Contribution ID: **134** Type: **Oral invited talk. This category is for invited speakers only.**

I-1 Chiral Phonons: Phonon Angular Momentum and Intrinsic Magnetism

Thursday, 24 July 2025 13:10 (30 minutes)

Chirality —the geometric property defining the handedness of an object —is a fundamental concept with broad relevance across scientific disciplines. Recent advances have highlighted the pivotal role of chirality in condensed matter physics, particularly through the emergence of chiral phonons: vibrational excitations that carry angular momentum. These quasiparticles are of great interest due to their intrinsic magnetism, which enables non-trivial coupling between lattice vibrations and spin degrees of freedom in solids.
In this presentation, I will show our recent work demonstrating the existence of chiral phonons in non-centrosymmetric crystals, using resonant inelastic X-ray scattering (RIXS) as a probing technique [1,2]. By exploiting the angular momentum transfer between circularly polarized X-ray photons and chiral phonons, we uncover the selection rule that enables the observation of circular contrast in phonon excitation spectra, which is a clear signature of chiral phonons. I will also outline our ongoing efforts to directly detect and characterize the intrinsic magnetism associated with these chiral lattice excitations.

[1] H. Ueda et al., Nature 618, 946-950 (2023).
[2] H. Ueda et al., arXiv 2504.03330.

Email

hiroki.ueda@psi.ch

Funding Agency

Supervisors Name

Supervisors Email

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Primary author: UEDA, Hiroki (Paul Scherrer Institute)

Presenter: UEDA, Hiroki (Paul Scherrer Institute)

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