breast self-check, looking for any changes in the size, shape, color, any distortion, swelling, etc. With the final implementation of this mobile application, it is expected the Bulgarian users to get more informed about the importance of breast screening and understand the importance of breast prevention activities.

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3D printing of anthropomorphic breast phantoms dedicated to research of X-ray image modalities

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Physical phantoms are a basic tool for the assessment and verification of performance standards in daily clinical practice of X-ray imaging modalities. Most of the physical phantoms have a homogeneous background with inserted test objects. For research purposes, many of the existing phantoms should be developed to a next degree of sophistication in order to mimic the real objects more closely in terms of radiographic and anatomical properties. The development of 3D printing technologies opens potentially new possibilities for phantom manufacturing. The aim of this study is to explore the absorption properties of common 3D printing materials such as resins, PLA, ABS, etc. and to estimate their potential for production of the anthropomorphic phantoms. To achieve this goal, step-wedge phantoms were computationally modeled and then manufactured using two popular 3D printing technologies: stereolithographic and fused-deposition modeling. X-ray images of the phantoms were acquired, using monochromatic beam at ID17, ESRF, Grenoble for three energies – 30 keV, 45 keV and 60 keV. Experimental data were further processed to obtain the linear attenuation coefficients of these materials. Comparison with theoretical data for the linear attenuation coefficients for breast tissues was performed. Based on the results, several breast anthropomorphic phantoms were manufactured. Finally, a practical approach for printing anthropomorphic phantoms has been established and verified. From the studied materials, most of the resins, Hybrid, PET-G show absorption properties close to the glandular tissue, while ABS shows absorption characteristics close to these of the adipose tissue. It allows the production of complex shapes, which are very advantageous for the case of breast phantoms.

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Protection of personnel and patients in diagnosis and therapy with ionizing and non-ionizing radiation

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Most of the sources used in physiotherapy use pulse magnetic fields; spark-discharges; radiofrequencies (RF); direct and low-frequency electric currents, electrical pulses; ultraviolet (UV) and infrared (IR) radiation; broad-spectrum lamps; lasers. The most relevant diagnostic sources are MRI scanners emitting static magnetic field, low-frequency fields, RF. The exposure of medical personnel to NIR depends on the type of transmitter, irradiation power, mode of operation, specific application, access of medical personnel to the treatment zone, shielding of the source and workplace, time duration of exposure.

Devices for electric current therapy like pulses, ionophoresis therapy, vacuum therapy, emit magnetic field less than several μT. The devices for subthermal therapy emit RF energy up to 9,8 W/kg, compared to 0,4 W/kg basic restriction for whole body exposure. The average daily dose of the staff at 10 patients per day is 18,356 $(V/m)^2 \cdot h$. The dose of medical personnel in protective chambers averaged per patient is $W_E = 23{,}88\ (V/m)^2 \cdot h$.

Regard to MRI equipment, the basic restrictions for static magnetic field for normal operating conditions exceed the action values for people at specific risk, also for risk of attracting ferromagnetic materials. In the case of the use of optical sources, power densities exceed the exposure limit values, and therefore the permissible stay is limited to minutes and seconds, and in some cases it is inadmissible. In cosmetic centers, sanatoriums and SPA centres, power densities are significant and some of them are not controlled (tanning beds and IPL systems).

The laser systems applied in physiotherapy are mainly class 3R (visible range), which only pose a risk to the eyes, in some cases 1C. For some procedures, lasers of class 3B are also used which cause risk to the eye by intra-beam viewing as well as diffuse reflected radiation. In cosmetic centers where specific lamps and high class (4) lasers are used, there is a risk for serious skin burns and eye damage.

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Professional realization of specialists in medical sanitary physics and sanitary engineering

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In Bulgarian legislation there are basically two medical specialties for physicists and engineers:

- *medical radiological physics*
- *medical sanitary physics*

In addition, for engineers, architects, environmentalists, the main medical specialty is:

- *Sanitary engineering.*

Here, we focused only on the specialties *medical sanitary physics*and*sanitary engineering* that are important for the prophylactic medicine.

These training courses last for 3 years, and trainees receive the highest degree of competence in the field of *measurement and exposure assessment of physical factors, risk evaluation and management, possible health effects of ionizing and non-ionizing radiation, methods for prevention.*Simultaneously, they are trained in the field of *occupational and environmental health concerning human exposure to physical factors.*Such, they are the best specialists for medical units dealing with imaging and medical treating using non-ionizing radiations (NMR, ultrasound, UV and IR radiation), for the health control bodies of the working and living environment, for ecological expertizes, for occupational health services. Unfortunately, most of them are requalified as medical radiological physicists and other professions or they are leaving the country because of better incomes and respect.