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Direct mapping of phonon dispersions in copper by x-ray thermal diffuse scattering. RUQING XU, HAWOONG HONG, TAI CHIANG, University of Illinois at Urbana-Champaign — X-ray Thermal Diffuse Scattering (TDS) arises from lattice vibrations. Measured TDS intensities can be used to extract phonon dispersion relations, as has been demonstrated in a number of systems. But most analysis methods so far have involved data fitting based on assumed atomic force constant models, and it is difficult to determine a priori the accuracy of the procedure. Methods of direct inversion, i.e., determining phonon frequencies directly from x-ray TDS data without a presumed model, have been proposed in prior work, but most of the schemes involve absolute intensity measurements, which are difficult especially in the presence of an unknown background. Here we report an improved approach, in which phonon frequencies are determined through the temperature dependence of TDS intensities at each point in reciprocal space. Polarization selection rules are employed to disentangle contributions from different phonon branches. Results taken from a simple model material, copper, will be presented.

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