



## Einladung zum Vortrag

# Novel magnonic phenomena for future applications in computing

von

**Jun.-Prof. Dr. habil. Andrii Chumak**

Technische Universität Kaiserslautern, Germany

**Termin: Mittwoch, 21.02.2018, 10:30 Uhr**

**Ort: Christian-Doppler-Hörsaal**

9. Boltzmannngasse 5 / Strudlhofgasse 4, 3. Stock

### Abstract:

With the fast growth in the volume of information being processed, researchers are charged with the primary task of finding new phenomena to process and transfer data fast and efficiently. Computing based on spin excitations – spin waves and their quantum magnons – is considered as an alternative route to present-day, electron-based CMOS technology. Magnon based computing bears the promise of high-speed, low-power information processing with dense packing [1].

In my talk, after an introduction into the field of magnonics, I will discuss novel physical phenomena in the field of magnonics and their application into processing of digital data. I will present two novel magnon-based devices. The first one is the magnon transistor [2] based on the utilization of nonlinear magnon-magnon interactions for the manipulation of one magnon current by another. This proof-of-concept, three-terminal device opens a way towards integrated magnonic circuits in which data is transferred and processed purely in the form of magnons. The second device is a magnon crossing structure needed to realize the wiring via magnon conduits between magnonic devices. I show, that this can be realized by introducing the principle of a directional coupler into the field of magnonics, as hitherto used in the field of integrated optics. I will present micromagnetic simulations of such a circuit [3].

[1] A.V. Chumak, V.I. Vasyuchka, A.A. Serga, and B. Hillebrands, Magnon Spintronics (Invited Review), Nature Phys. 11, 453 (2015).

[2] A.V. Chumak, A.A. Serga, and B. Hillebrands, Magnon transistor for all-magnon data processing, Nat. Commun. 5, 4700 (2014).

[3] Q. Wang, P. Pirro, R. Verba, A. Slavin, B. Hillebrands, and A. V. Chumak,

Reconfigurable nano-scale spin-wave directional coupler, Science Advances 4, e1701517 (2018).