RATCHET EFFECT IN NANOSTRUCTURED SUPERCONDUCTORS AND BIOLOGICAL MOTORS

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In type II superconductors the applied magnetic field threads inside the superconductor shaping a vortex lattice. This vortex lattice could move if it is driven by an appropriate external force, and therefore dissipation appears. In the case of superconducting films grown on arrays of asymmetric potentials an input ac current yields an output dc voltage [1, 2]. A rectified vortex flow occurs, which polarity could be tuned by the applied magnetic field and the input ac current strength. This superconducting ratchet system is a reversible rectifier. Ratchet effect is the directional motion of out-of -equilibrium particles induced by a periodic asymmetric potential, without the need of being driven by non-zero average forces or temperature gradients. Ratchet effect spans from Nature to laboratory, from biological molecular motors to fabricated nanodevices. For instance, from the RNA transcription mechanisms in the cell to vortex motion rectification nanodevices. In this talk we will present the fabrication and properties of this reversible rectifier and the comparison with different ratchet systems, mainly molecular motors based on the ratchet effect.

References:

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