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Systematic Angular Study of Magnetoresistance in Permalloy Connected Kagome Artificial Spin Ice JUNGSIK PARK, BRIAN LE, Univ of Illinois - Urbana, JUSTIN WATTS, CHRIS LEIGHTON, University of Minnesota, NITIN SAMARTH, Pennsylvania State University, PETER SCHIFFER, Univ of Illinois - Urbana — Artificial spin ices are nanostructured two-dimensional arrays of ferromagnetic elements, where frustrated interactions lead to unusual collective magnetic behavior. Here we report a room-temperature magnetoresistance study of connected permalloy ($Ni_{81}Fe_{19}$) kagome artificial spin ice networks, wherein the direction of the applied in-plane magnetic field is systematically varied. We measure both the longitudinal and transverse magnetoresistance in these structures, and we find certain transport geometries of the network show strong angular sensitivity – even small variations in the applied field angle lead to dramatic changes of the magnetoresistance response. We also investigate the magnetization reversal of the networks using magnetic force microscopy (MFM), demonstrating avalanche behavior in the magnetization reversal. The magnetoresistance features are analyzed using an anisotropic magnetoresistance (AMR) model. Supported by the US Department of Energy. Work at the University of Minnesota was supported by Seagate Technology, NSF MRSEC, and a Marie Curie International Outgoing Fellowship within the 7th European Community Framework Programme.

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