JOHANNES KEPLER
UNIVERSITÄT LINZ

PHYSIKKOLLOQUIUM
Fachbereich für Physik

Im Rahmen des Physikkolloquiums
spricht

Prof. Dr. Pawel Buczek

Hochschule für Angewandte Wissenschaften, Hamburg

Spin dynamics of complex metals beyond the Heisenberg model

Abstract:
Spin waves (or magnons) are low-lying collective excitations (quasiparticles) of the electronic spin structure in a crystal lattice and each of these excitations corresponds to a reduction in the total magnetization of the system by $2\mu_B$ which manifests itself as a deviation of the atomic moments from their equilibrium directions. Magnons are bosons, carry a fixed amount of energy and a lattice momentum, and cover a very wide frequency window from gigahertz to a few hundreds of terahertz. Hence, they contribute to many observed phenomena, e.g., magnetic ordering, ultrafast magnetization processes, electronic specific heat, electrical and thermal conductivity, current induced magnetization reversal, and electron spin dynamics. They are the basis of the proposed new generation, spintronic computers.

Also the spin excitations in magnets with reduced dimensionality, including wires and thin films, attract strong interest from the experimental, theoretical, and applied physics perspective. Impressive experimental progress, in particular the inelastic scanning tunneling microscopy and spin-polarized electron energy loss spectroscopy (SPEELS), allows probing directly their properties.

In this talk I will review our research of the spin dynamics in complex metallic magnets based on the time dependent density functional theory. Parameter free studies reveal a subtle interplay between the dimensionality of the magnet, exchange interactions, chirality of the excitations, disorder, and the damping of the spin-waves.

The last part of the talk will be devoted to the magnetic excitations in non-magnetic metals, so called paramagnets. I will outline how they can mediate effective interaction between electrons, believed to be the mechanism behind the high temperature superconductivity in the iron family of pnictides.

Datum: Mi, 03.10.2018 **Zeit: 15:30 Uhr** **Ort: HS 8**