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Observing real time motion of nano-scale objects[1] JORIS VAN DE VONDEL, MATIAS TIMMERMANS, KU Leuven, Belgium, TOMÁS SAMUELY, P. J. Šafárik University, BART RAES, Catalan Institute of Nanotechnology, LISE SERRIER-GARCIA, VICTOR MOSHCHALKOV, KU Leuven, Belgium — The dynamics of nanoscale objects is a very interesting field of research with a strong technological impact. Still, the combination of a technique resolving (sub)nanometer particles within a time frame relevant to observe dynamics is a very challenging task. Due to the inherent atomic-scale resolution, scanning tunneling microscopy (STM) is an ideal candidate to achieve this goal. Nevertheless, in most physical systems the dynamic events of the objects under investigation cannot be resolved by conventional STM image acquisition and will only reveal an average trace of the moving object. This is why a strong drive exists to develop new functionalities of STM, which allow studying dynamic events at the nanoscale. We address this issue, for vortex matter in $NbSe_2$, by driving the vortices using an ac magnetic field and probing the induced periodic tunnel current modulations [1]. Our results reveal different dynamical modes of the driven vortex lattice. In addition, by extending a known functionality of STM, (i.e. the 'Lazy Fisherman' technique) we can use single pixel information to obtain the overall dynamics of the vortex lattice with submillisecond time resolution and subnanometer spatial resolution. [1] M. Timmermans et al., ACS NANO, 8 (3), 2782 (2014)

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