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Optimal spin current pattern for fast domain wall propagation in nanowires¹ PENG YAN, Physics Department, The Hong Kong University of Science and Technology, Hong Kong, ZHOUSHOU SUN, JOHN SCHLIEMANN, Institute for Theoretical Physics, University of Regensburg, D-93040 Regensburg, Germany, XIANGRONG WANG, Physics Department, The Hong Kong University of Science and Technology, Hong Kong — One of the important issues in nanomagnetism is to lower the current needed for a technologically useful domain wall (DW) propagation speed. Based on the modified Landau-Lifshitz-Gilbert (LLG) equation with both Slonczewski spin-transfer torque and the field-like torque, we derive an optimal temporally and spatially varying spin current pattern for fast DW propagation along nanowires. Under such conditions, the DW velocity in biaxial wires can be enhanced as much as tens of times higher than that achieved in experiments so far. Moreover, the fast variation of spin polarization can efficiently help DW depinning. Possible experimental realizations are discussed.

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Peng Yan
Physics Department, The Hong Kong University of
Science and Technology, Hong Kong

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