Determining of Electron Beam Percentage Depth Dose in Media with Varied Density by Longitudinal Arranged Dosimetry Film: Simulation Results

I.Miloichikova[a,b1]***, A.Bulavskaya***[a,]***, Yu.Cherepennikov***[a]***, S.Stuchebrov***[a]

[a] *National Research Tomsk Polytechnic University, Tomsk, Russia*
[b] *Cancer Research Institute of Tomsk National Research Medical Center of the Russian Academy of Sciences, Tomsk, Russia*

It has become a standard to monitor the parameters of clinical electron radiation sources. To increase the accuracy of irregular dose field measurement, it is necessary to measure the percentage depth dose (PDD), for instance, in a 3D printing material with density differs from the 1 g/cm^3. The purpose of this work is to explore the possibility to determine the PDD in media with different densities using dosimetry films.

We use the Monte-Carlo method for simulation. A flat 10×10 cm^2 parallel electron beam with a uniform distribution falls on a water phantom.

Water is a medium for the beam propagation, and we can vary its density in the settings. The density varies from 0.4 to 2.3 g/cm^3 and the chemical composition remains constant. Simulation for each density is carried out in two geometries: 1 - electrons propagate in a homogeneous medium; 2 - flat dosimetry film corresponding to the Gafchromic EBT3 film (1.2 g/cm^3 density) is placed in the path of the beam and oriented along the electron motion.

The results show that tissue-equivalent dosimetry films can be arranged longitudinally to measure the electron beam PDD in media with densities from 0.9 to 1.8 g/cm^3. This can simplify the experimental measurements of the PDD in 3D printing materials with densities close to water.

This work is supported by the Russian Science Foundation, project No. 19-79-10014.

[1] Corresponding author: miloichikova@tpu.ru