



CRC/TRR 270

HoMMage



UNIVERSITÄT
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ESSEN

Offen im Denken

Hysteresis Design of Magnetic Materials for Efficient Energy Conversion

Tuesday, 03 December 2024, 9:00 s.t., UDE Campus Duisburg MG 272 + Zoom



Dr. Ursula Ebels
SPINTEC Laboratory,
Grenoble

Zoom information:
Meeting-ID: 225 349 6215
Kenncode: 0000

Leveraging non-linear dynamical properties of spintransfer torque oscillators for communication and unconventional computing applications

Abstract:

Spintorque nano-oscillators (STNO) are nanoscale magnetic tunnel junction devices (diameter 100nm), that combine different spintronics concepts to induce magnetization oscillations in the free layer of the devices and convert these oscillations into microwave or DC voltage signals. STNOs can thus act as DC-to-RF and RF-to-DC converters. In this talk I will first present the operational principle of the spintronics based oscillators, in particular their non-linear properties. Then I will present an overview on the different applications of these devices for signal treatment and wireless communication, such as fast spectrum analysis and phase modulation. In the third part I will present in detail our current studies, where the binarized phase state of synchronized STNOs is used to implement a network of coupled Ising spins, that can be exploited for novel, low power hardware solutions suitable for an associative memory or for solving optimisation problems.

About the speaker:

Dr Ursula Ebels performed her undergraduate studies at the RWTH Aachen and received her PhD in physics from the University of Cambridge, UK. After two postdoctoral stays at the Ohio State University, US and the IPCM Strasbourg, France, she joined in 2002 SPINTEC laboratory in Grenoble France. Today she is a senior CEA research scientist and Research Director at SPINTEC, heading the « Devices group » and leading the « microwave spintronics » team within the Devices group. Her research is focused on fundamental and applied aspects of the spintorque driven magnetization dynamics in magnetic tunnel junction. This research includes device realization, high-frequency experiments, non-linear dynamics, device modeling and CMOS co-integration. The applications target wireless communication systems as well as unconventional computing platforms. She has published over 130 peer-reviewed articles and coordinated collaborative projects (FP7, MSCA, ANR, CEA funded), supervised more than 20 postdocs and 15 PhD students.