**Matthew Holwill**

J. R. Wallbank[1], R. Krishna Kumar[1;2], M. Holwill[1;2], Z. Wang[2], G. H. Auton[1], J. Birkbeck[1;2], A. Mishchenko[1;2], L. A. Ponomarenko[3], K. Watanabe[4], T. Taniguchi[4], K.S. Novoselov[1;2], I. L. Aleiner[5], A. K. Geim[1;2], V. I. Fal'ko[1;2]

[1]National Graphene Institute, University of Manchester, Manchester, UK
[2]School of Physics, University of Manchester, Manchester, UK
[3]Department of Physics, Lancaster University, Lancaster, UK
[4]National Institute for Materials Science, Tsukuba, Japan
[5]Physics Department, Columbia University, New York, USA

matt.holwill@manchester.ac.uk

# Excess resistivity in graphene superlattices caused by umklapp electron-electron scattering

Umklapp processes allow electrons to transfer momentum to the crystal lattice and, therefore, provide a finite electrical resistance in pure metals. Experimental observation of these mechanisms is challenging as they are easily obscured by other dissipation mechanisms. Our recent electron transport studies of graphene-hBN superlattices reveal that umklapp processes dominate the transport characteristics. As the twist angle is reduced, a giant excess resistivity increases degrading the intrinsic carrier mobility over a wide range of temperatures. Aside from fundamental interest, our results have direct implications for the design of possible electronic devices based on heterostructures featuring superlattices.