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## Skyrmion Dynamics Using FMR In Resonant Elastic X-ray Scattering

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Magnetic diffraction using x-ray detected ferromagnetic resonance (DFMR) offers a powerful and novel technique for performing time-resolved measurements on individual spin textures [1,2]. DFMR combines FMR and circular dichroism in REXS as pump and probe, respectively. This allows us to study the element-, layer-, and mode-selective magnetisation dynamics by stroboscopic probing, utilizing the time structure of the synchrotron (~500 MHz). The radio-frequency field that drives the spin precession is synchronized with the x-ray pulses using the clock of the synchrotron such that each x-ray pulse measures the magnetisation cone at precisely the same point in the precession cycle [3].

We studied the FMR modes of both the conical and field-polarized phases in the chiral magnet Cu<sub>2</sub>OSeO<sub>3</sub> [4]. Following the identification of these modes at different temperatures using broadband vector network analyser FMR, we used DFMR on the crystalline (001) Bragg peak to reveal the time-dependent spin configurations of the selected FMR modes. By being able to measure both the amplitude and phase response of the spin system across the resonance, a continuous phase advance (by 180°) in the conical mode and a phase lag (by -180°) in the field-polarized mode is found. By performing dynamic measurements in the conical phase as a function of the linear polarization angle of the x-rays, i.e., successively probing the dynamics of the moments, we found an inversion of the dynamics along the conical axis upon inverting the applied field direction. By enabling time-resolved measurements of the phase and amplitude of individual magnetic structures, DFMR opens new opportunities for obtaining a deeper understanding of the complex dynamics of chiral magnets.

### REFERENCES

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