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Magnetization dynamics in artificial spin ice lattices[1] OLLE HEINONEN, SEBASTIAN GLIGA, Argonne National Laboratory — Artificial spin ice lattices (ASIL) consist of regular arrays of single-domain nanomagnets displaying ice rule ordering. Frustration is introduced through shape anisotropy. ASILs have been shown to exhibit complex behavior, with rich phase diagrams and quasi-static magnetization reversal. In particular, topological defects, such as Dirac monopoles and Dirac strings, play a fundamental role in the quasi-static behavior of ASILs. In this work, we use micromagnetic simulations to investigate the resonant frequencies of square lattice ASILs consisting of stadium-shaped nanomagnets. We calculate the evolution of the fundamental modes of a single element when elements are combined in four-stadia configurations and large lattices. In a cross-shaped four-stadium configuration for example, the Dirac monopole splits the frequencies of the lowest (near)-degenerate symmetric and antisymmetric edge modes of a single stadium. This splitting increases in a 24-stadium system with two monopoles. We also calculate the evolution of the spectral characteristics as the monopoles move farther apart in the lattice, but stay connected through a Dirac string. Our work suggests that these topological defects have distinct spectral signatures that can be detected experimentally.

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