Seminar/Talk

Mapping tunable bands in twisted double bilayer graphene in magnetic fields

Yulia Maximenko
National Institute of Standards and Technology (NIST)

Host: Hryhoriy Polshyn

Mapping tunable bands in twisted double bilayer graphene in magnetic fieldsFlat and narrow band physics in moiré materials has proven to be extremely rich with many-body quantum phenomena. Twisted 2D heterostructures host an abundance of quantum phases, such as non-trivial superconductivity, correlated insulator, anomalous quantum Hall effect, or charge density waves, which often compete with each other and are extremely sensitive to tunable parameters. Local probe measurements are key for disentangling the complicated parameter space while probing a well-characterized atomically pristine domain. Here, we chose to study small-angle twisted double bilayer graphene (TDBG): Its electrostatic tunability gives us extra control compared to magic-angle systems, while its narrow but not completely flat bands give us a practical experimental way to systematically study its low energy physics. We employ scanning tunneling spectroscopy in magnetic fields up to 15 T and analyze the system's magnetic field response to fully map the low-energy bands in varying electric fields. We demonstrate experimentally and theoretically the importance of band geometry and evaluate the Berry phase, quantum metric, and magnetic susceptibility contributions.Authors: Y. Maximenko1,2, M. R. Slot1,3, S. Kim1,2, D. T. Walkup1, E. Strelcov1, E. M. Shih1,3, D. Yildiz1,2, S. R. Blankenship1, K. Watanabe5, T. Taniguchi5, Y. Barlas6, P. Haney1, N. B. Zhitenev1, F. Ghahari7, and J. A. Stroscio1 1National Institute of Standards and Technology, MD2University of Maryland, MD 3Georgetown University, DC 5National Institute for Materials Science, Japan 6University of Nevada, Reno, NV 7George Mason University, VA

Monday, September 12, 2022 11:00am - 12:00pm
Heinzel Seminar Room/ Office Building West

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