Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Nonlinear absorption of terahertz radiation due to light impact ionization. SERGEY GANICHEV, WILHELM PRETTL, Faculty of Physics, University of Regensburg — A nonlinear increase in free carrier absorption in InSb bulk samples with rising intensity of terahertz radiation has been observed. It is shown that the effect is caused by a generation of electron-hole pairs at intense excitation with photon energies several factors of ten smaller than the energy gap. The experimental results give strong evidence that the increase of carrier density is caused by light impact ionization in the radiation field. In contrast to well known impact ionization in static or low frequency fields, when the frequency of the electric field is less than the reciprocal relaxation time of free carriers and ionization is due to the acceleration of electrons in one half period, at terahertz frequencies the opposite limit is achieved and carriers acquire high energies entirely because of collisions. Nonlinear transmission and photoconductive response has been observed in n- and p-type InSb with carrier density in the range of 10^{13} cm^{-3}to 10^{16} cm^{-3} applying 40 ns pulses at wavelengths 90.5 μm, 152 μm and 250 μm with a maximum radiation intensity of 3 MW/cm^2.

Sergey Ganichev
Faculty of Physics, University of Regensburg

Date submitted: 06 Dec 2004 Electronic form version 1.4