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Ballistic Spin Field Effect Transistor Based on Silicon Nanowires[1] DMITRI OSINTSEV, VIKTOR SVERDLOV, ZLATAN STANOJEVIC, SIEGFRIED SELBERHERR, Institute for Microelectronics, TU Wien — We investigate the properties of ballistic spin field-effect transistors build on silicon nanowires. An accurate description of the conduction band based on the **k·p** model is necessary in thin and narrow silicon nanostructures. The subband effective mass and subband splitting dependence on the nanowire dimensions is analyzed and used in the transport calculations. The spin transistor is formed by sandwiching the nanowire between two ferromagnetic metallic contacts. Delta-function barriers at the interfaces between the contacts and the silicon channel are introduced. The major contribution to the electric field-dependent spin-orbit interaction in confined silicon systems is due to the interface-induced inversion asymmetry which is of the Dresselhaus type [1]. We study the current and conductance through the system for the contacts being in parallel and anti-parallel configurations. Differences between the [100] and [110] orientated structures are investigated in details.

[1] M.O. Nestoklon *et al., Phys.Rev.B* **77**, 155328 (2008); M. Prada *et al.*, cond-mat 0908.2417.

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Viktor Sverdlov
Institute for Microelectronics, TU Wien

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