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DK Seminar

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Vienna University of Technology,
Freihaus, green area, 4th floor, 101C

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Self-consistent modeling of magnetization dynamics and spin-polarized currents: A step towards a fully implicit spintronics framework

We propose a model for a self-consistent description of magnetization dynamics and spin-polarized currents. The nonlinear system of equations consists of the Landau-Lifshitz-Gilbert equation, an elliptic equation to model the spin accumulation in the stationary regime and an equation for the electric potential derived from Maxwell's equations. The presented model accounts for nonlocal spin-torque contributions due to spin diffusion and describes three-dimensional composite material structures in a self-consistent manner. Despite the overall nonlinearities, the system is discretized by a numerical method, which requires only to solve linear systems per time step. Preliminary numerical experiments provide a first validation of the model. The presented work is the result of a cooperation with Dirk Praetorius (ASC, TU Wien), Claas Abert, Dieter Suess (CD Laboratory, TU Wien), Gino Hrkac (Exeter).