THz control of superconductivity

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By using strong-field THz transients, we control superconducting cuprates, for the first time without inducing high-energy excitations of hot carriers. Selective excitation of specific lattice or electronic modes on low energy scales allow for greatly increased control of these materials. Here we demonstrate the formation of a superconducting state by selective vibrational excitation of a near-600 cm^{-1} Cu-O stretch $La_{1.8-x}Eu_{0.2}Sr_xCuO_4$ (LESCO 1/8), a striped superconductor with a pronounced crystallographic distortion underpinning the stripe state. We also use high intensity THz pulses to control the dimensionality of an optimally doped compound. Finally, I will comment on the use of soft x-ray pulses from synchrotrons and FELs to probe electronic order in these systems, to study appearance or disappearance of charge spin and orbital ordering in photo-controlled solids.

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