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Effective theory of rotationally faulted multilayer graphene

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The crystal structure of graphene multilayers with an interlayer twist is characterized by Moiré patterns with various commensurabilities. Also the electronic structure of the material, which grows for instance epitaxially on SiC, is remarkably rich. In this talk an effective low-energy description of such multilayers will be discussed. In certain limits the theory reduces to a (single-layer) Dirac model with space-dependent potentials and mass term. The consequences of this theory will be explored and comparison with experiment will be made. The discussion of experimental consequences will focus on the Landau quantization in a magnetic field, where much experimental data is available. For instance, a spatially modulated splitting of the zeroth Landau level in the material has been observed through scanning tunneling spectroscopy [1]. That splitting finds a natural explanation in the space-dependent mass term of the presented theory [2]. Also a large low-field splitting of higher Landau levels recently observed in graphene multilayers [3] will be shown to follow from that theory. Finally, a theoretically expected [4] amplitude modulation of the Landau level wavefunctions on the top layer of the material will be discussed.

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