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Theoretical and computational models of emergent magnetic monopoles and Dirac strings in kagome spin-ice REMO V. HUGLI, HANS-BENJAMIN BRAUN, GERARD DUFF, University College Dublin, CONDENSED MATTER THEORY, UCD TEAM, MAGNETIC NANOSTRUCTURES, PAUL SCHERRER INSTIUTE, SWITZERLAND TEAM — Magnetic monopoles and their associated Dirac strings have recently been experimentally observed as emergent quasiparticles in frustrated magnetic spin-ice systems. Detection of reciprocal signatures of monopoles were reported for 3D pyrochlore systems, and subsequently, direct real-space observations of monopoles and their associated Dirac strings were made in 2D artificial kagome lattices. In contrast to conventional domain growth, the magnetization process in these spin ice systems proceeds through nucleation and avalanche-type propagation of overturned dipoles - physical versions of a Dirac string. The 1D nature of these avalanches in a 2D system provides an example of dimensional reduction through frustration. We establish a theoretical model and perform Monte Carlo simulations which faithfully reproduce the observed hysteresis, string-avalanche statistics and monopole densities.

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