



Atomistic theory of topological spin textures in altermagnets

Research project

Magnetic skyrmions are localized, vortex-like spin textures characterized by a nontrivial integer topological charge Q . They play a central role in modern magnetism, attracting considerable interest for both fundamental studies and spintronic applications. So far, the main focus of the community has been on topological magnetic structures in ferromagnets (FM) or antiferromagnets (AFM). In this internship, we aim to extend this paradigm to skyrmions in newly discovered altermagnets (AM). Given that AM has been recognized as a major breakthrough in physics in 2024, investigating topological spin textures in AM is not only timely but also novel [PRL 133, 196701 (2024), PRL 134, 176401 (2025)].

During this internship, the student will use atomistic spin models to investigate magnetic skyrmions in AM. The project will focus on understanding how AM skyrmions are created, stabilized, and annihilated. Special attention will be given to their stability and lifetime, and to the fundamental differences between skyrmions in AM and those found in conventional FM and AFM systems. Through numerical simulations, the student will gain insight into the microscopic mechanisms governing topological spin textures and their potential applications in future spintronic devices.

Host group

The Toulouse Spintronics Theory Group at CNRS, led by Dr. Dongzhe Li, has extensive expertise in topological magnetism in reduced dimensions based on first-principles electronic structure theory and atomistic spin simulations (see our recent publications below). The student will be closely supervised throughout the internship and will benefit from the support of PhD students and postdoctoral researchers in the group, with regular discussions to develop the necessary theoretical and computational skills for the project. CNRS offers excellent computational (CPU and GPU) facilities.

Requirements

- Applicants should be enrolled in a Master 2 program in Physics, Nanoscience, Materials Science, or a closely related field.
- Familiarity with magnetism, quantum mechanics, and solid state physics.
- Programming skills (Fortran, Python) are not mandatory but will be considered an advantage.

Program duration

February 2027–July 2027 (6 months)

How to apply?

Please send a CV, a copy of the last two years' transcripts, and a cover letter to Dr. Li with the following title "CNRS M2 Internship".

Our recent publications

[arXiv:2509.09344](#); [arXiv:2606.31633](#); PRB **113**, 094420 (2026); PRB **113**, 104445 (2026); Nano Lett. **26**, 6307–6314 (2026); Nano Lett. **25**, 16703–16710 (2025); PRB (Letter) **109**, L220404 (2024); Nano Lett. **24**, 2496–2502 (2024);

Contact

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