ID de Contribution: **33**   Type: **Non spécifié**

From Středa's formula to Luttinger's theorem: Topological signatures unveiled through density probes

vendredi 9 février 2024 12:00 (30 minutes)

Identifying experimentally accessible probes that are able to reveal truly distinctive properties of topological phases of matter has remained as an ever-relevant mission. In this talk, I will start reviewing recent advances that were made possible thanks to a remarkable thermodynamic relation known as the Widom-Středa formula, which relates the quantized Hall conductivity of an insulator to its density response under an external probe magnetic field.

I will discuss how this response can be interpreted as a genuine local topological marker and briefly show how we adapted this well-known formula to explore the emergence of quantized valley Hall signals in strained honeycomb lattices [1]. Then, I will explain how this non-perturbative relation allowed us to derive a fundamental connection between the failure of Luttinger's theorem and the classification of correlated quantum Hall phases with winding numbers built from single-particle Green's functions [2].

[1] Maxime Jamotte, Lucila Peralta Gavensky, Cristiane Morais Smith, Marco Di Liberto, and Nathan Goldman, "Quantized valley Hall response from local bulk density variations,"Communications Physics 6, 264 (2023).

[2] Lucila Peralta Gavensky, Subir Sachdev, and Nathan Goldman, "Connecting the Many-Body Chern Number to Luttinger's Theorem through Středa's Formula,"Phys. Rev. Lett. 131, 236601 (2023)Phys. Rev. Lett. 131, 236601Phys. Rev. Lett. 131, 236601

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