The Quantum Hall Effect and Electron Interactions in Graphene Monolayers

Yang, Justin

Quantum transport is a point of focus for researchers today because it plays a large role in determining the physical and chemical properties of materials. Studies on graphene have the potential to elucidate the mechanisms behind subjects such as the quantum Hall effect and the many body problem. We describe a computational analysis of the quantum Hall effect in graphene using techniques from solid state physics and quantum mechanics. A framework for computation was devised and implemented in Python 2.7. Open source modules, SciPy, and Tinyarray, were used in conjunction with Wolfram Mathematica to perform calculations, data reduction, and data visualization. The results were compared with data from literature and shown to exhibit a strong correlation with 85% accuracy. The results of this experiment can offer insight into the unique properties of graphene and the potential role of graphene in the semiconductor industry.

Awards Won: