Experimental report

17/01/2025

Proposal: 5-54-380 **Council:** 10/2022

Title: Magnetic correlations in the room-temperature skyrmion multilayers

Research area: Physics

This proposal is a resubmission of 5-54-379

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Experimental team: Victor UKLEEV
Florin RADU

Local contacts: Anton DEVISHVILI

Samples: |Ta 5|Pt 7|(Pt 1.0|Co40Fe40B20 0.8|Ru 1.4)x40|Pt3/Si

Instrument	Requested days	Allocated days	From	To
SUPERADAM He3 Spin Filter	4	4	30/10/2023	03/11/2023

Abstract:

Magnetic multilayers composed of alternating ferromagnetic / heavy-metal layers are one of the most technologically promising classes of skyrmion-hosting systems due to number of their advantages, such as skyrmion stability at room temperature and their tunability via layer engineering. Through the combination of broken inversion symmetry and spin-orbit-coupling at the interfaces, Dzyaloshinskii-Moriya interaction is induced that leads to stabilization of Néel-type skyrmions in finite magnetic fields. Here we propose to utilise the polarized neutron reflectometry method that is optimized for probing multilayered films and provides important layer-resolved information on magnetic structure of the MMLs. By using the parameters deduced from PNR modelling we will be able to refine the Hamiltonian parameters used for micromagnetic models. This information will allow the further improvement of both material and technological aspects of the samples, thus making further steps towards the real-life applications of room-temperature skyrmions or other non-collinear topological 3D textures in MMLs. We re-submit the proposal since the 3He cell was not provided in the previous cycle.

See published paper:

Ukleev, Victor, Fernando Ajejas, Anton Devishvili, Alexei Vorobiev, Nina-Juliane Steinke, Robert Cubitt, Chen Luo et al. "Observation by SANS and PNR of pure Néel-type domain wall profiles and skyrmion suppression below room temperature in magnetic [Pt/CoFeB/Ru] 10 multilayers." *Science and Technology of Advanced Materials* 25, no. 1 (2024): 2315015.