Contribution ID: **301** Contribution code: **P-THU-33** Type: **Poster**

Simulating muon spin depolarisation in a nanostructured magnetic material

Thursday, 1 September 2022 18:40 (20 minutes)

Artificial spin ices, which are composed of dipolar coupled arrays of elongated nanomagnets, host a broad range of physical phenomena usually the preserve of bulk condensed matter[1]. In particular, collective phase transitions between ordered and disordered states have been well documented in these nanomagnetic systems[2]. The complex phases observed in artificial spin ices occur as a consequence of dipolar interactions between neighbouring magnetic moments. In order to better control the collective behaviour of the spins one must tune the interactions between nanomagnets. Traditionally this has been achieved by either varying the lengthscales within the lattice or by altering the dimensions of the individual nanomagnets themselves. However, when one pushes to smaller dimensions direct imaging techniques can no longer be used to characterise the phase transitions due to limitations in resolution.

In recent years, low energy muon spin relaxation has been used to great effect in order to study the behaviour of artificial spin systems[3]. Here we present our recent work on modelling the muon spin depolarisation in nanostructured magnetic materials. We use Monte Carlo simulations to compute the static nanomagnet moment configurations, and from these configurations calculate the net stray field distribution at the muon site. Muons are then implanted and their spin evolution determined *via* solution of the Landau-Lifshitz precession equations. By performing a full spatial integration over the plane of the sample and the muon stopping profile, we are able to simulate experiment[4].

[1]. S. H. Skjærvœ et. al. Nat. Rev. Phys., 2019
[2]. O. Sendetskyi et. al. Phys. Rev. B, 2019
[3]. N. Leo et. al. Nat. Communs., 2018.
[4]. R. Stewart et. al. In Preparation, 2022

Primary author: STEWART, Rhea (ISIS Muon Group, STFC, UK)

Co-author: Dr DERLET, Peter (Condensed Matter Theory Group, Laboratory for Theoretical and Computational Physics, Paul Scherrer Institut, Switzerland & Laboratory for Mesoscopic Systems, Department of Materials, ETH Zurich, 8093 Zurich, Switzerland)

Presenter: STEWART, Rhea (ISIS Muon Group, STFC, UK)

Session Classification: Posters

Track Classification: Spin liquids and related phenomena