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# Study of electron microdosimetry using experimental cross-sections compared to the default cross-sections of the Geant4-DNA code

**M. Mokari[1*], H. Moeini[2]**

[1]Department of Physics, College of Sciences, Behbahan Khatam Alanbia University of Technology, Behbahan, Iran.
[2]Department of Physics, School of Science, Shiraz University, Shiraz, Iran.

[*]Department of Physics, Behbahan Khatam Alanbia University of Technology, Zeydun Road, Behbahan, Iran.
P. O. Box: 63616-63973
Email: mokari@bkatu.ac.ir

## Abstract

Microdosimetry is an approach that can be very effective in improving the quality of radiation therapy. Based on the possible concept of deposited energy in microbiological tissues and environments, this knowledge can help to calculate and examine the quantities related to the effect of radiation. In this research, using the Geant4-DNA code in conjunction with experimental cross-sections and the μ-randomness method, the microdosimetry quantities known as the frequency-mean lineal energy and frequency-mean specific energy were calculated for low-energy electrons. The calculations concerned cylinders that are comparable in size with living organisms such as DNA, nucleosome, and chromatin fiber, distributed randomly in a sphere of water with a diameter of about the average size of the nucleus of human cells. The results were compared with the ones obtained based on the default cross-sections of Geant4-DNA. We found that the average values of (frequency-mean) lineal and specific energy calculated with experimental cross-sections were larger than those calculated with default cross sections. The maximum difference of these quantities was observed, in the so-called small and medium cylinders, at 0.1 keV and, in the large cylinder, at 0.3 keV. Also, for a volume comparable in size to DNA, a good correspondence between the results of frequency-mean lineal energy with experimental cross-sections and the electron DNA-damage in the cell was observed.

**Keywords**: Geant4-DNA code, electron, cross-sections, microdosimetry, lineal energy, specific energy.

For full article, refer to the Persian section.