

## Poster-1-19

**Ultrafast Magnetic Fields from THz-Driven Chiral Phonons**

Malo Hervé, Martin Luttmann, Sophie Barmet, and Gregor Jotzu

*EPFL*

Coherent optical control of the solid state is paving the way for applications based on out-of-equilibrium materials. Here, we study how dynamical magnetization can emerge in materials where chiral phonons are driven by resonant ultrashort laser pulses.

Dynamically chiral phonons have been predicted to be able to produce artificial magnetic fields on the order of tens of Tesla, but the existence of an induced magnetic field extending outside the solid sample has yet to be characterized. Such a study requires strong narrowband THz pulses with adjustable frequency and polarization. A tunable THz source in the 1-15THz domain is used with complete pulse-to-pulse control of the ellipticity. This way we were able to observe ellipticity dependent rotation inside CeF<sub>3</sub>.

Ultrafast proximate magnetometry (UPOM) gives access to the magnetic field outside a sample on sub picosecond time scale. UPOM hence allows us to distinguish effects arising from purely artificial gauge fields and from the creation of real magnetic fields inside a driven sample. This will eventually lead to the possibility to individually control phonon, electron and spin degrees of freedom, with notable use in phononics or spintronic applications.