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Weak antilocalisation in topological insulators XINTAO BI, ICQD, The University of Science and Technology of China, EWELINA HANKIEWICZ, Institute for Theoretical Physics and Astrophysics, University of Würzburg, DIMITRIE CULCER, School of Physics, The University of New South Wales, Sydney
— Topological insulators (TI) have changed our understanding of insulating behaviour. They are insulators in the bulk but conducting along their surfaces due to spin-orbit interaction. Much of the recent research focuses on overcoming the *transport bottleneck*, the fact that surface state transport is overwhelmed by bulk transport stemming from unintentional doping. The key to overcoming this bottleneck is identifying unambiguous signatures of surface state transport. This talk will discuss one such signature, which is manifest in the coherent backscattering of electrons. Due to strong spin-orbit coupling in TI one expects to observe weak antilocalisation rather than weak localisation, meaning that coherent backscattering increases the electrical conductivity. The features of this effect, however, are rather subtle, because in TI the impurities have strong spin-orbit coupling as well. I will show that spin-orbit coupled impurities introduce an additional time scale, which is expected to be shorter than the dephasing time, and the resulting conductivity has a *logarithmic dependence* on the carrier density, a behaviour hitherto unknown in 2D electron systems. The result we predict is observable experimentally and would provide a smoking gun test of surface transport.

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