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Investigation of conditions for electron equilibrium establishing in thermoluminescent dosimeter

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The aim of this study is discussing about how to establish the electron equilibrium (EE) in simulation of Thermoluminescent Dosimeter (TLD) by Monte Carlo code. LiF TLD was modeled in MCNP code and the photon energy of 1 MeV was considered. Due to the small volume of TLDs (~ 3×3×0.89 mm^3), simulations are extremely time-consuming and that is a problem in Monte Carlo simulation. One way to reduce the run-time is to establish the EE, therefore one can use kerma approximation instead of the absorbed dose calculation in the MCNP (Monte Carlo N-Particle Transport Code) code. For this purpose, LiF TLD was surrounded by the different wrapping materials (Aluminium and Teflon), therefore LiF TLD was surrounded by AL and Teflon. The thickness (and volume) of these wrappings were obtained 0.329 cm (0.082 cm^3) and 0.339 cm (0.217 cm^3) for Aluminium and Teflon, respectively. However, finding suitable thickness for different materials at each energy is a time consuming process in this way. The second way to establish the EE is placing a huge volume in the front of TLD. For this purpose one LiF TLD was placed on the chest and the other TLD on the back of the phantom (the anatomical models of the human body). Results show that when phantom was irradiated from the front the EE is established for back TLD and vice versa. In this way, the establishing of the EE is dependent on the position of TLD. The third way is enlarging the TLD volume and replacing LiF by air as TLD material. Results indicate that by increasing the volume from 10^{-3} till 105 cm^3, the absorbed dose remains constant in air TLD ,but it decreases in LiF TLD; whereas for very small volume the results of two TLDs are consistent with each other. In this way, the EE is established without any restriction.

Biography

Keyhandokht Karimi Shahri has completed her PhD in Nuclear Physics from Ferdowsi University of Mashhad in 2014. She is Assistant Professor of Birjand University. She has published 10 papers. Her interests are Dosimetry Calculations, Radiation Protection Dosimetry and Radiation Dosimetry and Anatomical Modeling for Various Applications in Health Physics.

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