

Magneto-optical insights into quantum materials

Ana Akrap

University of Fribourg, Switzerland

I will give a broad overview of our recent progress on Landau level spectroscopy of Dirac and Weyl semimetals. With infrared light, one can excite carriers from one Landau level into another, causing inter-Landau level transitions. This technique, known as Landau level spectroscopy, has been widely employed since the early 1950s as an extremely sensitive probe of semimetal and semiconductor band structures.

Through recent advances, one can resolve intricate complexities of topological materials' bands, all while discovering new physics. I will present highly detailed inter-Landau level transition maps in extreme magnetic fields, focusing on select topological materials: Dirac semimetals [1,2], a weak topological insulator ZrTe₅ [3,4], and a Weyl semimetal TaAs [5]. I will discuss how we can apply magneto-optical techniques to confirm or eliminate possible magnetic topological semiconductors [6].

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