

Time-resolved X-ray Magnetic Circular Dichroism (XMCD) and Photoelectron Emission Microscopy (PEEM)

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In collaboration with:

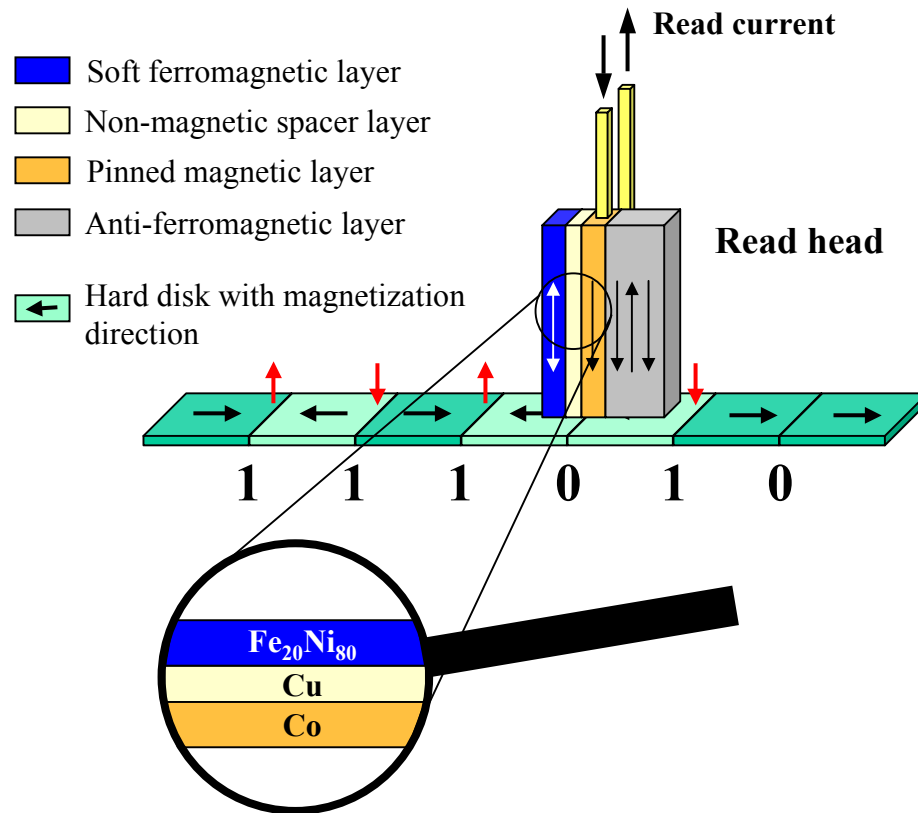
J. Camarero, [Universidad Autonoma de Madrid/ LLN](#)

W. Kuch, K. Fukumoto, J. Kirschner, [MPI Halle \(PEEM\)](#)

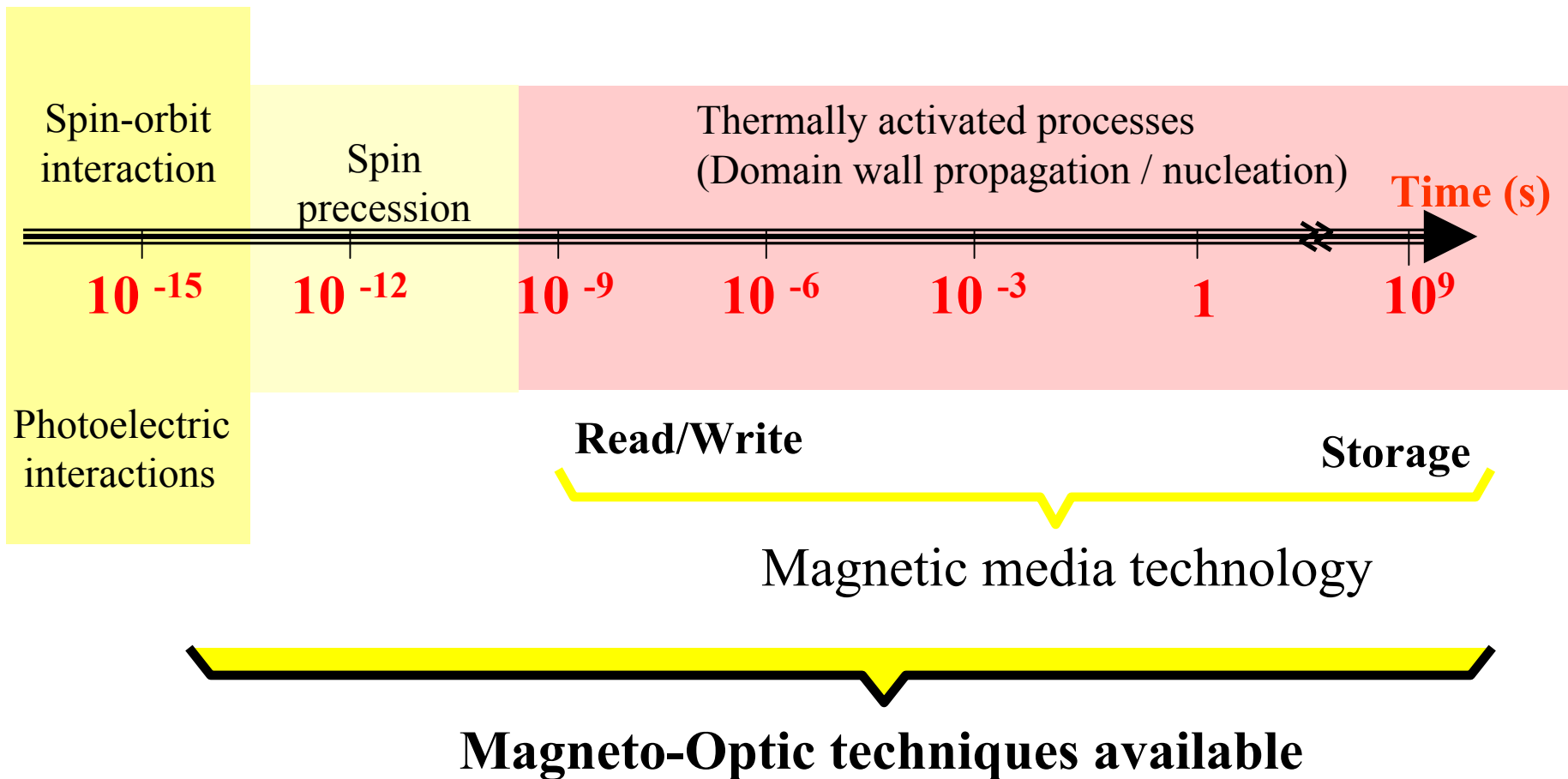
G. Ghiringhelli, N.B. Brookes, [ESRF Grenoble \(XMCD\)](#)

F. Petroff, [Unité mixte de recherche CNRS/Thales, Orsay](#)

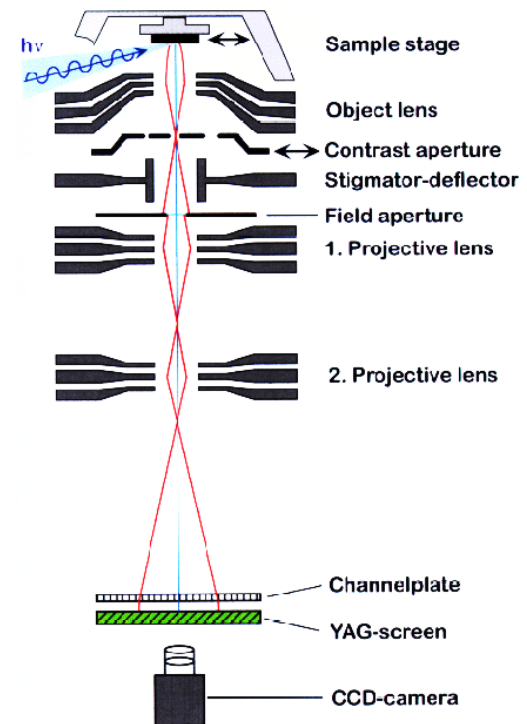
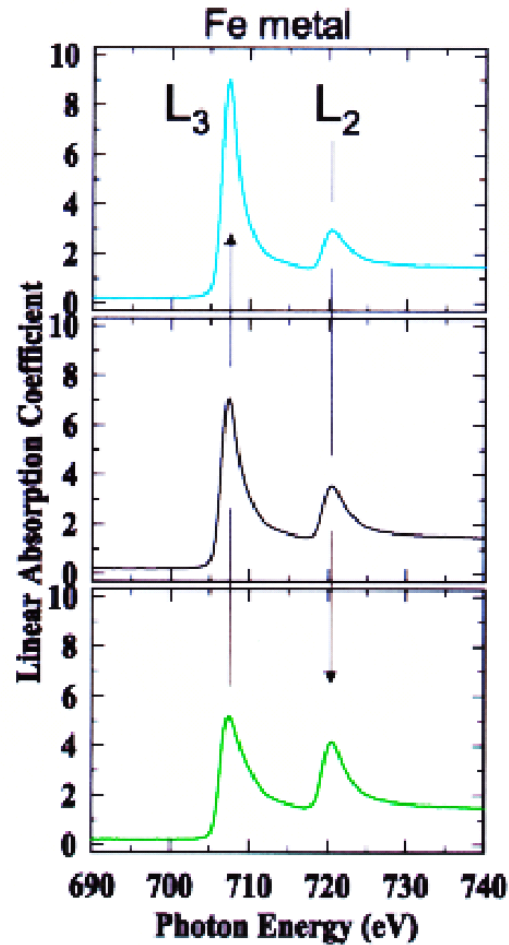
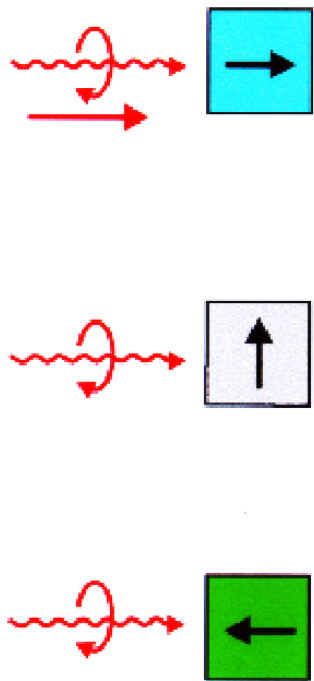
Time- and layer resolution: spin-valves and magnetic tunnel junctions



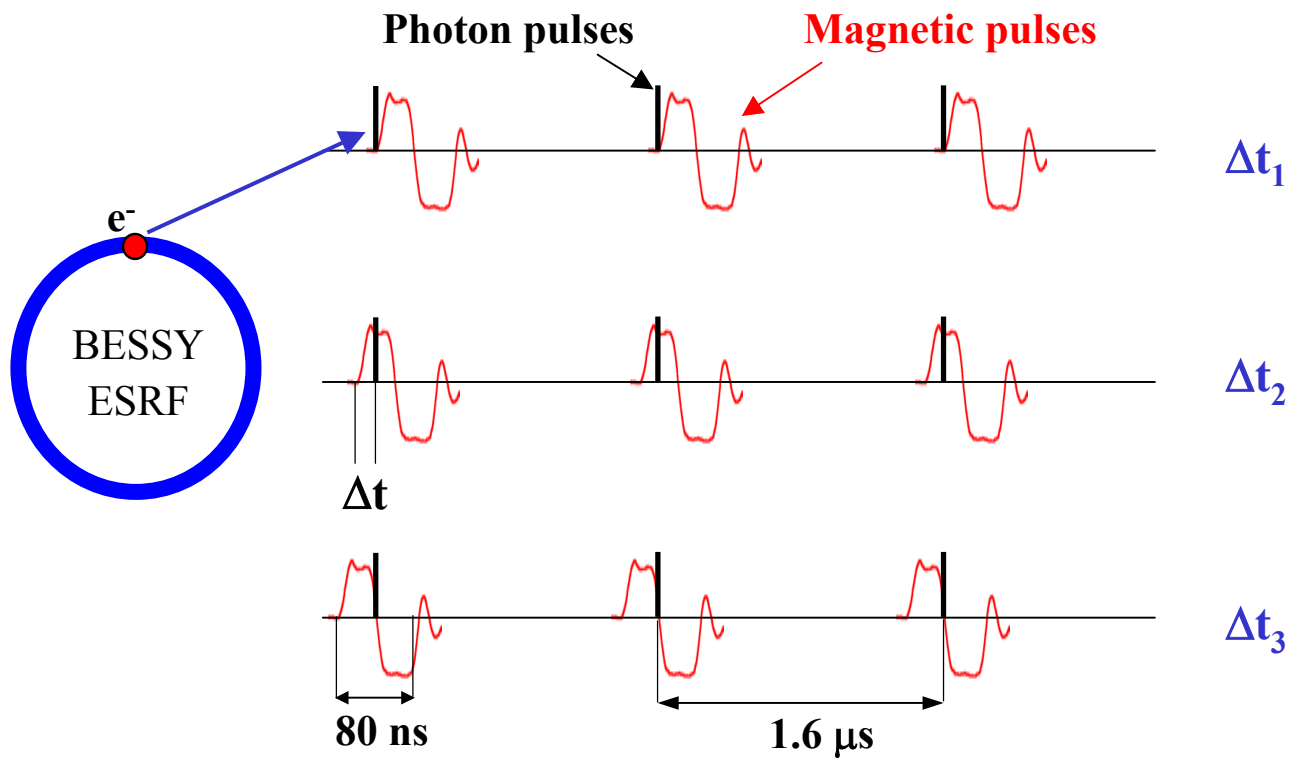
Timescales in magnetic materials



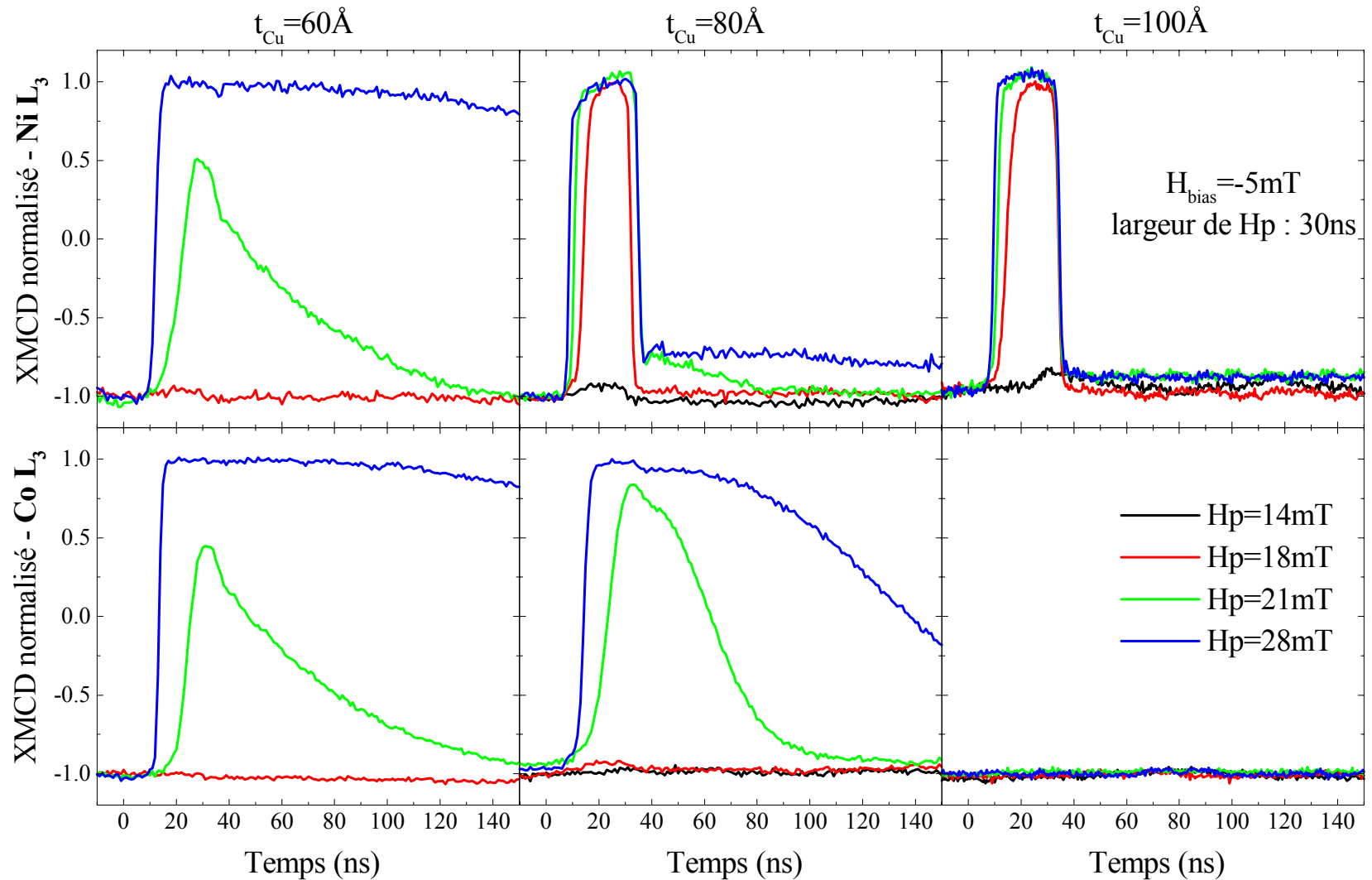
X-ray Magnetic Circular Dichroism (XMCD) and Photoelectron Emission Microscopy (PEEM)



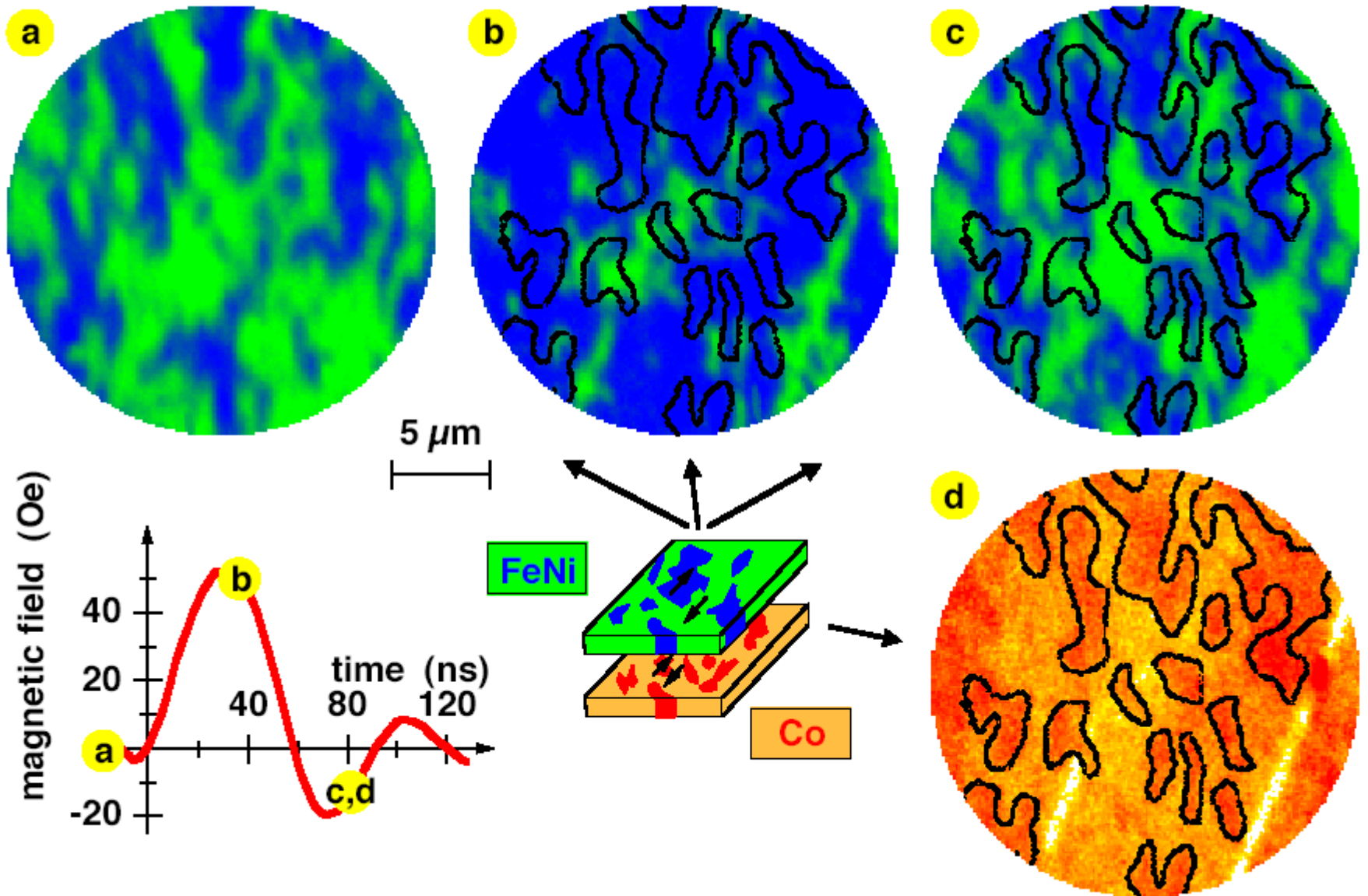
Pump-probe measurements



Time-resolved XMCD



Time-resolved PEEM

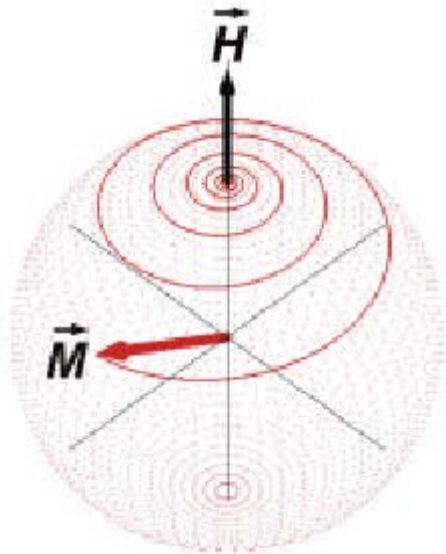


Precessional switching

Atomic scale

Magnetization precession

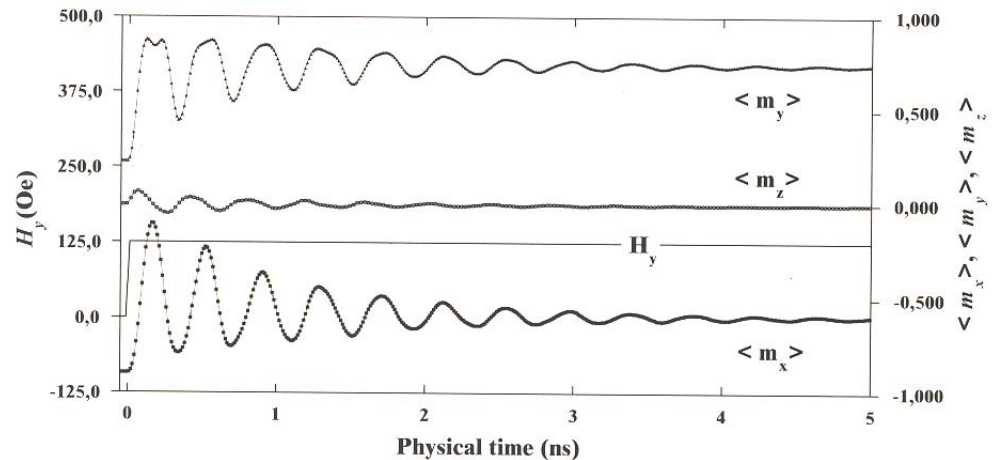
Landau-Lifschitz-Gilbert equation



www-esg.lbl.gov/esg/meetings/ultrafast/agenda/SiegmannVG.pdf

Micro/Nanostructure

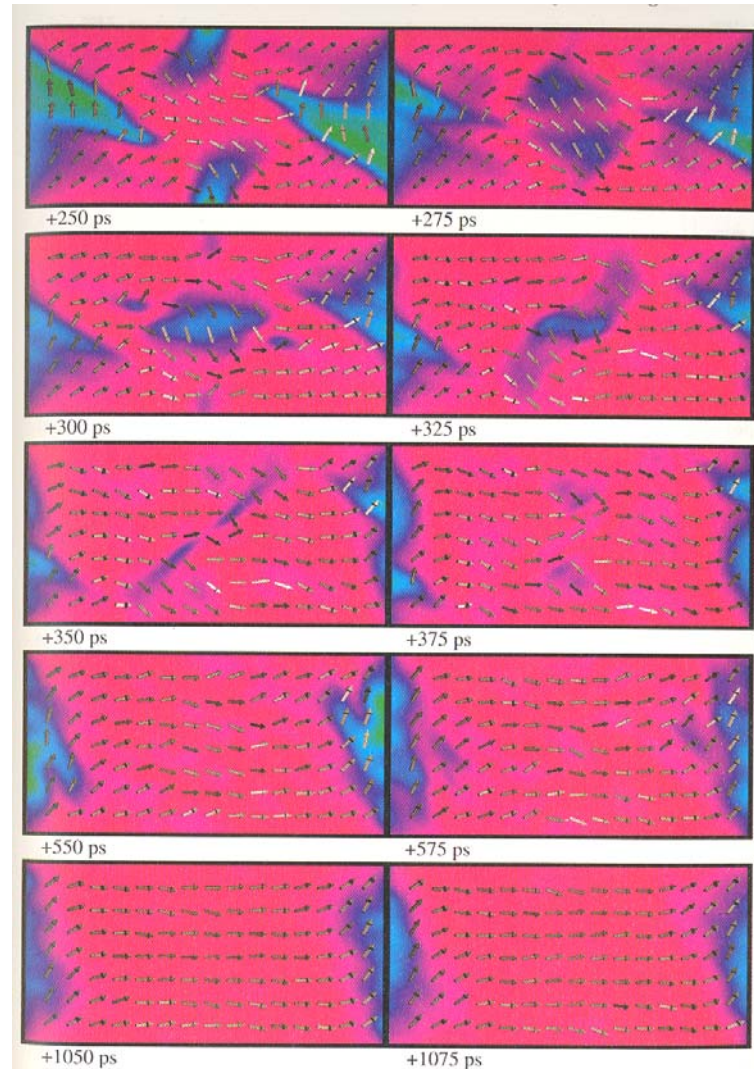
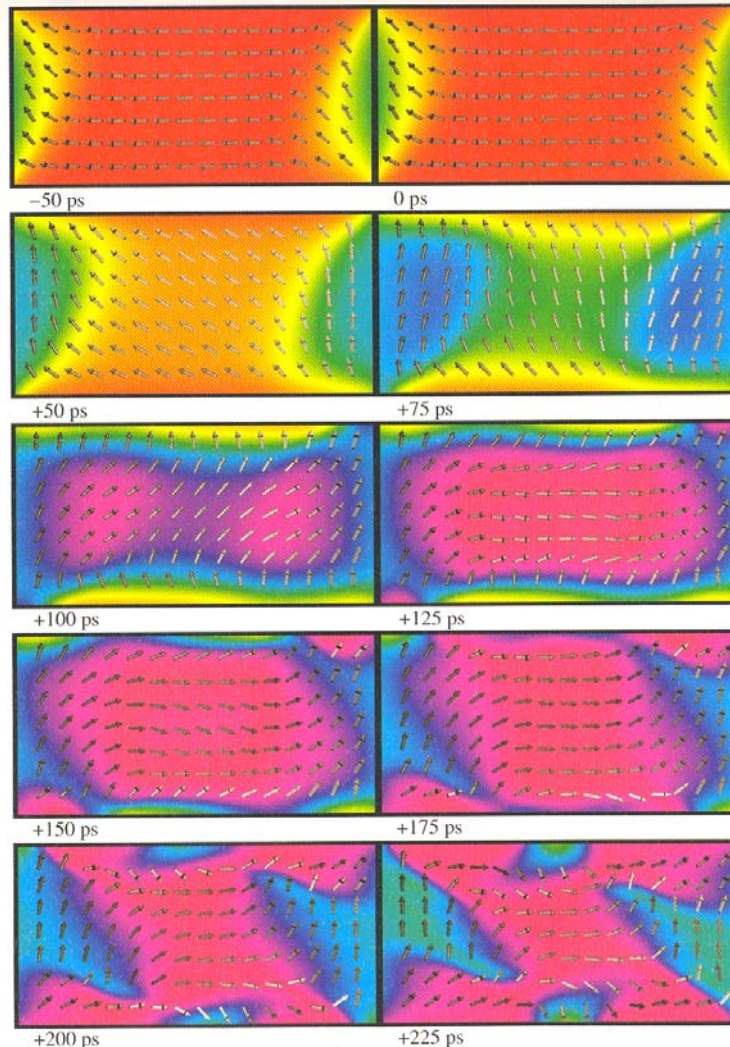
Permalloy $0.5\mu\text{m} \times 0.25\mu\text{m} \times 5\text{nm}$



J. Miltat, G. Albuquerque, A. Thiaville in "Spin dynamics in confined magnetic structures I", eds. B.Hillebrands and K.Ounadjela, **Topics in Applied Physics 83**, 1-33, Springer-Verlag Berlin Heidelberg 2002.

Spatial resolution

Permalloy $0.5\mu\text{m} \times 0.25\mu\text{m} \times 5\text{nm}$



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Fast magnetization reversal dynamics at SOLEIL/Arc-en-ciel

Spatial resolution necessary: < 50nm

- PEEM (BESSYII: 5minutes / image with 10 mA)
- Focussing

Total number of photons more important than pulse length

- 1 ps sufficient