

Controlling magnetism with light

Theo Rasing

Institute for Molecules and Materials Radboud University Nijmegen, The Netherlands

The interaction of light with magnetic matter is well known: magneto optical Faraday or Kerr effects are frequently used to probe the magnetic state of materials or manipulate the polarisation of light. The inverse effects are less known but certainly as fascinating: with light one can manipulate magnetic matter, for example orient their spins. Using femtosecond laser pulses we have recently demonstrated that one can generate ultrashort and very strong (\sim Tesla) magnetic field pulses via the so called Inverse Faraday Effect. Such optically induced magnetic field pulses provide unprecedented means for the generation, manipulation and coherent control of magnetic order on very short time scales, including the complete reversal of a magnet with a single 40 femtosecond laser pulse. In principle this opens the way for all-optical recording of magnetic bits at extremely high data rates. The basic ideas, including their limitations, behind these discoveries will be discussed and illustrated with recent results.