Universität Regensburg

FAKULTÄT FÜR PHYSIK
Lehrstuhl für Experimentelle und Angewandte Physik

Prof. Dr. Rupert Huber

Seminar

Wednesday, October 23, 2024, 1:00 PM

Zoom Meeting Login

Nonlinear spin dynamics in antiferromagnets driven by intense terahertz magnetic fields

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We excited the coherent spin dynamics in the canted antiferromagnets $HoFe_{O3}$ and $Sm_{0.7}Er_{0.3}FeO_3$ using Tesla-class multicycle THz magnetic fields and investigated their nonlinear properties through the time-resolved pump-probe measurements[1,2]. The spin dynamics in these antiferromagnets can be described in terms of two modes: the antiferromagnetic (AFM) and the ferromagnetic (FM) modes.
In $HoFeO_3$, we adopted a configuration where only the AFM mode can be excited. We observed the third-order harmonic and the frequency redshift of the AFM mode. From analysis, we found that these nonlinear phenomena originate from the anharmonicity of the potential energy of the AFM mode. In $Sm_{0.7}Er_{0.3}FeO_3$, we employed a configuration where both modes can be excited. We observed the spin switching in the potential energy of the FM mode. We found that the spin switching is driven by the dynamical modification of potential energy induced by intense multicycle THz magnetic fields, which is further enhanced by the coupling between AFM and FM modes.

[1] Z. Zhang et al., Nat. Commun. **14**, 1795 (2023).
[2] Z. Zhang et al., accepted by Nat. Mat. (2024).

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