

ESTIMATION OF DOSE RATES AT THE ENTRANCE SURFACE FOR EXPOSURE SCENARIOS OF TOTAL BODY IRRADIATION USING MCNPX CODE

J. S. Cunha¹, F. R. Cavalcante¹, S. O. Souza¹, D. N. Souza¹, W. S. Santos², A. B. Carvalho Júnior¹

¹Departamento de Física, Universidade Federal de Sergipe, São Cristóvão, Brazil;

²Instituto de Física, Universidade Federal de Uberlândia (INFIS/UFU), Uberlândia, MG, Brazil

scjulyanne@gmail.com

Abstract

One of the main criteria that must be held in Total Body Irradiation (TBI) is the uniformity of dose in the body. In TBI procedures the certification that the prescribed doses are absorbed in organs is made with dosimeters positioned on the patient skin. In this work, we modelled TBI scenarios in the MCNPX code to estimate the entrance dose rate in the skin for comparison and validation of simulations with experimental measurements from literature. Dose rates were estimated simulating an ionization chamber laterally positioned on thorax, abdomen, leg and thigh. Four exposure scenarios were simulated: ionization chamber (S1), TBI room (S2), and patient represented by hybrid phantom (S3) and water stylized phantom (S4) in sitting posture. The posture of the patient in experimental work was better represented by S4 compared with hybrid phantom, and this led to minimum and maximum percentage differences of 1.31% and 6.25% to experimental measurements for thorax and thigh regions, respectively. As for all simulations reported here the percentage differences in the estimated dose rates were less than 10%, we considered that the obtained results are consistent with experimental measurements and the modelled scenarios are suitable to estimate the absorbed dose in organs during TBI procedure.

Key words:

Total Body Irradiation, Monte Carlo simulation, dose rate.

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