

Lattice dynamics using neutrons and x-rays

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Neutron spectroscopy has played a pivotal role uncovering lattice dynamical properties from early studies of elemental superconductors to density-wave materials and current investigations of materials featuring intertwined ordering phenomena. Over the years, experimental goals have evolved from the basic determination of phonon dispersion to detailed mapping of phonon renormalization related to, e.g., lattice anharmonicity, spin-phonon coupling or exotic effects such as phonon-phonon nesting and signatures of gaps in the electronic band structure. In my presentation, I will explain how I use a combination of neutron time-of-flight, triple-axis and inelastic x-ray scattering spectroscopies to investigate superconducting, magnetic and density-wave materials backed-up by a *ab-initio* lattice dynamical calculations. Based on these science cases, I will discuss instrument features which are particularly useful for the investigation of lattice dynamics in solids.

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