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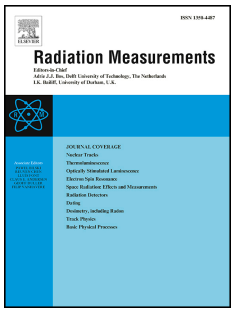


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# Monte Carlo simulation of a new TEPC for microdosimetry at nanometric level: response against a carbon ion beam

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## *ABSTRACT*

The lower operation limit of common tissue equivalent proportional counters (TEPCs) is about 0.3 µm in simulated site. On the other hand, the pattern of the particle interactions at the nanometric level, which has a correlation with the radiation induced damage on the DNA, is measurable by only three instruments worldwide. In order to fill this gap, a novel TEPC capable of simulating site sizes down to 25 nm was designed and constructed. Its response was characterized with gamma, neutron and carbon beams and the capability in measuring microdosimetric spectra at 25 nm was demonstrated. The present paper aims at describing a further characterization of this TEPC by simulating with the Monte Carlo FLUKA code the microdosimetric spectra measured with a carbon beam. Since the sensitive volume of the TEPC has an unconventional shape, a study on the chord length distribution for the adopted irradiation set-up was performed and compared with the analytical one. The results show a good agreement between the experimental data and the FLUKA simulations, showing that this code is capable of reproducing microdosimetric spectra of a carbon beam down to 25 nm in simulated site.

**Keywords**: Microdosimetry; Nanodosimetry; Tissue Equivalent Proportional Counter (TEPC); FLUKA; Monte Carlo simulation;

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