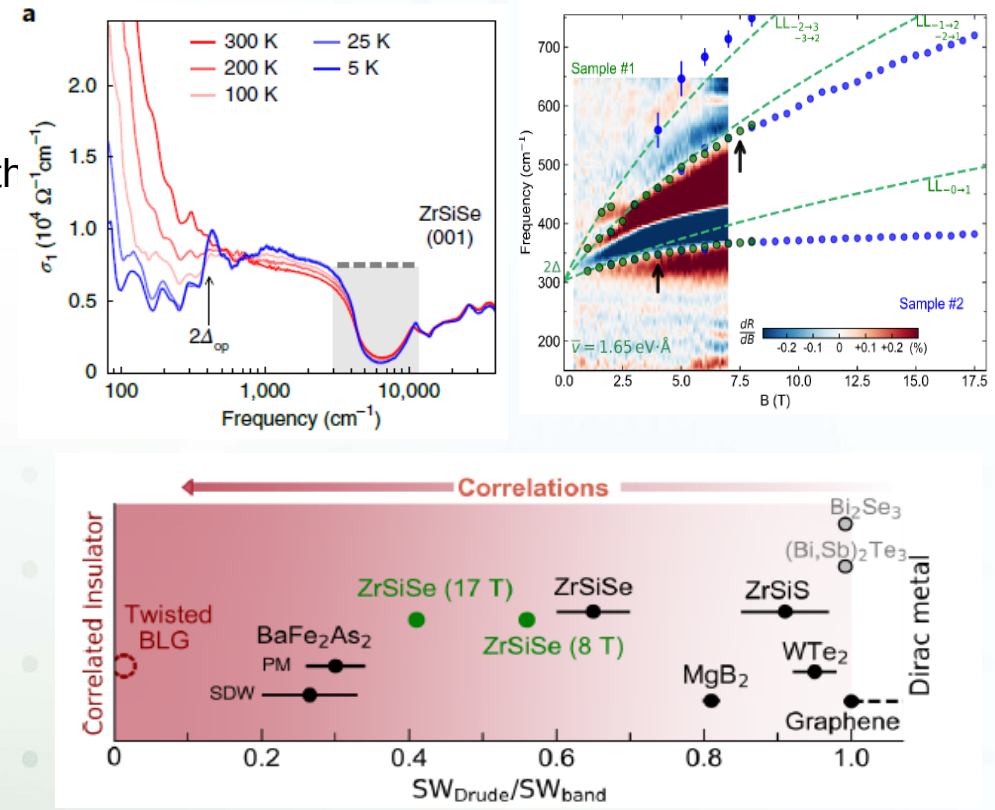
MIP: 2DCC at Penn State University, DMR-1539916

External User Project - 2020

Electronic correlations in nodal-line semimetals

Yinming Shao, Zhiyuan Sun and D. N. Basov (Univ. of Columbia, A. N. Rudenko and M. I. Katsnelson (Radboud University),...Yanglin Zhu and Zhiqiang Mao (2DCC)

Dirac fermions with highly-dispersive linear bands are usually considered weakly correlated, due to relatively large bandwidths (W) compared to Coulomb interactions (U). With the discovery of nodal-line semimetals, the notion of Dirac point has been extended to lines and loops in the momentum space. The anisotropy associated with nodal-line structure gives rise to greatly reduced kinetic energy along the line. However, experimental evidence for anticipated enhanced correlations in nodal-line semimetals is sparse. Through optical studies on the ZrSiSe single crystals provided by 2DCC, Basov's group at Univ. of Columbia find prominent correlation effects in nodal-line semimetals.
They observed spectroscopic hallmarks of electronic correlations: strong reduction of the Drude weight and the Fermi velocity.



Published in Nature Physics 2020

Also supported by: DOE-SC0019443; SC0019068; SC0019467; ARO W911nf-17-1-0543; EPIOS GBMF4533; JTCFLAG-ERA; DE-FG02-07ER46451; DMR-1644779