Diploma thesis abstract.
“Generation and detection THz pulses in thick crystals”

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In this work we present researches of generation and detection of THz radiation by femtosecond pulses in electro-optical crystals ZnTe and GaP. The coherent picosecond ultrashort pulses of terahertz radiation are generated by optical rectification and detection based on electro-optical effect. These effects both depend on quadratic nonlinearity, laser pulse duration and phase synchronism.

We investigate how efficiency of generation and detection of THz depends on laser pulse parameters (wavelength, spectral width, pulse duration) and crystal's parameters (thickness, refraction and absorption). We found that model of THz spectrum which well agrees with experiments and allows to analyze influence of each parameter. In this work we present quantitative estimations of significant parameters. The measured refraction and absorption spectra in THz range are well described by Lorenz model. The insufficiently known case when thick crystals are used for increase signal - noise ratio in required THz range.

Taking into account changes of pulse duration in crystal is the new method in research of generation and detection THz radiation. Obtained model of generation and detection considers diffusion of laser pulse in thick crystal. We found that the use of laser pulse with large chirp increases efficiency of generation THz radiation in thick crystals. Moreover we propose the use of the structure consists of both crystals GaP and ZnTe as a detector of THz pulse. We found that this structure could increase frequency range of THz spectrometer.

These results allow finding optimal set of parameters, when sensitiveness of THz spectrometer is maximum in required THz range. Width of THz spectrum and frequency of maximum efficiency THz spectrometer are changed by modifications of wavelength, crystal thickness and laser pulse duration.