

## Nanoscale Physics

### Quantum dynamics of the nanoscale structural inhomogeneities of the domain wall in uniaxial ferromagnets

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Studies of structural inhomogeneities in domain walls (DWs) in uniaxial ferromagnets are an actual problem in the modern nanoscale physics. In materials with strong magnetic anisotropy among the elements of the inner structure of DW, localized stable nanosized formations – vertical Bloch Lines (VBLs) and Bloch Points (BPs) – are distinctive.

Physical properties of the VBL and BP determine the wide prospects of using these nanosystems as hardware components in the micro – and nanoelectronics. The further development of the VBL and BP application is related to the investigation of their quantum properties that occur at the low temperatures [1,2]. In this connection, the macroscopic quantum oscillations of the VBL and BP in the DW of magnetic bubble have been investigated. The conditions for the excitation of these oscillations are determined [3].

The quantum nature of DW bending of the VBL and BP is established. This result allows us to propose the system comprised of the ground and activated by magnetic field levels of the VBL (BP) oscillations spectrum as a basic q – bit for data recording. It means that the peculiarities of DW displacement determined by the VBL (BP) quantum oscillations may be considered as elements of logical algebra in the data storage devices.

1. *Shevchenko A.B.* Quantum tunneling of a Bloch line in the domain wall of a cylindrical magnetic domain // *Techn. Phys.*-2007.-**77**.-P. 128-130.
2. *Shevchenko A.B., Barabash M.Yu.* The Bloch point in uniaxial ferromagnets as a quantum mechanical object // *Nanoscale Research. Letters* -2014.-**9**, N 1.-P. 132 (5).
3. *Shevchenko A.B., Barabash M.Yu.* Quantum oscillations of the Bloch point in the domain wall of magnetic bubbles // *Low Temp. Phys.*-2016.-**42**, N 1.-P. 56-59.