Topological Flat Bands in Super-moiré Lattices

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We show theoretically that a single monolayer of graphene can be made to support a topological flat band when sandwiched between two bulk boron nitride crystal substrates provided one substrate is twisted by a commensurate angle relative to the rest of the stack. This arrangement causes a commensurate super-moiré potential whose theoretical treatment we develop here. This configuration can be readily fabricated with existing experimental capabilities and is one of the simplest platforms to support topological flat bands. We demonstrate the flat band emerges from the second hole band and is robust to Hartree-Fock corrections, both properties in contrast to many other well-known flat band systems. We therefore anticipate that this will be a favorable playground for strongly correlated physics. The continuum model we employ is very general, and we show that similar topological flat bands also emerge in both graphene bilayers and trilayers when similarly sandwiched by boron nitride substrates.