Multivortex periodic structures in driven magnetic nanodot

Conference by professor **Yury Gaididei**, from Bogolyubov Institute ofor Theoretical Physics, Kiev, Ukraine

Premises: LENCOS Lecture Hall, Hotel Becquer, Sevilla

Date and time: Thursday, July 12, 2012 at 12:40.

Conference organized by the Group of Nonlinear Physics of the University of Sevilla

Abstract:

Multivortex periodic structures in driven magnetic nanodots are studied. Two types of driving are considered: space and time-varying magnetic fields and spin-polarized electric currents. An interaction of a magnetic vortex with a rotating magnetic field causes the nucleation of the vortex–antivortex pair. The key point of this process is a creation of a dip, which can be interpreted as a nonlinear resonance in the system of the certain magnon modes with nonlinear coupling. The usually observed single-dip structure is a particular case of a multidip structure. Dynamics of the structure with n dips is described as a dynamics of nonlinearly coupled modes with azimuthal numbers m = 0,+-n,+-2n.

Current induced vortex lattices are investigated in the frame of Slonczewski-Berger mechanism. The existence of a critical current jc which separates two regimes: (i) deformed immobile vortex state, (ii) vortex-antivortex periodic structures, is shown. When jc < j < J , where J is the saturation current, periodic vortex-antivortex structures appear. In the close vicinity of the saturation current J the square vortex-antivortex lattice appears. The lattice is stable for disturbances and rotates as a whole around the disk center. For currents close to jc the system of narrow current ranges exists were stable regular vortex-antivortex structures with symmetries C2, C3, C4 appears. The ring-type structures which are the circularly closed cross-tie domain walls are also observed in this regime.