FLIPPER 2024
11 - 13 December Grenoble, France

Contribution ID: **39** Type: **Contributed talk**

A triangular lattice Ising model candidate

Thursday, 12 December 2024 09:30 (20 minutes)

Rare earth trihalides are gaining attention in the field of quantum matter for their potential to exhibit exotic ground states due to interacting magnetic moments with competing interactions or geometrical frustration. Compounds such as YbBr3 and ErBr3 exemplify this interest with their unique 2D honeycomb structures where magnetic anisotropy can be tuned by varying the rare-earth ion, enabling the study of 2D magnetism in various regimes including XY, Ising, and Heisenberg limits. These attributes make rare earth trihalides versatile systems for probing the fundamental physics of 2D magnetism.

In contrast, early rare earth halides with a 3D UCl3-type structure have a honeycomb-like topology in the ab-plane. We have investigated a cerium trihalide that display an antiferromagnetic ordering wave-vector of k=(1/3, 1/3, 1/2). Recent single crystal diffraction and spherical polarimetry studies have further elucidated the magnetic properties of this system. The cerium sublattice splits into two orbits, and we find the compound to be a triangular lattice Ising model candidate. These findings highlight the complex interplay between 1D and 2D magnetic behaviors in rare earth trihalides, enriching our understanding of magnetic anisotropies and order parameters in quantum materials.

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Session Classification: Frustrated magnetism

Track Classification: Frustrated magnetism