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ASSESSMENT OF SOME UNACCOUNTED CONTRIBUTIONS TO THE ABSORBED DOSE DURING RADIATION THERAPY

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Radiation therapy is widely used in the treatment of various types of cancer today. However, a number of factors are not taken into account at the planning stage of radiation treatment. This may be the reason for the additional dose load on the patient.

When medical electron accelerators operate at energies above 8 MeV, fluxes of secondary neutrons can be generated. The contribution to the dose from secondary neutrons is not estimated and is not taken into account in modern planning systems. To evaluate this contribution, a computer model of the medical linear accelerator head, verified based on the depth dose distribution in water, is used. As a result of Monte Carlo simulation, spectra of secondary neutrons were obtained and their contribution to the absorbed and equivalent doses was assessed.

Secondary neutrons can also be produced on structural elements of proton accelerators and even in the patient's body during proton and hadron therapy. A simulation was carried out and an estimate of the additional dose load from neutrons produced on the modulator wheel of a proton accelerator was obtained. In addition, to assess the risks for personnel and accompanying personnel, the parameters of neutron radiation generated in the water phantom during irradiation with proton beams were calculated.

Another factor not taken into account is distortion of MR images. It can lead to radiation treatment not meeting the plan. As a result of various experiments on MRI machines with a magnetic field induction of 0.5 T and 1.5 T, the distortion of images of homemade phantoms was assessed. Based on the images obtained, a radiation treatment plan was constructed and compared with a similar plan based on CT images, and the unaccounted dose was assessed.

Section

Applications of nuclear methods in science, technology, medicine and radioecology

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