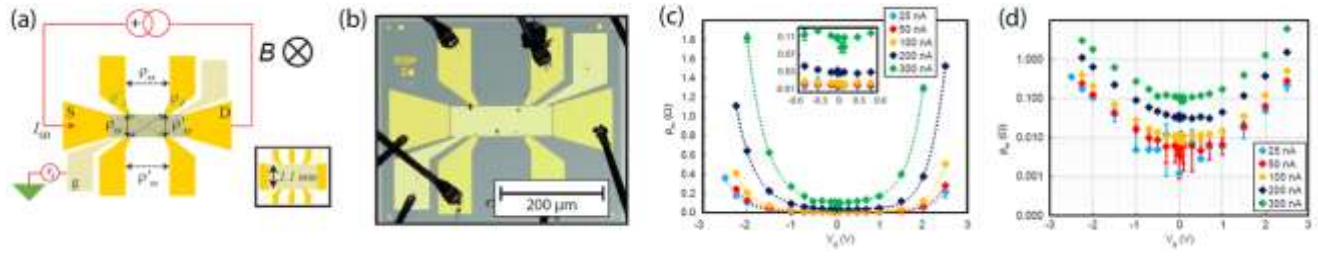

Figure 1: Fabrication of a MTI-based device and a basic top gate characterization of the longitudinal resistance.