

## Ultrafast heating above the spin reorientation phase transition in the Co/SmFeO<sub>3</sub> heterostructure

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The magnetization direction of ferromagnetic (FM) films can be pinned by coupling them to an antiferromagnet (AFM). It has been demonstrated recently [A. Kimel et al., Nature, 429, 850 (2004)] that a subpicosecond laser-excitation of an antiferromagnetic orthoferrites RFeO<sub>3</sub>, where R is a rare-earth ion, may result in ultrafast modification of the magnetic anisotropy followed by a reorientation of the antiferromagnetic spins over 90-degrees within a few picoseconds, which is much faster than a typical nanoseconds long spin precession period in a ferromagnetic material. What would be the response of an FM-layer if such a spin-reorientation in the AFM takes place in a coupled AFM-FM structure? How fast would the FM-layer reorient?

Here we report on our investigations of the laser-induced dynamics of Co spins in a Co/SmFeO<sub>3</sub> heterostructure using X-ray magnetic circular dichroism (XMCD) and time-resolved Photoemission electron microscopy. Orientation changes of the Co-spins faster than 100 ps is observed. The possible formation of exchange springs in the SmFeO<sub>3</sub> to prevent large orientation changes will be discussed.

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**Author:** LE GUYADER, Loïc (Swiss Light Source, Paul Scherrer Institut)

**Co-authors:** KIMEL, Alexey (IMM, Radboud University, Nijmegen, The Netherlands); KIRILYUK, Andrei (IMM, Radboud University, Nijmegen, The Netherlands); KLEIBERT, Armin (Swiss Light Source, Paul Scherrer Institut); F. NOLTING, Frithjof (Swiss Light Source, Paul Scherrer Institut); JOLY, Loïc (IPCMS, Strasbourg, France); RASING, Theo (IMM, Radboud University, Nijmegen, The Netherlands)

**Presenter:** LE GUYADER, Loïc (Swiss Light Source, Paul Scherrer Institut)

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