Abstract Submitted
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Observation of coherent high-wavevector acoustic vibrations in a bulk material using time-resolved X-ray diffraction[1] MARIANO TRIGO, YU-MIIN SHEU, EMILY PETERSON, DAVID REIS, MATTHEW REASON, RACHEL GOLDMAN, ROBERTO MERLIN, University of Michigan, ERIC LANDAHL, Argonne National Laboratory, DONALD WALKO, DOHN ARMS, Argonne National Laboratory — We report on the observation of high-wavevector acoustic phonons in bulk InP that originate from folded phonons in a GaInAs/AlInAs superlattice. Synchrotron time-resolved X-ray diffraction is used to probe the evolution of the laser-generated acoustic phonons. Due to the short wavelength, X-ray diffraction gives access high-wavevector components of the acoustic wave-packet in a bulk material. Experiments show a bulk excitation at a wavevector $q = 2\pi/D$, where D is the superlattice period, which propagates into the substrate at the speed of sound. These results are supported by time-resolved dynamical diffraction calculations in which the strain is included as a perturbation from the perfect crystal.

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