The aim of the research project is the optimization and automation of non-invasive percutaneous technology of forming the thermal damage to the entire volume of the primary solid breast tumor, implanted into the rat mammary gland *in vivo*, by means of the proposed bi-modal equipment, enabling ultrasonic heating of small tissue volume within the tumor under the control of ultrasonic imaging, as well as automatic 3D scanning of the heating beam focus throughout the entire volume of the tumor. During the implementation of the project the conducted research will be aimed at determination of the optimum exposure of the tumor to pulsed high intensity focused ultrasound (High Intensity Focused Ultrasound - HIFU) able to induce coagulation necrosis in a small volume within the tumor, as well as at selection of the speed of 3D scanning of the heating beam focus across the interior tumor volume, which leads to the "merging" (connecting) of necrotic areas induced by single exposures, without damaging healthy tissues adjacent to the tumor.

In Poland, the cancers are the second cause of death overall and first before the age of 65. Demand for new anticancer therapies is increasing every year. The increase in demand is driven by both, the increase of the incidence of cancer, as well as the appearance of an effective, but very expensive, innovative methods of treatment. Since 2011, the costs of oncological treatments in Poland amount to over 6 billion zloty per year. The main objective of the research on the medical and technical aspects of new methods of combating cancer is to reduce the unwanted side effects associated with conventional methods of treatment. Percutaneous (non-invasive) HIFU technique gives the chance to radically reduce side effects. Compared with conventional cancer therapies (surgery, radio- and chemotherapy) advantage of the HIFU technology, justifying the need for its further development, is its non-invasiveness, minimized pain for the patient, low cost compared with surgery, lack of ionizing radiation during imaging of necrotic lesions using diagnostic ultrasound (US) or magnetic resonance (MR), as well as the lack of scars, minor complications after the therapy, theoretically unlimited number of repeated treatments and low operating costs.

Possessed interdisciplinary knowledge, ability to solve problems both technical and medical problems, and the experience gained during the implementation of previous research project (implemented in 2015) tend applicants to take to solve the problem of selection of optimal exposure to focused ultrasound and speed of the 3D scanning of the heating beam focus to optimize and automate the technique for producing coagulation necrosis throughout the tumor volume, leaving intact the surrounding healthy tissues.