The Orbital Angular Momentum to shed light onto the Topology of Quantum Materials

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In this talk I will give an overview on the power of dichroic light to unveil properties and topology of quantum materials. The orbital angular momentum (OAM) of Bloch states is in fact the key quantity that encodes the information about the quantum-geometrical character in momentum space, such as the local (spin-)Berry curvature (BC, see Fig. 1). I will bring concrete examples from the realm of strongly spin-orbit coupled materials [1], topological insulators [2], Weyl semimetals [3], nodal line systems and Kagome metals [4].



Fig. 1. OAM and Berry curvature calculated on a small sphere around a Weyl node and the corresponding azimuthal equidistant projections [3].

[1] Ünzelmann et al, Phys. Rev. Lett. **124**, 176401 (2020)

[2] Bauernfeind et al, Nat. Commun. 12, 5396 (2021)

[3] Ünzelmann et al, Nat. Commun. 12, 3650 (2021)

[4] Di Sante et al, Nat. Phys. (2023) https://doi.org/10.1038/s41567-023-02053-z