

Congratulations to New ICFO PhD Graduate

Dr. Geng Li graduated with a thesis entitled "Fourier Transform Infrared Spectroscopy of Twisted Bilayer Graphene"

April 11, 2025

We congratulate Dr. Geng Li who defended his thesis this morning in ICFO's Auditorium. Dr. Li obtained his MSc of Science from the University of Buffalo, before joining the Quantum Nano-Optoelectronics research group led by ICREA professor at ICFO Dr. Frank Koppens. Hi thesis titled "Fourier Transform Infrared Spectroscopy of Twisted Bilayer Graphene" wa supervised by Prof. Dr. Frank Koppens

ABSTRACT:

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.

Thesis Committee:

Prof. Dr. Giacomo Scalari, Eidgenossische Technische Hochschule Züric

Prof. Dr. Niek van Hulst, ICF

Dr. Antoine Reserbat-Plantey, Centre de Recherche sur l'Hetero-Epitaxie et ses Applications