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Forum de Physique Statistique @ ENS

Mercredi 27 Octobre 2021, 14 :00
LPENS, L367(onsite+zoom. For zoom meeting id, write to xiangyu.cao@phys.ens.fr)
Domaines : cond-mat.stat-mech

Titre : *Geometry, Light Response and Quantum Transport in Topological States*

Orateur : **Karyn Le Hur (CPHT-X)**

Résumé : *Topological states of matter are characterised by a gap in the bulk of the system referring to an insulator or a superconductor and topological edge modes as well which find various applications in transport and spintronics. The bulk-edge correspondence is associated to a topological number. The table of topological states include the quantum Hall effect and the quantum anomalous Hall effect, topological insulators and topological superconductors in various dimensions and lattice geometries. Here, we discuss classes of states which can be understood from mapping onto a spin-1/2 particle in the reciprocal space of wave-vectors. We develop a geometrical approach on the associated Poincare- Bloch sphere, developing smooth fields, which shows that the topology can be encoded from the poles only. We show applications for the light-matter coupling when coupling to circular polarisations and develop a relation with quantum transport and the quantum Hall conductivity. The formalism allows us to include interaction effects. We show our recent developments on a stochastic approach to englobe these interaction effects and discuss applications for the Mott transition of the Haldane and Kane-Mele models. Then, we develop a model of coupled spheres and show the possibility of fractional topological numbers as a result of interactions between spheres and entanglement allowing a superposition of two geometries, one encircling a topological charge and one revealing a Bell or EPR pair. Then, we show applications of the fractional topological numbers C=1/2 in bilayer honeycomb models describing topological semi-metals characterised by a quantised π Berry phase at one Dirac point.*