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Ultrafast manipulation of electrons and spins with x-rays

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Polarized soft x-rays have been used over the past 20 years to obtain fascinating new insights into nanoscale magnetism. The separation of spin and orbital magnetic moments, for instance, enabled detailed insights into the interplay of exchange and spin-orbit interactions at the atomic level. The now available polarized soft x-ray pulses with only 100 fs duration allow us to observe the magnetic interactions at work in real time. The ultimate goal of such studies is to understand how spins may be manipulated by ultrashort magnetic field, spin polarized current or light pulses. In this talk I will show how intense fs x-ray pulses now available at LCLS enable us to obtain nanometer scale snapshots of the evolving spin distribution and offer novel ways of magnetic switching without damaging the sample.

Author: DÜRR, Hermann (SLAC)

Presenter: DÜRR, Hermann (SLAC)

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