profile, a compact diagnostic device can be developed. The research was carried out using MI-6 microtron at Tomsk Polytechnic University.

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INVESTIGATION OF SEASONAL DYNAMICS OF *β*- AND *γ*-RADIATION FIELDS VERTICAL PROFILE IN THE SURFACE ATMOSPHERIC LAYER

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Since 2010 TPU together with IMCES have studied the dynamics of *β*- and *γ*-radiation fields vertical profile in the surface atmospheric layer.

On the experimental platform TPU - IMCES for monitoring flux density of *β*- radiation and the ambient dose equivalent rate of *γ* -radiation in the surface atmospheric layer scintillation detectors BDPB-01 and BDKG-03 (ATOMTEX, Republic of Belarus) installed respectively at 1, 5, 25, 30, 35 m and 1.5, 25 m are used. The monitoring of meteorological, actinometrical and atmospheric-electrical values is performed via automated information measuring system.

The results of monitoring data for the 2012-2014 years are shown in Figure 1. The variations of *β*- and *γ*-background have weakly expressed maximum in summer every annual cycle. It was found out that the gradient of the vertical profile fields of *β*- and *γ*-radiation can have different sign depending on the season. In spring, summer and autumn seasons in the absence of snow cover, there is a decrease of *β*-radiation flux density and *γ*-radiation dose rate occurring with increasing distance from the earth's surface. The appearance of snow cover leads to a significant change in the vertical profile fields of *β*- and *γ*-radiation.

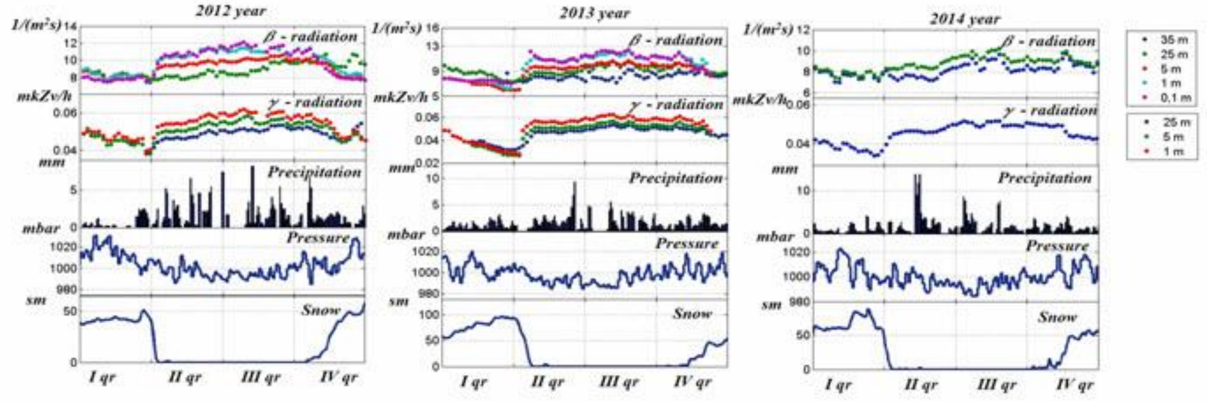

Fig. 1. Dynamics of radiation and meteorological values

Analysis of monitoring results has led to the following conclusions. A significant seasonal change in the vertical field profile of β- and γ-radiation has been revealed. It has been found out that in warm season there is a decrease of β-radiation flux density and γ-radiation dose rate occurring with increasing distance from the earth's surface, and in winter period - an inverse relationship is shown.

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ELECTRON BEAMS FOR RADIOTHERAPY

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In this paper the theoretical component of the electron beams application in radiotherapy is considered. The physical properties of the beams impact on the organ or part of the body affected by tumor are described. Applications of this method are studied, namely for which organs and body parts it is more suitable. Finally, the advantages of this method and future prospects for its use in medicine are found out.

The most important issue in curative cancer treatment is how to maximize effects on tumor without incurring serious damage to normal tissue. Exposure of biological tissue to ionizing radiation immediately leads to ionization and excitation of their constituent atoms making them fall apart in so-called free radicals. They react with other nearby molecules, thereby transferring chemical damage to them and, consequently, to the tumor [1]. Megavoltage electron beams represent an important treatment modality in modern radiotherapy, often providing a unique option in the treatment of superficial tumors (less than 5 cm deep) [2]. Electron beam therapy is performed using a medical linear accelerator. Electron beams have a finite range, after which dose falls off rapidly, eventually to a near-zero value. Therefore, they spare deeper healthy tissue. There is no surface sparing effect, so electron therapy is used when the target extends to the patient's skin.

Electron beam therapy is used in the treatment of superficial tumors, such as cancer of:

1) skin: eyelids, nose, ears, lips, scalp, limbs;
2) upper-respiratory and digestive tract: floor of mouth, soft palate, retromolar trigone, salivary glands;
3) breast: chest-wall irradiation following mastectomy, nodal irradiation;
4) other sites: retina, orbit, spine (craniospinal irradiation), pancreas and other abdominal structures (intraoperative therapy), cervix (intracavitary irradiation).

Major attraction of the electron beam irradiation is the shape of the depth dose curve. Region of more or less uniform dose followed by a rapid dose drop-off offers a distinct clinical advantage over the conventional x-ray modalities. Most useful treatment depth, or therapeutic range, of electrons is given by the depth of the 90% depth dose. In some instances, internal shields need to be used to protect underlying sensitive structures.

Electron therapy can be expected to become more sophisticated in the future, as the enthusiasm for intensity-modulated radiation therapy will carry into electron therapy. Advances in electron dose calculations, methods for electron-beam optimization, and availability of electron multileaf collimators will enable further application of the intensity-modulated and energy-modulated electron therapy.