

Montag, 11.12.2023 um 15:15 Uhr
R87, Wilhelm-Klemm-Str. 10

On the origin of circular dichroism in angle resolved photoemission from graphene, WSe₂, and other quantum materials



Dr. Lukasz Plucinski
Forschungszentrum Jülich

© Dr. Lukasz Plucinski

On the example of graphene, within the dipole approximation, we will discuss various contributions to circular dichroism in angle-resolved photoemission (CD-ARPES) [1,2] which include phase shifts of the participating partial waves in the atomic photoionization [3], the finite inelastic mean free path induced CD [4], the interatomic phase shifts [5], and the CD due to elastic scattering of an excited electron [6]. Using tabulated phase shifts and radial integrals [7] we predict photon energies at which CD signal might exhibit sign changes, and compare the prediction to experimental results. Subsequently, we perform similar analysis for WSe₂, a material where orbital characters are relatively well-defined, however, varying over BZ, with different contributions at K, K', and Gamma points.

Subsequently, we will proceed with the simple interatomic interference model that qualitatively explains asymmetric spin-polarized ARPES (SARPES) spin texture from WTe₂ single crystal surface.

If time allows, we will in addition discuss preliminary experimental CD-ARPES and SARPES results from PtTe₂.

The main objective of this study is to investigate how CD-ARPES and SARPES techniques can contribute to a better understanding of the topological properties exhibited by novel quantum materials.

- [1] L. Plucinski, arXiv:2309.02187 (2023)
- [2] Krueger et al. JESRP 258, 147219 (2022)
- [3] Dubs et al., Phys. Rev. B 32, 8389 (1985)
- [4] Moser, JESRP 214, 29 (2017)
- [5] T. Heider, et al., Phys. Rev. Lett. 130, 146401 (2023)
- [6] Daimon et al., Jpn. J. of Appl. Phys. 32, L1480 (1993)
- [7] S. Goldberg et al., JESRP 21, 285 (1981)