Magnetization dynamics from spin injection to ultrafast switching

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Magnetization dynamics can be viewed from two perspectives. Processes on atomic length scales govern the exchange of angular momentum between spins, the orbit and the lattice. The energy scale leads to femtosecond dynamics. As the speed of spin waves limits the propagation if information, only short length scales are relevant. On the other hand, the micro-magnetic view of magnetism treats the magnetization as a continuum of coupled spins. The picosecond time scales relevant for this regime leads to complex, non-uniform dynamics [1][2]. In this talk an overview over magnetization dynamics in nanostructures on the picosecond time scale will be presented. X-ray microscopy has proven to be the method of choice to image magneto-dynamics on the scale of 30nm and 100ps. Imaging switching dynamics in nanopillars will be presented as an example of time resolved x-ray microscopy using synchrotron sources. An outlook of what we can learn from improved spatial and temporal resolution using free electron laser sources will be given.

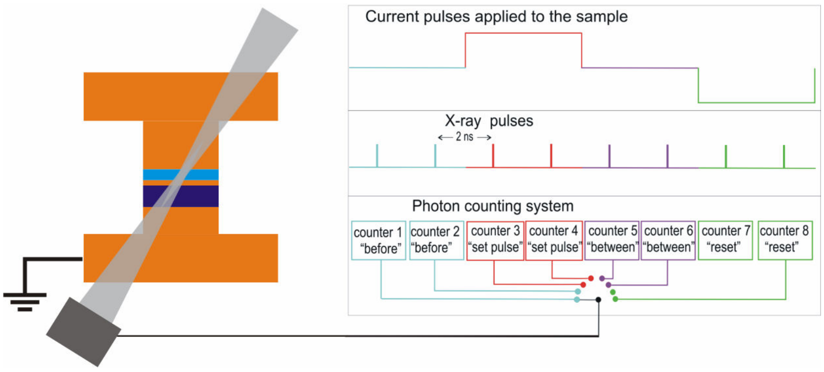

Figure: Schemtic of the pump-probe x-ray microscope used to study magnetization reversal by spin injection [3]

References

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