
Dynamic metastable vortex states in interacting vortex lines

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Résumé

The electron transport in current-biased superconducting nano-bridges is determined by the motion of the quantum vortex confined in the internal disorder landscape. Here we consider a simple case of a single or two neighbouring linear defects crossing a nano-bridge. The strong anharmonicity of the vortex motion along the defect leads, upon RF-excitation, to fractional Shapiro steps. In the case of two defects, the vortex motion becomes correlated, characterised by metastable states that can be locked to a RF-drive. The lock-unlock process causes sudden voltage jumps and drops in the voltage-current characteristics that can be observed in experiments. We analyse the parameters that promote these metastable dynamic states and discuss their possible experimental realisations.

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