

Total internal reflection Terahertz time-domain spectroscopy.

Diploma thesis

Student 6-th year

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THz pulse spectroscopy is a perspective tool for a medicine, identification and visualization problems. The best way to investigate strong absorbing media, remote objects, liquid samples is the reflection spectra measurement.

In diploma thesis terahertz total internal reflection spectroscopy is investigated. The scheme of time-domain terahertz total internal reflection spectrometer is developed for a realization of the reflection experiment to investigate a strong absorptive media. From experimental complex reflection spectrum the refraction index and absorption coefficient are directly calculated, without any assumption, due to the phase information in time-domain data. The influence of prism parameters is evaluated for the dynamic range of possible media optical properties. The influence of thin film immersion liquid on TIR sensitivity is studied. We have measured the reflection spectra polycrystals, water solutions of different concentration and of some biological samples.

The most interesting result is the number of water molecules bounded with monosaccharide molecule using the THz response change of water molecules owing to hydrogen bond network. The water molecules absorption value chained with L-Arabinose has increased on 5% and refraction value has decreased on 25%. The suggested analysis is important for measuring the quantity of the water molecules chained with biology macromolecules and to predict bounded water properties.

Science chef: PhD

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