THE UNIVERSITY
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at CHAPEL HILL

Analysis and PDE Seminar

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PH 328

Magic angles and high Chern number flat band of a twisted multilayer graphene model

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Abstract. In condensed matter physics, when two or more sheets of graphene are twisted by certain angles, a.k.a. magic angles, the resulting material becomes superconducting. The mathematics behind this is a blend of basic representation theory, Bloch-Floquet theory, Jacobi theta functions and holomorphic line bundles. In this talk, I will compare a chiral multilayer graphene (TMG) model with the chiral twisted bilayer graphene (TBG) model studied by Tarnopolsky–Kruchkov–Vishwanath and Becker–Embree–Wittsten–Zworski, and I will show that magic angles of TMG are the same as magic angles of TBG. I will also present a band separation result due to inter-layer tunneling by setting up a Grushin problem. Finally, I will present a construction of a holomorphic line bundle with Chern number $-n$. The high Chern number band has attracted significant attention in physics for its role in both integer and fractional quantum Hall effects.