JOHANNES GUTENBERG-UNIVERSITÄT MAINZ D-55099 Mainz
Germany

SpinNet Announcement:

Minisymposium on Spintronics

Friday, 6th September 2013
Medien-Raum (Room 03-431)
Institute of Physics
Staudingerweg 7

Institute of Physics

Institute for Inorganic and Analytical Chemistry

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Date August 14, 2013

10:30 s.t. Prof. G. Bauer (Tohoku Univ.): Spintronics and spin caloritronics with magnetic insulators

Lunch Break

14:00 s.t. Prof. O. Tretiakov (Tohoku Univ.): Topologically Protected Domain-Wall Dynamics in Ferromagnets and Antiferromagnets

JOHANNES GUTENBERG UNIVERSITÄT MAINZ

Name: Prof. G. Bauer (Tohoku Univ.)
Title: Spintronics and spin caloritronics with magnetic insulators
Abstract:

Since the discovery that the magnetic order in insulators such as Yttrium Iron Garnets can be thermally and electrically actuated, these classical materials enjoy much recent attention. In this talk I will review recent developments on topics such as the spin Seebeck effect, spin Seebeck power generators, spin torque transistor, the spin Hall magnetoresistance etc. involving magnetic insulators from a theoretical point of view.

Name: Prof. O. Tretiakov (Tohoku Univ.)
Title: Topologically Protected Domain-Wall Dynamics in Ferromagnets and Antiferromagnets
Abstract:

Ferromagnets (FMs) and antiferromagnets (AFMs) can be used to store and manipulate spin information, and new developments have created opportunities to use them as active components in spintronic devices.

We study current-induced domain-wall (DW) dynamics in thin FM and AFM nanowires. We derive effective equations of motion describing the dynamics of the DW soft modes associated with topological defects.

Because the DWs are topological objects, these equations are rather universal and depend only on a few parameters. We obtain spin spiral DW structure in FM wires with Dzyaloshinskii-Moriya interaction (DMI) and critical current dependence on the DMI. We also find the most efficient way to move the DWs by resonant current pulses and propose a procedure to determine the DW dynamics by measuring the voltage induced by moving DW. Based on translationally non-invariant nanowires, we show how to make prospective magnetic memory nanodevices much more energy efficient. In AFMs, the dynamics is more complex because of the coupling between the staggered field and magnetization.

Nevertheless, using collective coordinate approach we are able to describe the AFM dynamics and show that it is equivalent to the motion of a massive particle subjected to friction and external forces. We find that in AFMs the currents induce DW motion by means of dissipative rather than reactive torques.