Probing Topological Matter by «Heating»: From Quantized Circular Dichroism to Tensor Monopoles

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The intimate connection between topology and quantum physics has been widely explored in solid-state physics, revealing a plethora of remarkable physical phenomena over the years. Building on their universal nature, topological properties are currently studied in an even broader context, ranging from ultracold atomic gases to photonics, where distinct observables and probes offer a novel view on topological quantum matter.

In this talk, I will discuss how the geometry of quantum states can be revealed using an universal scheme based on excitation-rate measurements upon periodic driving [1,2,3]. When applied to Chern insulators or Landau levels, this approach leads to a quantized circular dichroism phenomenon [1,2], which can be interpreted as the dissipative counterpart of the quantum Hall effect. Besides, we will present protocols allowing for the experimental detection of the quantum metric tensor [3], which could be applied to detect new forms of monopoles in higher dimensions [4]. Finally, I will report on the first experimental observation of quantized circular dichroism in an ultracold Fermi gas [5].

References

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