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# Twists and Turns: Exploiting Azimuthal Dependences in the Ultrafast Time Domain

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Ultrafast spin manipulation carries great potential for future information technology. Ferromagnets, which are commonly studied in this context, are limited by the dissipation of angular momentum. This is not the case for antiferromagnets, which offer both the prospect of faster and more efficient spin dynamics, as well as the possibility to exploit magnetic properties that are unavailable in ferromagnets. One such property is the internal arrangement of the spins. Controlling this arrangement can alter how the antiferromagnet stores data, interacts with neighboring materials, and more.
Resonant X-ray diffraction is commonly used to study spin arrangements in antiferro-magnets, and the azimuthal dependence of diffracted intensity can be collected. This information is particularly important when the Ewald sphere is limited by the use of soft X-ray resonance, so only a few reflections can be recorded.
Here I will discuss femtosecond soft X-ray resonant diffraction studies of antiferromagnetic spin dynamics. In these projects we take advantage of azimuthal angle dependences to disentangle the rearrangement of spin order from the "usual"demagnetization. We demonstrate deterministic ultrafast control of the spin arrangement, and we use the dynamic azimuthal data to retrieve intrinsic material properties associated with the spin dynamics.
The materials of focus are Lanthanide-based intermetallics [1-3].

REFERENCES
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