SPIN TRANSFER TORQUE POINT CONTACTS AND NANOPILLARS

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I will start with a brief overview of the role of the spin transfer torque in existing commercial applications such as hard disk read heads, where it is an unwanted source of noise, and STT-MRAM which is in the final stages of development at multiple companies.
The main part of the presentation will focus on our work on spin-torque oscillations in point contacts. I will first discuss the fabrication and electrical characterization of these devices, paying particular attention to structures with optical access to the magnetic layers very close to the point contacts.
Electrical studies in collaboration with the Université Paris-Sud and the University of Sheffield have shown DC-current-induced vortex oscillations in the sub-GHz regime. In contrast to vortex oscillations in nanopillars where the vortex core is physically confined within the nanopillar boundaries, point contacts form an open geometry and the vortex core orbits outside the actual point contact.
Brillouin light scattering (BLS) experiments, performed in collaboration with the Technical University Kaiserslautern, show spin wave emission as well as 3 magnon processes when the point contacts are excited by an RF current. However, the requirement for optical access puts constraints on the design of the top contact, and the first generation of optical devices broke down before the onset of DC-current-induced oscillations. I will discuss improved devices designed to overcome this limitation.
Finally I will give a brief comparison between point contact and nanopillar devices, and make a few comments on spin torque effects and magnetization dynamics in magnetic semiconductors.