

Composite super-moiré lattices in double aligned graphene heterostructures

by Dr. Colin Woods

Date: 23 July 2019 (Tuesday)

Time: 2.30pm – 3.30pm

Venue: EA-06-05

Abstract

When two-dimensional atomic crystals are brought into close proximity to form a van der Waals heterostructure, neighbouring crystals can start influencing each other's electronic properties. Of particular interest is the situation when the periodicity of the two crystals closely match and a moiré pattern forms, which results in specific electron scattering, reconstruction of electronic and excitonic spectra, crystal reconstruction, and many other effects. Thus, formation of moiré patterns is a viable tool of controlling the electronic properties of 2D materials. At the same time, the difference in the interatomic distances for the two crystals combined, determines the range in which the electronic spectrum is reconstructed, and thus is a barrier to the low energy regime. Here we present a way which allows spectrum reconstruction at arbitrary energies. By using graphene which is aligned simultaneously to two hexagonal boron nitride layers, one can make electrons scatter in the differential moiré pattern, which can have arbitrarily large wavevector and, thus results in spectrum reconstruction at arbitrary low energies. We demonstrate that the strength of such a potential relies crucially on the atomic reconstruction of graphene within the differential moiré super-cell. Such structures offer further opportunity in tuning the electronic spectra of two-dimensional materials.

Speaker

Dr Colin Woods is a research associate with the University of Manchester's condensed matter physics group. Colin's research has focused on the electronic properties and unique inter-crystal interactions in van der Waals heterostructures based on two-dimensional materials. As well as learning the most advanced skills and techniques for modern experimental physics, Colin has taken on additional responsibility for teaching (under-graduate level) and formal equipment training. Underpinning his work-ethic is the belief that the most rewarding challenges are difficult because; *if they were easy, someone else would have done it*. Beyond professional life, Colin enjoys watching and playing sports, most notably football; although, he would like to return to his first sporting-passion, cricket.

ALL ARE WELCOME!

Host: Assoc Prof Chen Jingsheng