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# 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

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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. His thesis titled "Fourier Transform Infrared Spectroscopy of Twisted Bilayer Graphene" was 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 effects. 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 FTIR 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, Eidgenössische Technische Hochschule Zürich

Prof. Dr. Niek van Hulst, ICF

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