

POZVÁNKA

na seminář oddělení 15 Fyzikálního ústavu AV ČR, v.v.i.

v pátek 8. ledna 2016 v 10:00

v zasedací místnosti budovy A v Cukrovarnické

Friday 8 Jan 2016 at 10:00 a.m.

in the meeting room, A building, Cukrovarnicka

Jakub Železný (FZÚ AV ČR)

Spintronics with antiferromagnets

Antiferromagnets are common in nature and just like ferromagnets possess a long-range magnetic order. Unlike ferromagnets though, they have found little practical applications so far, primarily due to their lack of total magnetization. However, development of spintronics opens up ways how they could be used. Magnetization is less important in the newest spintronic devices since electrical currents are instead used for detecting and manipulating the direction of magnetic moment. Antiferromagnets have some advantages over ferromagnets, in particular ultrafast magnetization dynamics and wide range of materials available. One of the key problems for application of antiferromagnets remains manipulation of the magnetic moments direction. Recently we have predicted that in some bulk antiferromagnets, electrical current can efficiently manipulate the magnetic moments [1]. Switching of an antiferromagnet using this method have recently been observed experimentally [2]. The effect is analogous to the spin-orbit torque in ferromagnets. Here, we present DFT calculations that explore antiferromagnetic CuMnAs and other I-Mn-V compounds as possible materials for spintronics applications. We analyze the symmetry necessary for existence of an efficient spin-orbit torque in antiferromagnets and calculate the spin-orbit torque in various antiferromagnets using a linear response theory. We show that CuMnAs and other antiferromagnets have the necessary symmetry and that the spin-orbit torque in antiferromagnets can have magnitude comparable to spin-orbit torque in ferromagnets.

[1] J. Železný et al., PRL 113 (15), 157201

[2] P. Wadley et al., arXiv:1503.03765