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Lattice slips in slow moving magnetic vortex lattices in $NbSe_2$[1]
MICHAEL DREYER, JONGHEE LEE, HUI WANG, University of Maryland, BARRY BARKER, LPS — We studied vortex matter in $NbSe_2$, a type II superconductor, at magnetic fields of 0.25 - 0.75 T and temperatures of 4.2 K. At these fields the vortices form an Abrikosov lattice. Due to a small residual resistance in our superconducting magnet the applied magnetic field slowly decayed, driving the vortex lattice. The velocity was low enough to allow acquiring highly resolved time series using a low temperature scanning tunneling microscopy (STM). From the images we where able to extract local variations in the lattice constant as well as time series of the average vortex position (path) and velocity. A more subtle observation where closed loops on the order of nanometer in diameter in the averaged path of the vortices. Although this was observed in more than one data series it was at first dismissed as an artifact. Later, similar loops where observed in simulations. The loops occurred when a lattice dislocation traveled through the vortex lattice. This observation, unexpected in the simulation, gave new credence to the previously observed loops in the data. Since the vortex lattice in $NbSe_2$ was in the Bragg glass phase we would expect locally ordered domains of several micrometer in diameter. It is conceivable that lattice slips occur at the domain boundaries and lead to the observed loops. The observation and simulation will be compared in detail. We would like to thank Eva Andrej and Helmut Berger for providing $NbSe_2$ samples.

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