Diploma thesis abstract

Planar waveguide structures for propagation and generation of terahertz radiation

In this research we study the propagation and generation of THz electromagnetic radiation in planar waveguides with included subwavelength structures (SWS). Two types of SWS are used: metal film with an array of rectangular holes (RH) and an array of metallic split-ring resonators (SRR) realized on dielectric substrate.

By theoretical analysis of propagation of THz radiation through planar three layer waveguides in the RH-dielectric-RH configuration, and by experimental study of structures in the dielectric-SRR-dielectric configuration, it is shown that these structures have spectrally selective properties in THz spectral range.

Investigation of THz diffraction on the RH samples is performed. Diffracted (along the surface of SWS) radiation shows distinct spectral maxima at surface plasmon frequency. This mechanism can be used as waveguide input technique.

Generation of THz radiation in waveguide consisted of GaAs plate covered by RH-layer by its stimulation with laser femtosecond pulse at normal incidence is investigated. It is shown that if laser radiation reaches RH-layer before it reaches GaAs, generated THz signal is stronger than in the case of reverse order. It can be accounted for higher efficiency of THz generation because of local field amplification in subwavelength holes of SWS.

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