Poster-2-14

Quantum oscillations in focused ion beam prepared microstructures of ZrSiS

Portia Allen,[1] Carsten Putzke,[1] Leslie Schoop,[2] and Philip Moll[1]

[1] *MPI for the Structure and Dynamics of Matter*
[2] *Princeton University*

Nodal-line semimetals are a topological phase of matter whose unique physics has only begun to be explored. The intersection of adjacent two-dimensional electronic bands creates closed nodal loops in reciprocal space with various potential configurations, providing a rich playground to explore correlation effects and different topological phases. Bulk ZrSiS has already proven to be an excellent probe into nodal-line semimetal physics, as quantum oscillation measurements have allowed for complete Fermi surface mapping in good agreement with density-functional-theory calculations [1] and it has shown a topological quantum phase transition under pressure [2]. Focused ion beam microstructuring techniques unlock new experimental capabilities, as sample sizes can be of order with their electronic mean free path leading to novel quantum coherent orbits [3]. Microstructures of ZrSiS allow for the exploration of these finite size effects. Here we present a size dependent study of magneto-quantum oscillations in microstructured ZrSiS, with particular emphasis on low strain in the sample. The appearance of new oscillation frequencies requires interpretation beyond the conventional Lifshitz-Kosevich formalism.

[1] C. Müller et al. Phys. Rev. Res., 2, 023217 (2020).
[2] D. VanGennep et al. Phys. Rev. B, 99, 085204 (2019).
[3] P.J.W. Moll et al. Nature 535, 266-270 (2016).