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On the origin of circular dichroism in ARPES spectra from graphene, WSe_2 , and other quantum materials

On the example of graphene, 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 [3], the interatomic phase shifts [4], and the CD due to elastic scattering of an excited electron [5]. Multiple scattering calculations are performed using the EDAC cluster code [6] and the KKR-based one-step model [7]. Subsequently, we perform similar analysis for WSe_2 , a material where orbital characters are relatively well-defined. Finally, a simple interatomic interference model that qualitatively explains asymmetric spin-polarized ARPES (spin-ARPES) spin texture from WTe_2 single crystal surface [4] is presented. This study aims to explore how CD-ARPES and spin-ARPES techniques can enhance the understanding of topological materials.

- [1] arXiv:2309.02187 (2023)
- [2] JESRP 258, 147219 (2022)
- [3] JESRP 214, 29 (2017)
- [4] PRL 130, 146401 (2023)
- [5] JJAP 32, L1480 (1993)
- [6] PRB 63, 75404 (2001)
- [7] PRB 83, 121408(R) (2011)

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