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Analysis of collective pinning and depinning of the flux line lattice in pristine 2H-$NbSe_2$ JONGHEE LEE, HUI WANG, MICHAEL DREYER, Department of Physics, University of Maryland, College Park, MD 20742, BARRY I. BARKER, Laboratory for Physical Sciences, National Security Agency, 8050 Greenmead Drive, College Park, MD 20740 — Larkin and Ovchinnikov predicted collective pinning of the flux line lattice (FLL) in type II superconductors several decades ago. The collective pinning results from the interplay between strong vortex-vortex interaction and randomly distributed weak pinning centers in a media. The evidence of collective pinning was previously observed at a magnetic field, H, close to H_{c2} in current-driven transport experiments on the macroscopic scale. But there still exists a lack of understanding of collective pinning on the microscopic level. In this talk, we show collective pinning and depinning of the FLL in pristine 2H-$NbSe_2$ in a long time series (15 days), measured by a low temperature scanning tunneling microscope. We observed the motion of the FLL within an area of 400 nm $\times$ 400 nm, with an initial magnetic field of 0.5 T. The motion was caused by the very slow decay of magnetic field ($\sim$ 5 nT/s) in a defective superconducting magnet. The average speed of FLL was $\sim$ 2.5 pm/s, lower than previously reported. Using highly time resolved data, we will further discuss the average direction of motion, the strength of pinning centers in pristine 2H-$NbSe_2$, flux line mass, and the difference between current-driven and field-driven FLL motions.

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