

**INVITADO:** Alexandre Dauphin (Université Libre de Bruxelles)

**TITULO:** Disorder and transport in the topological insulators

**LUGAR:** FACULTAD DE CIENCIAS FÍSICAS UCM

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**ABSTRACT**

The search for novel topological phase of matter has attracted much interest during the last decades. The quest for these fascinating quantum states, whose properties are guaranteed by topological invariants, finds its origin in the discovery of the quantum Hall effect. The latter takes place in two-dimensional electron gases subjected to very high magnetic fields. In quantum Hall systems, external magnetic fields break time-reversal symmetry and lead to quantized transverse conductivity, whose associated current is carried by chiral edge-states. More recently, time-reversal invariant topological insulators have been observed in quantum wells and are characterized by robust spin-transport.

In this talk, I will present several methods to calculate the Hall conductivity of a quantum Hall effect in 2D lattices. The first method is related to the topologically invariant Chern number of the system and I will emphasize the link between the quantized transverse conductivity and the edge states of the system. The second method is the Meir Wingreen formula. This really powerful formula is related to the green's functions formalism. I will show the coherence of both methods.

Finally, I will study the effect of the disorder on quantum Hall systems and emphasize the existence of a disorder induced quantized conductance (topological Anderson insulator).