Tata Institute of Fundamental Research
Survey No. 36/P, Gopanpally Village, Serilingampally, Ranga Reddy Dist., Hyderabad – 500 046

Seminar

Hyperbolic lattices: From Hofstadter Butterfly to Experimentally Realisable Cayley crystal decomposition

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Hyperbolic lattices, with their negative curvature, offer a unique platform for studying the interplay of geometry and non-commutative symmetries in electronic systems. We present a theoretical and experimental exploration of these lattices, starting with their characteristic Hofstadter butterfly spectrum in a magnetic field. To overcome the challenges of directly realising large hyperbolic structures, we decompose them into curved Euclidean lattices (exemplified by strained graphene), and simpler non-Abelian Z_2 lattices (Cayley crystals). We analyse topological states in curved graphene using Kitaev's real-space index. Additionally, we report recent findings of two distinct classes of states within Z_2 lattices: conventional Abelian states and non-Abelian states exhibiting a surprising Hall drift under an electric field. This unexpected behaviour suggests an effective internal magnetic field in the non-Abelian sector, opening exciting avenues for investigating novel physical phenomena.

Thursday, June 20th 2024

16:00 Hrs (Tea / Coffee 15:45 Hrs)

Seminar Hall, TIFR-H