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Topological valleytronics in bilayer graphene

Thursday 17 June 2021 17:00 (2 hours)

The valley isospin degrees of freedom in 2D hexagonal lattices offers a pathway to explore many-body ground states and novel paradigms of electronic applications. It is analogous to electron spin however coupling to an electric field offers a powerful control knob that is nimble and compatible with many device architectures. In this talk, I will describe how we create valley-momentum locked topological 1D channels in Bernal stacked bilayer graphene by electrically generating inverted band structures. This all-electric construction gives us the ability to realize reconfigurable ballistic waveguides and device operations that explicitly explore the valley-momentum locking of the 1D channels. I will show the working of a topological valley valve, which does not require valley-polarized current to operate but relies on the control of topology, and a continuously tunable electron beam splitter. Time permitting I will touch upon a few recent development in our lab where new physics emerges from exploring the valley isospin in the fractional quantum Hall effect.

Presenter: ZHU, Jun