MA 26: High Frequency Magnetic Light-Matter Interaction - Invited Talk

Time: Wednesday 10:15–10:45 Location: HSZ 04

Invited Talk MA 26.1 Wed 10:15 HSZ 04

Magnetic light-matter interaction at highest frequencies — •Tobias Kampfrath[1,2,3], Alexander Sell[1], Matteo Burresi[3], Dries van Oosten[3], Manfred Fiebig[4], Susumu Noda[5], Martin Wolf[2], Alfred Leitenstorfer[1], Kobus Kuipers[3], and Rupert Huber[1] — [1]University of Konstanz, Germany — [2]Fritz Haber Institute, Berlin, Germany — [3]AMOLF, Amsterdam, The Netherlands — [4]HISKP, Bonn, Germany — [5]University of Kyoto, Japan

In light-matter interactions at terahertz or even optical frequencies, the magnetic component of light usually plays a negligible role. Here, we consider two exceptions to this rule.

First, we use intense sub-picosecond electromagnetic pulses at terahertz frequencies to launch and stop a spin precession in the antiferromagnet NiO. The Zeeman coupling between the spins and the magnetic field of the terahertz pulse is enhanced by the spin-wave resonance at 1 THz. This scheme allows for an ultrafast spin control with minimum impact on other degrees of freedom of the solid [see also T. Kampfrath *et al.*, Nature Photon., doi:10.1038/nphoton.2010.259].

Second, we consider an optical analog of electron paramagnetic resonance and study the interaction between a metal ring (diameter 300 nm) and a nano-photonic cavity at telecom frequencies of 200 THz. We observe a blue-shift of the cavity resonance when the ring is above an antinode of the magnetic field of the cavity. This shift allows us to determine the magnetic polarizability of the nano-ring. We discuss how this method could be applied to even smaller objects such as atoms [see also M. Burresi *et al.*, Phys. Rev. Lett. **105**, 123901 (2010)].