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Simulations of geometrical vortex lattice pinning and melting in thin superconducting strips[1] ANDREAS GLATZ, Argonne National Laboratory, Argonne, Illinois, GIAN PAOLO PAPARI, Universita degli Studi di Napoli Federico II, Naples, Italy, FRANCESCO TAFURI, Seconda Universita di Napol, Naples, Italy, VALERII VINOKUR, Argonne National Laboratory, Argonne, Illinois — Recent findings that geometric restrictions may induce self-arresting hypervortices recovering the dissipation-free state at high fields and temperatures made superconducting strips an important topic of superconductivity studies. Here we report on the geometrical melting of the vortex lattice in a thin strip preceded by magnetoresistance (MR) oscillations fingerprinting the underlying regular vortex structure. We compare our numerical simulations of these systems to experimental measurements, allowing us to relate observed resistance oscillations to the penetration of vortex rows with intermediate geometrical pinning and uncover the details of geometrical melting. Our findings offer a reliable and reproducible pathway for controlling vortices in geometrically restricted nanodevices and introduce a novel technique of geometrical spectroscopy, inferring detailed information of the structure of the vortex system through a combined use of MR curves and large-scale simulations.

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