IFMP Seminar

TECHNISCHE UNIVERSITÄT DRESDEN

IFMP Institut für Festkörper- & Materialphysik

Date: Tuesday, January 19, 2020, at 14:50
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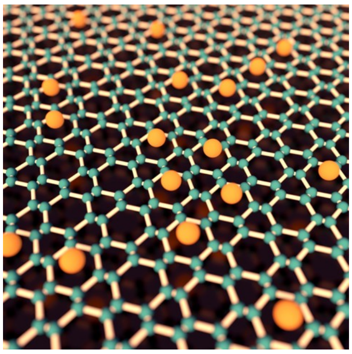
Speaker: **Christopher Gutiérrez**
UCLA

Title: **Surface engineering a novel density wave phase in monolayer graphene**

Abstract: Two-dimensional materials such as graphene offer a robust platform for investigating emergent behaviour due to the high tunability of their electronic properties. Recently, the ability to design electronic band structures through artificial moiré superlattices in twisted heterostructures has led to the discovery of several quantum phases, including superconductivity, correlated insulators, and density wave phases. However, such heterostructure devices require exquisite care in their assembly and have micrometre dimensions unsuitable for many spectroscopic probes. In this talk, I will describe a tunable method to induce a novel density wave phase in graphene that is phase-coherent over hundreds of micrometres. By depositing a dilute concentration of adatoms on its surface, we show that graphene can be driven towards a distinct, long-ranged C-C bond density wave phase. Using angle-resolved photoemission spectroscopy (ARPES) measurements, we directly probe the presence of this density wave phase and confirm the opening of an energy gap at the Dirac point. We further show that this Kekulé density wave phase occurs at various charge densities, with varying Fermi surface sizes and shapes, suggesting that this lattice instability is primarily driven by electron-phonon coupling and not electronic nesting. Our results demonstrate that superlattices of adsorbed atoms offer an attractive alternative route towards tailoring the properties of graphene and possibly other two-dimensional materials.



Host: T. Ritschel