Prof. Dustin A. Gilbert

Materials Science and Engineering, University of Tennessee, Knoxville, TN

Friday, November 10, 2023, 11:00 am. Osborne A204

Neutron Scattering from Magnetic Swirls

Magnetic skyrmions are localized spin textures in-which the magnetic moments curl into a continuous, coplanar loop, bounded on its outside perimeter and core by moments in the out-of-plane direction. This very specific configuration provides a non-trivial topology and quasiparticle qualities, including skyrmion kinetics and dynamic modes. Hybrid skyrmions have shown the largest stability envelope, which includes room temperature and zero magnetic field, making them attractive for skyrmion spintronic devices. In the first part of this talk I will present the basic usage of small angle neutron scattering (SANS) in preparing an ordered lattice of hybrid skyrmions. Then, using grazing incidence SANS and neutron reflectometry, we elucidate the 3D structure of the skyrmions – which is important for both the topology and stability. In the third part, we use SANS as an *in-situ* probe of the gigahertz skyrmion dynamics and discover a spin wave fractal network generated by collective interference.

Short Bio

Dustin Gilbert is an Assistant Professor in the Materials Science and Engineering Department, at the University of Tennessee. He received his Ph.D. in Physics from the University of California in Davis in 2014 and was an NRC postdoctoral fellow at the NIST Center for Neutron Research before joining the faculty at the University of Tennessee in 2018. Prof. Gilbert conducts research on nanoscale systems with an emphasis on magnetic materials and spin phenomenon. This research has included magnetic skyrmions, hard drive materials, biomedical materials, magneto-ionic systems, and high entropy alloys and oxides, as well as fundamental research into proximity effects and hysteretic reversal processes. Recently, Dr. Gilbert was awarded a DOE Early Career award to investigate chiral magnetic structures, including specifically magnetic skyrmions, using neutron and X-ray scattering.