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Terahertz-Driven Phonon Upconversion in SrTiO3

Monday, 9 September 2019 13:45 (20 minutes)

Direct manipulation of the atomic lattice using intense long-wavelength laser pulses has become a viable approach to create new states of matter in complex materials. Conventionally, a high frequency vibrational mode is driven resonantly by a mid-infrared laser pulse and the lattice structure is modified through indirect coupling of this infrared-active phonon to other, lower frequency lattice modulations. Here, we drive the lowest frequency optical phonon in the prototypical transition metal oxide $SrTiO_3$ well into the anharmonic regime with an intense terahertz field. We show that it is possible to transfer energy to higher frequency phonon modes through nonlinear coupling. Our observations are carried out by directly mapping the lattice response to the coherent drive field with femtosecond x-ray pulses, enabling direct visualization of the atomic displacements [1]

[1] M. Kozina, M. Fechner, P. Marsik, T. van Driel, J. M. Glownia, C. Bernhard, M. Radovic, D. Zhu, S. Bonetti, U. Staub, and M. C. Hoffmann, *Nature Physics* **15**, 387–392 (2019)

Summary

Topic

1. Excitations of strongly correlated electron systems

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