

Electron phonon interaction observed in ballistic carrier propagation experimentsS. Knauth and W. Grill

Institut für Experimentelle Physik II, Universität Leipzig

The temperature dependence of the spatially resolved detection of ballistic electron respectively hole transport has been studied in bismuth and tungsten single crystals. Modeling of the electron transport including interactions with the thermally excited phonon bath is employed to evaluate the observed transport properties. The observed transition from ballistic to diffusive carrier propagation is described in suitable approximation by a model based on isotropic interaction but anisotropic transport properties of the carriers. The observation is based on scanned electron beam excitation of carriers and phonons in the temperature range between 5 to 100 K. Detection is performed by point contacts. Special modulation techniques suitable for selective detection of electron and phonon transport are also demonstrated.