The role of size effects in the study of nanoparticles by scanning probe microscopy

The purpose of this scientific work is to investigate the role of size effects in the terahertz radiation generation. The first step in this study is the characterization of the experimental samples of gold nanoparticles and graphene on the surface of silicon doped with phosphorus using scanning probe microscopy. The second stage is the study of the process of terahertz radiation generation from a silicon surface with gold nanoparticles and a graphene monolayer when exposed to femtosecond laser radiation.

An experimental setup for recording the terahertz response of the surface was developed and created for this study. The generation of terahertz radiation was experimentally recorded for the first time in a given geometry (sliding incidence angle, registration normal to the surface of the sample) and conditions of ultrahigh vacuum. It was experimentally established that the graphene monolayer on the silicon surface makes a significant contribution to the intensity of the generated terahertz radiation, increasing the efficiency of this process by 3 times. The presence of gold nanoparticles on the silicon surface affects the generation of terahertz radiation and changes the form of the dependence of the power of terahertz radiation on the power of the incident radiation.