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Competing magnetic phases in Dirac nodal line semimetals LnSbTe

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The introduction of the topology concept has revolutionized modern solid-state research by offering new materials with such key functionality as the topological Hall effect and high charge carrier mobility useful in quantum computing.
LnSbTe (Ln –lanthanides) materials are one of the families extensively discussed as hosts of Dirac nodal lines, i.e., topological features in reciprocal space. These materials are an ideal platform for investigating the interplay between topological electronic structure, charge ordering instabilities, and localized magnetism stemming from Ln^{3+} ions. Despite a significant number of works on their electronic structure, little is known about their microscopic magnetism. The magnetic aspect is of interest due to the suggested but elusive antiferromagnetic skyrmion in Te-doped GdSbTe and the possible influence of magnetic order on the electronic structure. We performed neutron powder and single-crystal diffraction study of LnSbTe.
The most striking results are on LnSbTe (Ln = Ho, Tb, and Dy), where we observe the coexistence of several magnetically ordered phases below seemingly single transitions. Magnetic symmetry arguments hint at multi-k magnetic order in the case TbSbTe, which is a prerequisite for forming long-period magnetic textures with non-trivial magnetic topology. These results and their possible relation to the electronic structure will be presented in detail at the conference.

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