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Direct observation of magnetic monopole defects in an artificial spin-ice system SAM LADAK, DAN READ, GARRY PERKINS, WILL BRANFORD, LESLEY COHEN, Imperial College, FUNCTIONAL MAGNETISM GROUP TEAM — Frustration is the inability to satisfy the bonding requirements of all pairs in a system. Spin-ice materials have proven to be a model system to study frustration, and more recently they have been shown both theoretically and experimentally to be home to exotic excitations, whereby the atomic magnetic moments fractionalize into monopoles. Two-dimensional Kagome and square lattice systems have been shown to capture the physics of frustration and reproduce the ice-rules. In this study we have carried out magnetic force microscopy (MFM) at remanence in order to understand the magnetic reversal of an artificial kagome ice structure. We find that during the switching process ice-rule violating defects which carry magnetic charge are created and hop through the lattice with further increments to the magnetic field. These defects are the two-dimensional equivalent of magnetic monopoles in bulk spin-ice and hence are defined as monopole defects. The dynamics of the monopole defects through the artificial spin ice system will be discussed. High resolution MFM imaging at vertices and OOMMF simulations allow the micro-magnetic configuration of a monopole defect to be resolved.

Sam Ladak
Imperial College

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