

Supporting Information

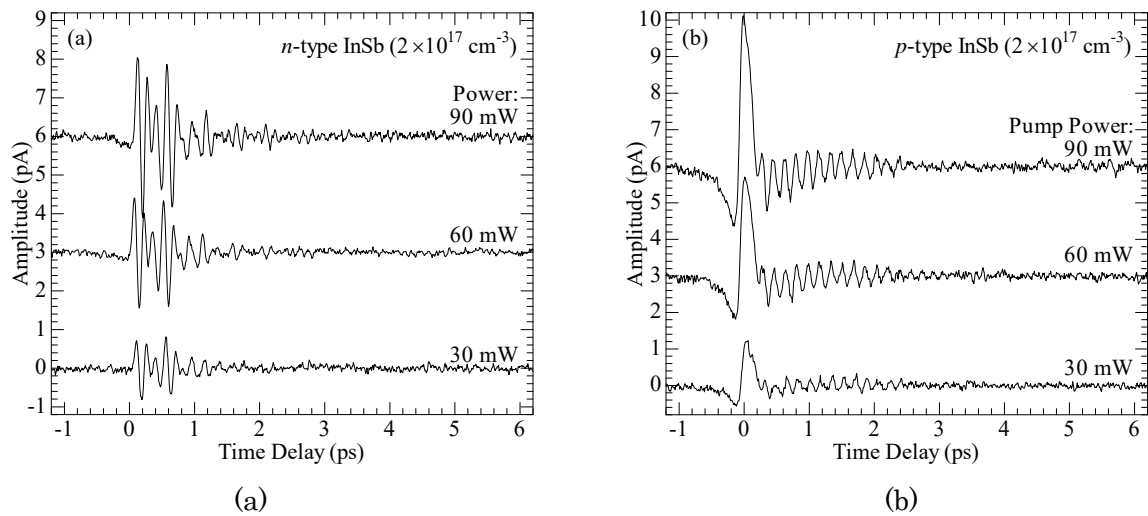


Figure 1: Amplitudes of terahertz time-domain waves at various pump powers as a function of time delay in the *n*-type InSb single crystal (a) and *p*-type InSb single crystal (b). The terahertz wave was measured at room temperature. In the *p*-type InSb sample, the relatively strong pulse is observed at the time delay of 0 ps. In addition, the small oscillation patterns continue up to the time delay of about 3 ps. Contrastingly, the beat pattern is observed in the *n*-type InSb sample.

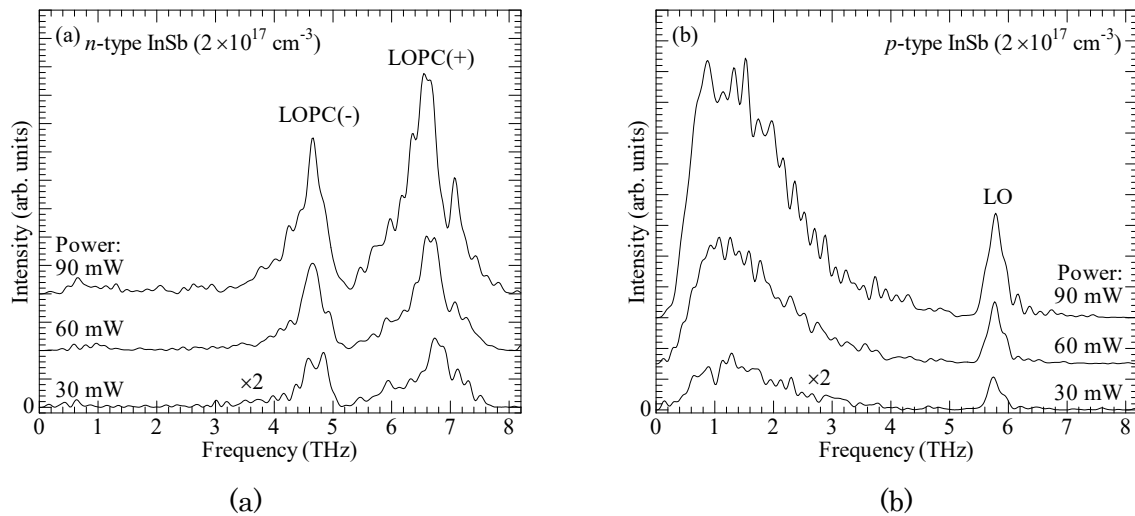


Figure 2: Fourier power spectra of terahertz time-domain waves at various pump powers in the *n*-type InSb single crystal (a) and *p*-type InSb single crystal (b). In the *p*-type InSb sample, the broad and large terahertz band, which results from the photo-Dember effects, appears at the frequency of 1.5 THz. The terahertz band at 5.8 THz originates from the coherent longitudinal optical (LO) phonon [1]. In the *n*-type InSb sample, the terahertz band resulting from the photo-Dember effects disappears. The terahertz bands, which are labeled by LOPC(-) and LOPC(+), are observed. The LOPC(-) and LOPC(+) originate from the lower and upper branches of the coherent LO phonon and electron plasmon coupled (referred as LOPC) mode, respectively.

[1] N. L. Rowell *et al.*, *J. Vac. Sci. Technol. A* vol. 22, 935 (2004).