Contribution ID: **128** Type: **Invited Talk**

Spin splitting in the chiral magnet EuAuSb

EuAuSb is a layered Dirac semimetal which exhibits a variety of unusual transport phenomena, including chiral magnetic and topological Hall e?ects. The topological Hall e?ect in particular is seen only in the magnetically ordered phase, suggesting that symmetry breaking due to magnetic order may be important for understanding electronic behavior. We have therefore collected single-crystal neutron di?raction measurements and identified an incommensurate helical order in which ferromagnetic Eu2+ layers rotate in-plane by ~120° from one layer to the next [1]. An in-plane magnetic field distorts the incommensurate order, eventually leading to a first order transition to a commensurate state, followed by the field polarized state. In the field range where topological Hall e?ect is at a maximum, we observe a suppression of the in-plane ordered moment and consider possible explanations for this observation. The observed magnetic order also breaks both parity and time-reversal symmetries, leading to a loss of spin degeneracy in the band structure even in the absence of spin-orbit coupling. We compare this spin-splitting to that seen in the collinear altermagnets, as well as the more recently studied coplanar magnetic materials termed p-wave or odd-wave magnets.
[1] J. Sears, Juntao Yao, Zhixiang Hu, Wei Tian, Niraj Aryal, Weiguo Yin, A. M. Tsvelik, I. A. Zaliznyak, Qiang Li, and J. M. Tranquada, EuAuSb: A helical variation on altermagnetism, arXiv:2505.00081 (2025)
Work at Brookhaven is supported by the OWice of Basic Energy Sciences, Materials Sciences and Engineering Division, U.S. Department of Energy (DOE) under Contract No. DE-SC0012704

Topical Area

Hard matter: quantum, electronic, semiconducting materials

Author: SEARS, Jennifer (Brookhaven National Laboratory)

Presenter: SEARS, Jennifer (Brookhaven National Laboratory)