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Emergent magnetic monopoles and their dynamics in artificial spin ice[1] YICHEN SHEN, OLGA PETROVA, PAULA MELLADO, OLEG TCHERNYSHYOV — Electrically charged particles such as electrons are common in our world. In contrast, no elementary particles with a net *magnetic* charge have ever been observed. After a recent discovery that magnetic monopoles can emerge in a system of magnetic dipoles [1], much attention has been paid to the behavior of magnetic monopoles in artificial spin ice, arrays of nano-scale magnetic islands or wires that mimic the behavior of geometrically frustrated materials [2]. We have developed a theoretical model of magnetization dynamics in artificial spin ice under the action of an external magnetic field [3]. Magnetization reversal is mediated by the creation, propagation and absorption of domain walls carrying two units of magnetic. Domain walls are emitted from lattice junctions when the local field becomes large enough to overcome the Coulomb attraction between the magnetic charges of the domain wall and the junction. This interaction is also responsible for a positive feedback that triggers magnetic avalanches observed experimentally in artificial spin ice.

[1] C. Castelnovo, R. Moessner, and S. L. Sondhi, Nature **451**, 42 (2008).
[2] O. Tchernyshyov, Nat. Phys. **6**, 323 (2010).
[3] P. Mellado, O. Petrova, Y. Shen, and O. Tchernyshyov, Phys. Rev. Lett. **105**, 187206 (2010).

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