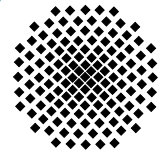


Stuttgarter Physikalisches Kolloquium

Max-Planck-Institut für Intelligente Systeme
Max-Planck-Institut für Festkörperforschung
Fachbereich Physik, Universität Stuttgart

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Dienstag, 29. Januar 2019

16.00 Uhr c.t.

Hörsaal 2D5

Stuttgarter Max-Planck-Institute, Heisenbergstraße 1, 70569 Stuttgart-Büsnau

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Recent Studies of X-Ray Circular Dichroism

Gerrit van der Laan
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Abstract

From the mid 1980s, x-ray magnetic dichroism (XMCD) has become a unique tool to study the magnetic moments of materials, especially after postulation of the sum rules, which relate integrated spectral intensities to ground state spin- and orbital-magnetic moments. Soft x-ray magnetic dichroism has played an ever-increasing role in improving our understanding of complex magnetic nanostructures since it provides elemental and chemical site-specific magnetic information with high sensitivity and tunable probing depth. Here, I will present some recent applications.

A new addition to the x-ray dichroism toolbox is ferromagnetic resonance (FMR) detected by time-resolved XMCD, which has opened the door to element-, site- and layer-specific dynamic magnetization measurements. Under magnetic resonance condition, the moments undergo a periodic oscillation that can be measured as a dynamic XMCD signal. By exploiting the pulsed time structure of the synchrotron radiation the relative phase of precession in the individual magnetic layers can be determined, which has enabled the observation of spin currents.

By exploiting the polarization dependence of resonant elastic x-ray scattering (REXS) we can determine the depth dependence of the full 3D spin structure of skyrmions—that is, topologically nontrivial whirls of the magnetization—below the surface of a bulk sample of Cu_2OSeO_3 . It was found that the skyrmions change exponentially from pure Néel- to pure Bloch-twisting over a distance of about hundred nanometer between surface and bulk, respectively.

While magnetism is normally at the origin of circular dichroism in resonant x-ray diffraction, this is not the only possible origin. I will show how strong non-magnetic circular dichroism can emerge from electric-polarization structures.