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In-plane spin wave modes in permalloy antidot arrays observation and analysis CHENGTAO YU, MICHAEL PECHAN, Miami University, Oxford OH 45056, GARY MANKEY, Unversity of Alabama, Tuscaloosa AL 35487 — Previously, we have reported demagnetization field induced localized modes[1] in-plane at 35 GHz ferromagnetic resonance, and dipolar-exchange governed lateral standing spin waves out-of-plane at 9.7 GHz in permalloy antidots. Here we present in-plane investigations at 9.7 GHz on various hole arrays (hole diameter 1.5μm; hole lattice 3μm x 3, 4, 5, and 7μm). In addition to the two main localized modes, which arise from regions confined by holes along the long axis and short axis (region A and B, respectively), spin wave manifolds pertinent to each peak are identified. Owing to the confinement imposed by the holes as well as the demagnetization field, region A and B exhibit distinct resonance geometry. For instance, for field along short axis, region A and B are in Damon-Esbach and magnetostatic backward volume mode geometry respectively, with the spin wave vectors determined by hole separations along long and short axis. This is reversed with field along long axis. The dispersion of the observed spin waves is analyzed accordingly. Supported by US DOE FG02-86ER45281 (MU) and NSF DMR-0213985 (UA). [1]Chengtao Yu, Michael J. Pechan, G. J. Mankey, Appl. Phys. Lett. **83,** 3948 (2003).

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