

Séminaire P2M

Vendredi 13 mai 2022 à 11h, salle Patrick Alnot (4.014)

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The art of seeing electrons and playing with their spins

After the rise of graphene in 2010, the discovery of exotic topological phases has become the hinge of a revolutionary concept: The currents can be generated by using the electron spins. Such currents, the so-called spin-currents, offer innumerable advantages compared to the classical ones: They are protected against disorder and can be transported without backscattering of carriers. This minimizes the power that allows the electronic devices to work, enabling technology to operate at a considerably lower switching energy. In this context, investigating and manipulating the spins of the electrons constitutes a unique opportunity to stabilize exotic phases of quantum matter which are currently beyond reach and to understand the ones which are still significantly unexplored.

Photoemission, resolved in spin, is a gold standard technique to directly probe the electrons, their spins and to see how these couple to the orbital motions. Here, I will show how such a technique is able to detect magnetic excitations in a family of unconventional oxides, i.e. the delafossite oxides and how such excitations can be tuned. In addition, I will present how the same can be used to investigate the spin-driven properties of Kagomé systems, opening a potential pathway to exploit their electronic and magnetic properties for multifunctional applications. Finally I will show how to push this technique beyond the current state of the art and use it to measure the topological invariants, exemplified by the Berry phase.

In doing this, I will present my research, including background, teaching, and current projects and I will show you potential ideas which could be implemented and integrated in Nancy overlapping significantly with the activities of the groups at the Institute.