



Wednesday, December 4th, 2019 – 10:00 a.m.
CFEL Seminar room IV (Bldg. 99)

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Valley Jahn-Teller effect in Twisted Bilayer Graphene

The surprising insulating and superconducting states of narrow-band graphene twisted bilayers have been mostly discussed so far in terms of strong electron correlation, with little or no attention to phonons and electron-phonon effects. We found that, among the 33492 phonons of a fully relaxed 1.08° twisted bilayer, there are few special, hard, and nearly dispersionless modes that resemble global vibrations of the moiré supercell ('moiré phonons'). One of them, doubly degenerate at Γ , couples very strongly with the valley degree of freedom, also doubly degenerate, realizing a so-called Exe Jahn-Teller (JT) coupling. The JT coupling lifts very efficiently all degeneracies which arise from the valley symmetry, and may lead, for an average atomic displacement as small as 0.5 mA, to an insulating state at charge neutrality. In addition, freezing the same phonon at a zone boundary point brings about insulating states at most integer occupancies of the four ultraflat electronic bands.

Host: Simone Latini, Angel Rubio

