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Micromagnetic Architectures for On-chip Microparticle Transport MINAE OUK, GEOFFREY S.D. BEACH, Massachusetts Inst of Tech-MIT — Superparamagnetic microbeads (SBs) are widely used to capture and manipulate biological entities in a fluid environment. Chip-based magnetic actuation provides a means to transport SBs in lab-on-a-chip devices. This is usually accomplished using the stray field from patterned magnetic microstructures [1], or domain walls in magnetic nanowires [2]. Magnetic anti-dot arrays are particularly attractive due to the high-gradient stray fields from their partial domain wall structures [3]. Here we use a self-assembly method to create magnetic anti-dot arrays in Co films, and describe the motion of SBs across the surface by a rotating field. We find a critical field-rotation frequency beyond which bead motion ceases and a critical threshold for both the in-plane and out-of-plane field components that must be exceeded for bead motion to occur. We show that these field thresholds are bead size dependent, and can thus be used to digitally separate magnetic beads in multi-bead populations. Hence these large-area structures can be used to combine long distance transport with novel functionalities. [1] B. Yellen, et al., Lab Chip, 7, 1681 (2007) [2] E. Rapoport and G. S. D. Beach, APL 100, 082401 (2012) [3] C C Wang, et al., Nanotechnology 17, 1629 (2006)

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