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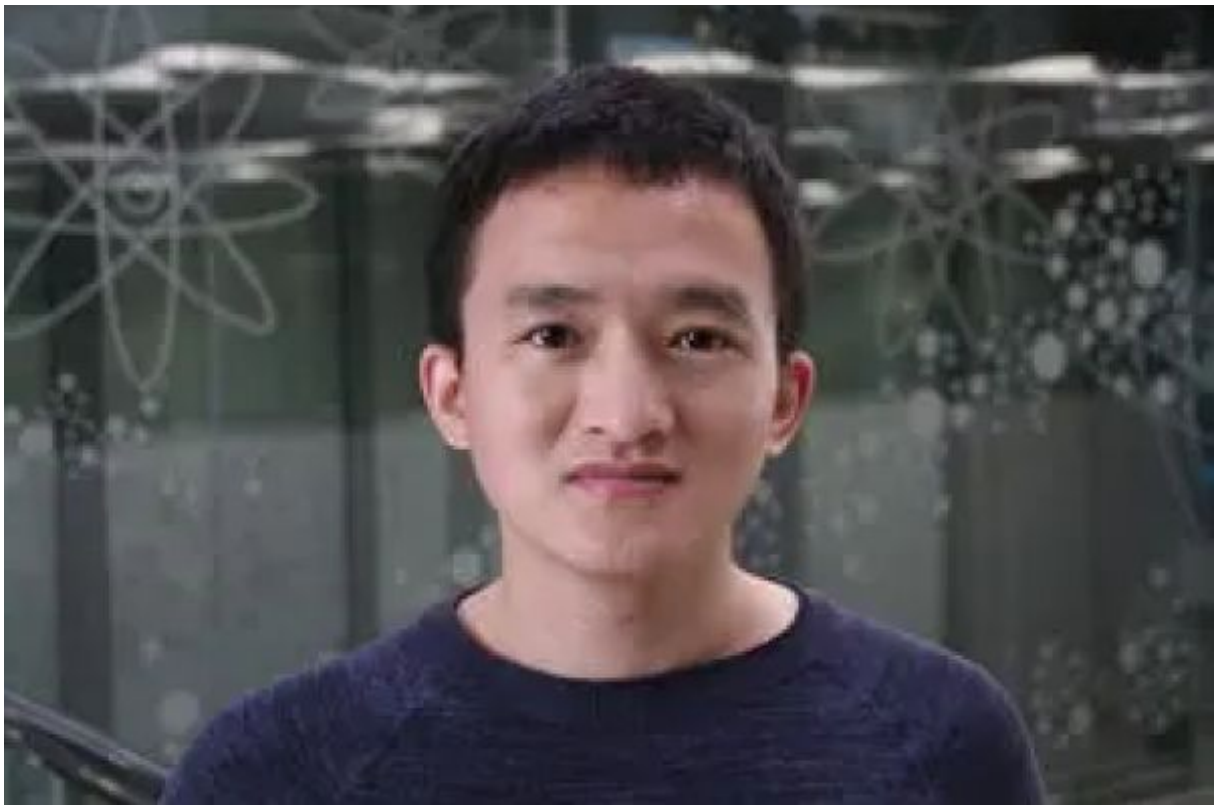

PhD THESIS DEFENSE: Fourier Transform Infrared Spectroscopy of Twisted Bilayer Graphene

GENG LI

April 11, 2025
10:00
ICFO Auditorium and Online (Teams)

The goal of this thesis is to probe the infrared optical response of twisted bilayer graphene (TBG) using Fourier transform infrared spectroscopy (FTIR). First, I used a commercial FTIR to measure the TBG in the mid-infrared range at room temperature. I improved the device fabrication technique and fabricated the TBG devices with a large area and simultaneously a low inhomogeneity. I observe that the TBG has abundant optical absorption features originating from the interband transitions that are uniquely determined by the twist angle. Then, I want to probe the interband transition of the TBG that lies in the terahertz range, which evolves the flat band of the TBG that hosts strongly correlated e?ects. I built a homemade FTIR that works in both the mid-infrared and terahertz range. I wired the cryostat carefully and achieved an electrical noise level approaching the Johnson noise limit. By

guiding the light from the FITR into the cryostat, I successfully measured the exciton states in the Bernal bilayer graphene device over a broad spectral range, demonstrating that the system is ready for future experimental study of TBG.

Friday April 11, 10:00 h. ICFO Auditorium and online via Teams
Thesis Director: Prof. Dr. Frank Koppens
Hosted by: Prof. Dr. Frank Koppens