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Engineered Nonlinear Excitations in Magnetic Nanostructures

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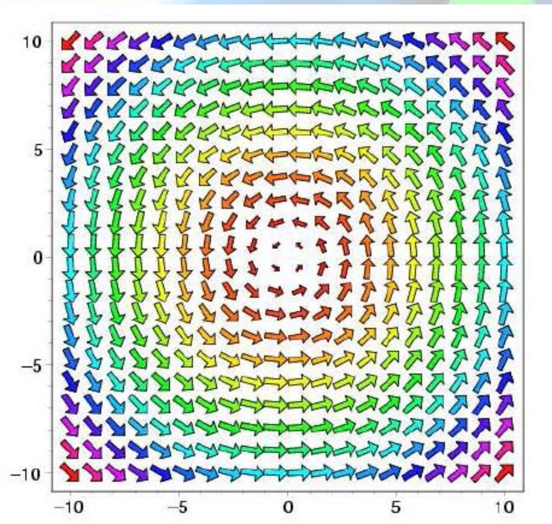

Abstract:
The active control of nonlinear dynamical systems — nonlinear excitations engineering — is a fastly developing area of condensed matter physics. Nonlinear photonic crystals — dielectric structures with periodic nonlinear susceptibility, ferromagnetic dots on top of a superconducting film, superstructures of well–controlled, laterally defined magnetic elements: so–called magnetic wires and dots (i.e. elements with one– and two–restricted dimensions, respectively) have acquired a significant place in physics as well as in technology. These structures are attracting increasing interest due to both fundamental and technological points of view. In these systems the topological excitations (domain walls and vortices) determine the static and dynamic properties.

The aim of this talk is to demonstrate that vortex dynamis in magnetic nanodots may be effectively controlled by applying alternative magnetic fields. Two main items are planned to discuss.

- Switching behaviour of vortex states in magnetic dots will be considered. Size-independent effects in vortex dynamics-the magnon spectrum in the presence of vortex, internal dynamics of vortices-will be discussed with a particular attention to the discreteness effects. Magnetization reversal effects and resonant phenomena for vortices interacting with ac and dc magnetic fields will be considered.
- The motion of non-planar vortices in a circular easy-plane magnet with a rotating in-plane magnetic field will be also discussed. It will be shown that the vortex tends to a circular limit-trajectory, with an orbit frequency which is lower than the driving field frequency and depends on the radius of magnetic nanodot.