Abstract Submitted
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Enhancement of long-range correlations in a 2D vortex lattice by an incommensurate 1D disorder potential[1] I. GUILLAMON, S. VIEIRA, H. SUDEROW, Universidad Autonoma de Madrid, Spain, R. CORDOBA, J. SESE, J.M. DE TERESA, R. IBARRA, Instituto de Nanociencia de Aragon, Spain — In two dimensional (2D) systems, theory has proposed that random disorder destroys long range correlations driving a transition to a glassy state. Here, I will discuss new insights into this issue obtained through the direct visualization of the critical behaviour of a 2D superconducting vortex lattice formed in a thin film with a smooth 1D thickness modulation [1]. Using scanning tunneling microscopy at 0.1K, we have tracked the modification in the 2D vortex arrangements induced by the 1D thickness modulation while increasing the vortex density by three orders of magnitude. Upon increasing the field, we observed a two-step order-disorder transition in the 2D vortex lattice mediated by the appearance of dislocations and disclinations and accompanied by an increase in the local vortex density fluctuations. Through a detailed analysis of correlation functions, we find that the transition is driven by the incommensurate 1D thickness modulation. We calculate the critical points and exponents and find that they are well above theoretical expectation for random disorder. Our results show that long range 1D correlations in random potentials enhance the stability range of the ordered phase in a 2D vortex lattice. [1] I. Guillamon et al., Nature Physics 10, 851856 (2014)

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