Diploma thesis abstract, 625 Student Account Group

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"Opto-acoustic diagnostics of the temperature impact on biological tissues induced by the high-intensity focused ultrasound"

Thermal impact induced by the High Intensity Focused Ultrasound (HIFU) on biological tissues can cause their coagulation necrosis at the specified location within a human body. This fact has been using in medical practice for the low-impact treatment of tumors, stoping the internal bleedings and other applications. However, the wide application of this method is affected by the lack of reliable methods for temperature controlling during HIFU impact.

The possibility of the opto-acoustic (OA) method application for monitoring of HIFU impact on different biological tissues is studied in the current work. The experimental part of the present work is aimed at the experimental *in-vitro* study of the dependence of the OA signal amplitude on the temperature in different *ex-vivo* tissues, in the temperature range of 20°C - 80°C. We used chicken breast as a model of muscle, porcine liver as a model of richly perfused tissue, and lard as a model of fatty tissue. Characteristic features of the temperature dependencies in tissues under study were described in terms of the difference of its structures.

Numerical calculation of OA signal profiles during HIFU impact is performed with use of the temperature dependencies measured experimentally for the different the detector locations and geometries of the probe laser radiation. 2D optoacoustic images of the heat release distribution within the model medium for the focal zone of the HIFU sourse have been obtained. It is shown that the temperature dependence of the OA image amplitude coincides withiun a constant factor with the measured calibrating dependence. Shown that the temperature dependence of the OA image coincides with the maesured gauge dependence of the amplitude of the optoacoustic signal on the temperature to within a constant factor. Thus, the possibility of quantitative monitoring of tissue heating during HIFU impact has been demonstrated.

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