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Honeycomb artificial spin ice at low temperatures[1] KATHARINA ZEISSLER, MEGHA CHADHA, LESLEY COHEN, WILL BRANFORD, Imperial College London — Artificial spin ice is a macroscopic playground for magnetically frustrated systems. It consists of a geometrically ordered but magnetically frustrated arrangement of ferromagnetic macros spins, e.g. an arrangement of single domain ferromagnetic nanowires on a honeycomb lattice. Permalloy and cobalt which have critical temperature scales far above 290 K, are commonly used in the construction of such systems. Previous measurements have shown unusual features in the magnetotransport signature of cobalt honeycomb artificial spin ice at temperatures below 50 K which are due to changes in the artificial spin ice's magnetic reversal. In that case, the artificial spin ice bars were 1 micron long, 100 nm wide and 20 nm thick. Here we explore the low temperature magnetic behavior of honeycomb artificial spin ice structures with a variety of bar dimensions, indirectly via electrical transport, as well as, directly using low temperature magnetic imaging techniques. We discuss the extent to which this change in the magnetic reversal at low temperatures is generic to the honeycomb artificial spin ice geometry and whether the bar dimensions have an influence on its onset temperature.

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