

Nanoscale Physics

Quantum dynamics of a pair of interacting vertical Bloch lines in a domain wall of stripe domain in uniaxial ferromagnetic film

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The investigation of the vertical Bloch lines (VBLs) is an important issue of the physics of nanoscale ferromagnetic systems. These objects are the topological elements of domain wall (DW) internal structure in uniaxial ferromagnetic films. Moreover, VBLs appear not only in DWs in films, but also in nanosized ferromagnetic stripes and wires. Similar structures were found out in the ferroelectric materials as well. These examples show that the VBLs can be regarded as an integral part of the process of self – organization of the order parameter in nanoscale magnetic and electrical structures.

It is known that the VBL exhibit macroscopic quantum properties at low temperatures [1–4]. Given this, the quantum dynamics of a pair of interacting VBLs in a DW of stripe domain was investigated. It was established conditions of low temperature quantum oscillations of the VBLs, provided by the external magnetic field. It should be especially emphasized that given effect may be used for creating a new type data storage device bit + q–bit on the VBLs basis.

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