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Ferromagnetic resonance modes of the vortex state in Permalloy dot arrays CHENGTAO YU, MARK ZIMMERMAN, MICHAEL PECHAN, Miami University, Oxford, OH 45056, JORDAN KATINE, LEISL FOLKS, MATTHEW CAREY, Hitachi Global Storage Technologies, San Jose, CA 95120
— Permalloy dot arrays (circular dot 1000nm in diameter and 40nm thick, arranged in square lattice at 1100 nm period) have been fabricated with e-beam lithography. Spin dynamics of the magnetic dots were measured via ferromagnetic resonance on a microstrip in the frequency range 5-36 GHz with the field applied in the film plane. A single mode is present at high microwave frequency, where resonance occurs well above the saturation field of the dots. With decreasing frequency, however, an additional mode appears on the high field side of the main mode, which may result from edge domains as indicated by micromagnetic simulation. At frequencies below 15 GHz, additional modes are observed at fields lower than the two above modes when sweeping up in field, but not when sweeping down in field. These additional modes are attributed to the influence of a vortex structure (the equilibrium state of the dot at zero field). This is inferred from simulation, wherein the vortex state persists up to 750 Oe when increasing field from zero and does not reappear with decreasing field until 100 Oe.

Michael Pechan
Miami University, Oxford OH 45056

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