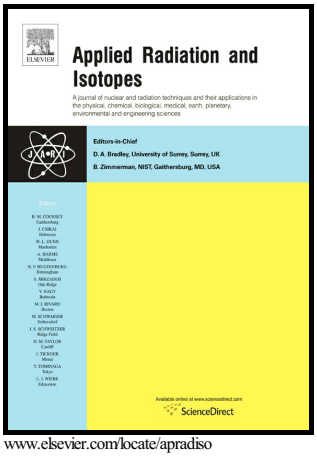

www.elsevier.com/locate/apradiso

A Monte Carlo investigation of the dose distribution for ^{60}Co High Dose Rate brachytherapy source in water and in different media

Hamza Badry, Lhoucine Oufni, Hmad Ouabi, Hideo Hirayama

PII: S0969-8043(17)31475-6
DOI: https://doi.org/10.1016/j.apradiso.2018.02.016
Reference: ARI8268

To appear in: *Applied Radiation and Isotopes*

Received date: 27 December 2017
Revised date: 11 February 2018
Accepted date: 14 February 2018

Cite this article as: Hamza Badry, Lhoucine Oufni, Hmad Ouabi and Hideo Hirayama, A Monte Carlo investigation of the dose distribution for ^{60}Co High Dose Rate brachytherapy source in water and in different media, *Applied Radiation and Isotopes,* https://doi.org/10.1016/j.apradiso.2018.02.016

A Monte Carlo investigation of the dose distribution for ^{60}Co High Dose Rate brachytherapy source in water and in different media

Hamza Badry [1], Lhoucine Oufni [1,*], Hmad Ouabi [2] and Hideo Hirayama [3]

[1] Sultan Moulay Slimane University, Faculty of Sciences and Techniques, Department of Physics (LPM-ERM), B.P. 523; 23000 Béni-Mellal, Morocco

[2] Oncology Center Al Azhar, Rabat, Morocco

[3] Applied Research Laboratory, KEK, High Energy Accelerator Research Organization, 1-1 Oho, Tsukuba, Ibaraki, 305-0801, Japan

Abstract

In this study, the dosimetric characterization for The BEBIG ^{60}Co High Dose Rate (HDR) brachytherapy source model Co0.A86 was investigated and the validity of the EGS5 Monte Carlo code to reproduce the dosimetric parameters in water phantom was checked. In addition, the dose distribution for different tissue phantoms was calculated. The BEBIG ^{60}Co HDR brachytherapy source was modeled using EGS5 Monte Carlo simulation code. A description of the source design, geometry and materials used in this work were provided. According to the update TG43-U1 formalism of AAPM, the air kerma strength, the dose rate constant, 2D rectangular dose distribution in water were calculated, moreover, the results of the radial dose function were obtained in water and different tissue phantoms; bone, lung, adipose tissue, breast and muscle. The obtained results were tabulated and presented in graphical formats for the comparison with available data. The calculated value of the air kerma strength of this study, 3.0419 U.Bq^{-1}, agree well with that of the other Monte Carlo calculation. The 2D look-up along-away rectangular dose were obtained in water, the results were similar to the published data for all distances larger than 1 cm, for the distances near to the source region on the transversal source axis small differences are apparent. The radial dose function were presented in graphical format for the comparison between the dose distribution in water and different tissue phantoms. The EGS5 results obtained in this study shows good consistency with the published data for the dosimetric parameters of the of the BEBIG ^{60}Co HDR brachytherapy source. It seems that the radial dose function calculated in water differed in tissue phantoms due to the atomic composition and densities for media that are not taken account by the TG43-U1 formalism.

Keywords: Monte Carlo, Brachytherapy, Dose, ^{60}Co.

*Corresponding author: Lhoucine Oufni
E-mail address: oufni@usms.ma , loufni@gmail.com