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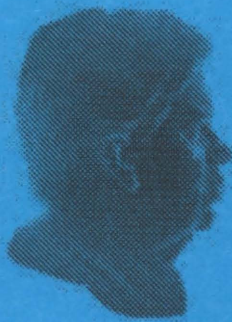

V Young Scientists Conference

Problems of Theoretical Physics

December 24-27, 2013
Kyiv, Ukraine

Program & Proceedings

Kyiv 2013

Magnetic vortex core reversal in Heisenberg magnets with surface anisotropy

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We consider a 3D Heisenberg magnet with Néel surface anisotropy (SA) in the ortex state. Under the action of the DC transversal magnetic field applied, the eavy vortex (polarized opposite to the field direction) becomes unstable and when ne field reaches some threshold amplitude, polarity reversal occurs.

In the present work we show that without SA the switching occurs symmetrically n z–direction via the planar vortex mechanism [1], while the SA breaks the symmetry which results in the Bloch point mediated switching scenario. In contrast to the witching in magnets with dipolar interaction, where the the polarity reversal is typ-ally mediated by one Bloch point [2], we show that the switching in magnets with A is accompanied by symmetrical nucleation of Bloch points. Using spin-lattice mulation [3] we show that the Bloch points nucleation scenario depends on the gn of the SA. For the easy-normal SA the effective anisotropy coefficent per lattice e on the face surfaces is smaller than the bulk one and Bloch points appear on the pposite ends of the sample's axis. For the easy-surface SA they born in the center f the sample's axis and run in the opposite directions.

The wired-core model is developed to describe the Bloch point-mediated switching ocess. It extends approach [4] for description of the vortex instability to the 3D se. One assumes that the vortex core in the each lattice plane is formed by the four nulatiously rotating spins and all other spins are fixed in the vortex state according the adjustment of the external field. In the 3D system spins of the core in the ch lattice plane are independent and polarity switching dynamics is reduced to the stem of coupled nonlinear oscillators. External field deforms shape of potentials d when the threshold value is reached, the process of the polarity reversal starts form of two waves spreaded in the opposite polarities. Wired-core model allows observe all main features of the full-scale simulations including characteristics of och points motion.

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Spin-lattice simulator SLaSi, http://slasi.rpd.univ.kiev.ua. Simulations are per-med on the Cluster of the University of Bayreuth, http://www.rz.uni-bayreuth.de.
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