

## Probing Non-Equilibrium Phonons in Ni

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In metals following absorption of a femtosecond laser pulse energy is pumped into electronic excitation resulting in a system out of equilibrium. This excitation eventually cools down by energy transfer to the lattice. In ferromagnetic metals this same laser pulse should lead to an ultrafast quenching of ferromagnetic order. In this ultrafast demagnetization momentum conservation requires a spin angular momentum exchange with another reservoir. There are three reservoirs for energy and angular momentum; the electronic reservoir, the spin reservoir, and the lattice. While there are several techniques for measuring electronic and spin excitations, probes of the phonon temperature evolution are few. Here we highlight a technique implemented at the Ultrafast Electron Diffraction Beamline at SLAC National Accelerator Laboratory that is used to measure the temporal evolution of momentum-resolved excitations of the lattice system via the diffuse scattering in metallic single crystalline thin films.