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Vortex Rectification in Thickness Modulated Films[1] YAOHUA LIU, DANIEL H. REICH, The Johns Hopkins University, CALEB D. BLISSETT, STUART B. FIELD, Colorado State University — Rectification effects of Abrikosov vortices have been addressed theoretically in both one-dimensional (1D) and two-dimensional (2D) asymmetric potentials. However, experimentally, vortex ratchets have typically been realized in 2D arrays of asymmetric micropatterned features in superconducting films. Here we report vortex rectification in a smooth, 1D modulation potential fabricated by a novel method. Low- pinning granular Al films were deposited on sinusoidal glass gratings by angle evaporation to achieve an asymmetrical thickness modulation with a period $\sim 2\mu m$. The varying thickness yields a 1D periodic pinning potential for the vortices, which is confirmed experimentally by observation of matching field effects in magneto-transport measurements. A rectified longitudinal DC voltage is generated when the sample is driven by a zero-biased AC current at $T < T_C$, which implies a unidirectional mean motion of the vortices. Weak frequency dependence up to 10 KHz signifies that the system is in the adiabatic regime. The maximum rectified voltage decreases as the applied field increases, but is detectable far above the first matching field. In some cases, a sign reversal in the DC voltage is observed, implying that the preferred direction for vortex motion can change.

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