Diploma thesis abstract

Combined optoacoustic and laser ultrasonic tomography of biological tissues

Bychkov A.S.

Academic adviser: Prof. Dr. Karabutov A.A.

This diploma thesis contains 61 pages, 28 illustrations, 1 table, 37 references, 2 appendices.

Keywords: laser induced ultrasound and optoacoustic tomography, phased arrays of focused detectors, point-spread functions, real-time signal processing.

In this work a review of current works in optoacoustic (OA) and laser-ultrasound (LU) tomography is given. Mathematical modelling of sensitivity maps of phased arrays with various geometries was conducted. Requirements on detection antenna parameters according to the task given are formulated. Methodology is described and mathematical modelling of tomographical images for a point source and blood vessels models was conducted. Description of the universal hardware/software solution with automated 3D positioning system of experimental objects is given. Experimental setup for combined real-time LU and OA tomography was created. Verification of the experimental setup was made. Experiments on modelling of needle insertion into blood vessel model and comparison of calculated and experimental data were conducted. Good agreement of calculated and experimental results was obtained.