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Nanoscale Determination of the Mass Enhancement Factor in Lightly-Doped Bulk Insulator PbSe KANE SCIPIONI, ILIJA ZELJKOVIC, DANIEL WALKUP, Boston College, YOSHINORI OKADA, Tohoku University, WENWEN ZHOU, Boston College, RAMAN SANKAR, National Taiwan University, GUOQING CHANG, National University of Singapore, YUNG JUI WANG, Northeastern University, HSIN LAN, National University of Singapore, ARUN BANSIL, Northeastern University, FANGCHENG CHOU, National Taiwan University, ZIQIANG WANG, Boston College, VIDYA MADHAVAN, University of Illinois Urbana-Champaign — Phonons play a significant role in achieving the desired thermoelectric properties of many materials. Recent evidence suggests that electron-phonon coupling plays an important role in specifically the Lead and Bismuth Chalcogenides. Thus, quantifying the interaction between phonons and electrons is of immense importance for understanding of these systems. Nearly all information about electron-phonon coupling is contained in the Eliashberg function of the material, but its precise extraction has in part been limited due to the lack of local experimental probes. By utilizing Landau level spectroscopy, we construct a method to directly extract the Eliashberg function, and demonstrate its applicability to lightly-doped thermoelectric bulk insulator PbSe. In addition to high energy, and access to both occupied and unoccupied electronic states, this novel experimental method could be used to detect variations in the mass enhancement factor (λ) on microscopic length scales, which opens up a unique pathway for investigating the effects of chemical defects, surface doping and strain on λ.

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