ICFO

INSIGHT SEMINAR: Twist-Angle-Controlled Anomalous Gating in Bilayer Graphene/BN Heterostructures

REBECA RIBEIRO

February 13, 2026
12:00 to 13:00
Elements Room

ABSTRACT:
Anomalous gating effects-such as gate ineffectiveness and pronounced hysteresis-have been observed in graphene-based systems encapsulated in boron nitride (BN) and linked to a possible ferroelectric state. However, their origin, stability, and reproducibility remain under debate. During this talk I'll present charge transport experiments in dual-gated, dynamically rotatable van der Waals heterostructures based on bilayer graphene encapsulated in BN. Remarkably, the angular degree of freedom acts as an ON/OFF switch for the anomalous gating response. We show that the angular alignment between the two BN layers is the key

parameter governing these effects. Both gate ineffectiveness and hysteresis are highly sensitive to small angular changes and they clearly change in behavior, which we classify into three distinct regimes.

BIO:

I'm an experimental condensed matter physicist and the latest member of the group Phynano. I obtained my bachelor degree from the University of Carabobo in Venezuela my master's degree at the Venezuelan Institute for Scientific Research (IVIC), where I was working in non-centrosymmetric superconductors at the low temperatures laboratory. After this I moved to France where I obtained my PhD in Physics from the Universite Paul Sabatier in Toulouse. During this time I worked at the French National High Magnetic Field Lab (LNCMI) in graphene nanoribbons under extreme conditions (high magnetic field and low temperature). My first postdoc was at the French National Metrology lab (LNE) where we demonstrated the exceptional experimental conditions at which graphene can be used as a quantum Hall resistance standard. After this I moved to the US where I worked as a MRSEC fellow at Columbia University. My work at Columbia was directed, among others, towards the in situ band structure manipulation of van der Waals heterostructures. In November 2017, I joined the group PHYNANO at C2N to investigate the generation and control of different topological orders in van der Waals heterostructures. To this aim our group combines innovative nanofabrication methods with electronic transport measurements techniques.

Hosted by: Prof. Dr. Carmen Rubio