

# Terahertz pulse emission from GaInAsBi

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Generation of Terahertz pulses by photoconductive antennas (PCA) is a commonly used technique. Main PCA advantages are compactness and versatility. THz radiation pulses are presently widely applied to study physical properties of materials, identification of chemicals, and for nondestructive testing using time-domain spectroscopy (TDS) techniques. These applications could benefit if inexpensive and maintenance-free fibre laser systems could be used in THz TDS systems. These lasers operate at 1  $\mu\text{m}$  and longer wavelengths. Recently PCA with bismuth (Bi) on GaAs substrate for 1  $\mu\text{m}$  and 1550  $\mu\text{m}$  were demonstrated [1,2]. The latter was quaternary with 20% In and 10 % Bi with large (3%) lattice mismatch on GaAs substrate. In this work quaternary  $\text{In}_{0.53}\text{Ga}_{0.47}\text{As}_{0.94}\text{Bi}_{0.06}$  layer was grown on InP substrate and lower lattice mismatch (0,3 %) and bandgap (up to 0,4 eV) were achieved.

6 % (I401) and 1,8 % (I405) Bi content samples were characterized by optical pump THz probe and X-ray diffraction techniques. Samples had carrier lifetime of few picoseconds and were fully strained. THz excitation spectra of I401 unbiased layer and fabricated as PCA were measured (Fig. 1). PCA showed sensitivity to optical pulses with more than 2  $\mu\text{m}$  wavelength, which could be used in THz - TDS systems for novel thulium or holmium fibre lasers.

THz pulses obtained when using Er-doped fibre laser for the photoexcitation were comparable with those observed in other emitters used for THz-TDS systems.

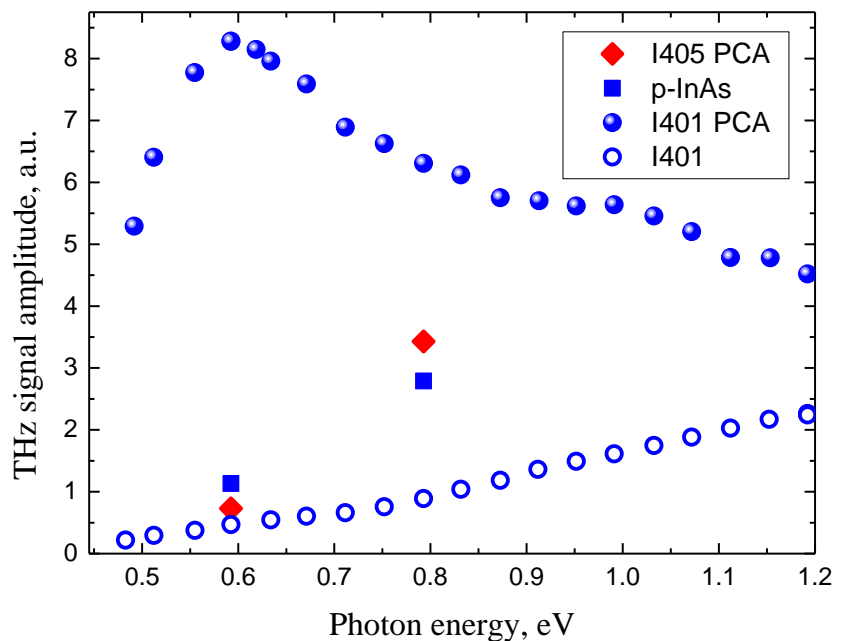


Fig. 1 . THz excitation spectra of the GaInAsBi epitaxial layer with 6% Bi (layer i401, empty points) and PCA fabricated from that layer (full points) biased cw at 50 V voltage. THz pulse amplitudes emitted from InAs layer (square) and PCA fabricated from GaInAsBi with 1.8% Bi (layer i405, red diamonds) excited by 2  $\mu\text{m}$  and 1.5  $\mu\text{m}$  optical pulses are shown for comparison.

## REFERENCES

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