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A nugget from FOCUS:

Ultrafast X-ray Diffraction Measurements of Nanoscale Thermal Transport

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Ultrafast X-ray Diffraction provides a means to investigate the motion of atoms on the short time and distance scales involved in thermal transport. Thermal transport across interfaces between materials is of fundamental interest in condensed matter and of practical interest in building smaller and faster semiconductor devices. In this work, reported in *Physical Review Letters* [1], FOCUS researchers and their collaborators present X-ray diffraction measurements of a femtosecond laser-produced ultrahigh frequency acoustic phonon pulse as it propagates across the boundary between two semiconductors. X-ray diffraction allows them to probe the atomic motion separately in each layer, so as to test models for the transmission and reflection of the phonons (which transport heat) at the boundary. The results in the case of the nearly perfect AlGaAs/GaAs interface, show that an acoustic mismatch model is appropriate for phonons of a frequency extending into multi-GHz regime.

[1] S. H. Lee, A. L. Cavalieri, D. M. Fritz, M. C. Swan, R. S. Hegde, M. Reason, R. S. Goldman, and D. A. Reis. Generation and propagation of a picosecond acoustic pulse at a buried interface: Time-resolved x-ray diffraction measurements. *Phys. Rev. Lett.*, 95(24):246104, 2005.

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