Evidence of weakly dispersive band in twisted bilayer graphene from nano-ARPES

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Transport experiments in twisted bilayer graphene revealed multiple superconducting domes separated by correlated insulating states [1]. These properties are generally associated with strongly correlated states in a flat mini-band of the hexagonal moiré superlattice as it was predicted by band structure calculations [2].
Here, we combine different imaging techniques and angle resolved photoemission with simultaneous real and momentum space resolution (nano-ARPES) to directly map the band dispersion in twisted bilayer graphene devices near charge neutrality. Our experiments reveal large areas with homogeneous twist angle that support a flat band with spectral weight that is highly localized in momentum space [3]. The flat band is separated from the dispersive Dirac bands which show multiple moiré hybridization gaps. These data establish the salient features of the twisted bilayer graphene band structure that were thus far deduced from transport measurements and theory.

References

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Figures

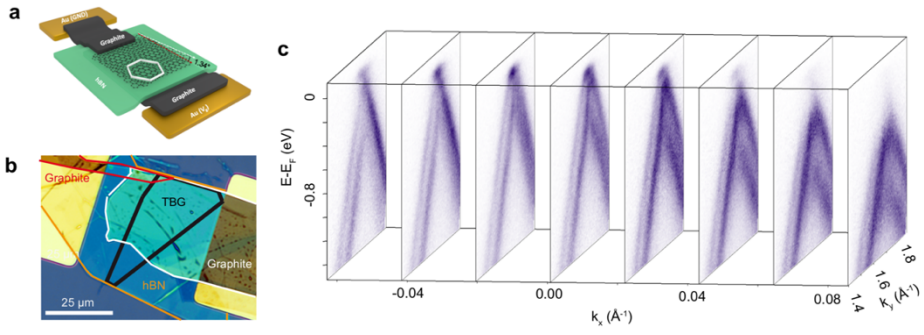

Figure 1: a) device schematic. b) Heterostructure optical micrograph. c) ARPES energy-momentum cuts for TBG.