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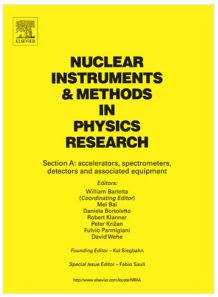

Stopping power and dose calculations with analytical and Monte Carlo methods for protons and prompt gamma range verification

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PII: S0168-9002(18)30552-7
DOI: https://doi.org/10.1016/j.nima.2018.04.045
Reference: NIMA 60765

To appear in: *Nuclear Inst. and Methods in Physics Research, A*

Received date : 16 November 2017
Revised date : 7 March 2018
Accepted date : 22 April 2018

Please cite this article as: M. Usta, M. Ṫufan, G. Aydin, A. Bozkurt, Stopping power and dose calculations with analytical and Monte Carlo methods for protons and prompt gamma range verification, *Nuclear Inst. and Methods in Physics Research, A* (2018), https://doi.org/10.1016/j.nima.2018.04.045

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Stopping power and dose calculations with analytical and Monte Carlo methods for protons and prompt gamma range verification

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Abstract

In this study, we have performed the calculations stopping power, depth dose, and range verification for proton beams using dielectric and Bethe-Bloch theories and FLUKA, Geant4 and MCNPX Monte Carlo codes. In the framework, as analytical studies, Drude model was applied for dielectric theory and effective charge approach with Roothaan-Hartree-Fock charge densities was used in Bethe theory. In the simulations, different setup parameters were selected to evaluate the performance of three distinct Monte Carlo codes. The lung and breast tissues were investigated are considered to be related to the most common types of cancer throughout the world. The results were compared with each other and the available data in literature. In addition, the obtained results were verified with prompt gamma range data. In both stopping power values and depth-dose distributions, it was found that the Monte Carlo

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