Contribution ID: **33** Type: **Contributed Oral**

Exploring Topological Magnetic Excitations with Combined μSR, Muon Site Calculations and Simulation

Monday, 21 July 2025 09:40 (20 minutes)

An important theme in magnetism is the understanding of phenomena in reduced dimensions using topology. Examples include excitations such as walls, vortices, merons and skyrmions, which exist in the spin textures of a range of systems [1]. Here we discuss case studies from our recent work, emphasising the ways in which muon site calculations, material simulation and μSR data can be combined to provide insights into the underlying interactions, magnetic phases and dynamics in topological materials.

1) In the multilayer system $[Ta/CoFeB/MgO]_{16}/Ta$, micromagnetic simulation and low-energy μSR provide evidence for a change from Néel- to Bloch-like skyrmions with depth into the material [2].
2) In the bulk centrosymmetric skyrmion host Gd_2PdSi_3 [3] single-crystal data and site calculations imply a prominent role for anistotropy in stabilizing skyrmions, while in related $GdRu_2Si_2$ [4], zero-point fluctuations determine the muon site and measurements suggests RKKY interactions lead to a skymion phase.
3) Finally, recent work on the toplogical-excitation hosting $N_{1/3}NbS_2$ series provides evidence for phase separation and dynamic transitions, and shows the role of electronic structure in the series.

[1] T. Lancaster, Contemp. Phys. **60**, 246 (2019).
[2] T.J. Hicken et al., Phy. Rev. B **109**, 134423 (2024).
[3] M. Gomilsek et al., Phys. Rev. Lett. **134** 046702 (2025).
[4] B.M. Huddart et al., Phys. Rev. B **111**, 054440 (2025).

Email

tom.lancaster@durham.ac.uk

Funding Agency

EPSRC (UK)

Supervisors Name

N/A

Supervisors Email

N/A

Did you request an Invitation Letter for a Visitors Visa Application

No

Primary author: LANCASTER, Tom (Durham University)

Co-authors: Dr HUDDART, Benjamin (University of Oxford); Dr MAYOH, Daniel (Warwick University); PRATT, Francis (ISIS); BALAKRISHNAN, Geetha (University of Warwick); Dr GOMILŠEK, Matjaž (Jožef Stefan Institute & Faculty of Mathematics and Physics, University of Ljubljana); BENTLEY, Nathan (University of Durham); BLUNDELL, Stephen (University of Oxford); BREEZE, Theo (Durham University); HICKEN, Thomas (Paul Scherrer Institute); Dr SALMAN, Zaher (PSI); WILSON, Murray (Memorial University of Newfoundland)

Presenter: LANCASTER, Tom (Durham University)

Session Classification: Oral Contributions

Track Classification: Magnetism