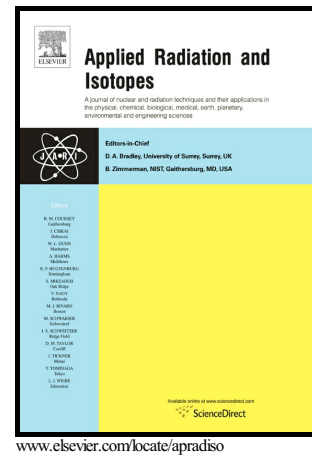


Author's Accepted Manuscript

Simulation of a complete X-ray digital radiographic system for industrial applications

E. Nazemi, B. Rokrok, A. Movafeghi, M.H. Choopan Dastjerdi



PII: S0969-8043(17)31342-8
DOI: <https://doi.org/10.1016/j.apradiso.2018.05.017>
Reference: ARI8366

To appear in: *Applied Radiation and Isotopes*

Received date: 21 November 2017
Revised date: 18 April 2018
Accepted date: 17 May 2018

Cite this article as: E. Nazemi, B. Rokrok, A. Movafeghi and M.H. Choopan Dastjerdi, Simulation of a complete X-ray digital radiographic system for industrial applications, *Applied Radiation and Isotopes*, <https://doi.org/10.1016/j.apradiso.2018.05.017>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Simulation of a complete X-ray digital radiographic system for industrial applications

E. Nazemi¹, B. Rokrok^{*}, A. Movafeghi, M.H. Choopan Dastjerdi

Nuclear Science and Technology Research Institute, Tehran, Iran.

^{*}Corresponding author. brokrok@aeoi.org.ir

Abstract

Simulating X-ray images is of great importance in industry and medicine. Using such simulation permits us to optimize parameters which affect image's quality without the limitations of an experimental procedure. This study revolves around a novel methodology to simulate a complete industrial X-ray digital radiographic system composed of an X-ray tube and a computed radiography (CR) image plate using Monte Carlo N Particle eXtended (MCNPX) code. In the process of our research, an industrial X-ray tube with maximum voltage of 300 kV and current of 5 mA was simulated. A 3-layer uniform plate including a polymer overcoat layer, a phosphor layer and a polycarbonate backing layer was also defined and simulated as the CR imaging plate. To model the image formation in the image plate, at first the absorbed dose was calculated in each pixel inside the phosphor layer of CR imaging plate using the mesh tally in MCNPX code and then was converted to gray value using a mathematical relationship determined in a separate procedure. To validate the simulation results, an experimental setup was designed and the images of two step wedges created out of aluminum and steel were captured by the experiments and compared with the simulations. The results show that the simulated images are in good agreement with the experimental ones demonstrating the ability of the proposed methodology for simulating an industrial X-ray imaging system.

Keywords: X-ray tube, Computed radiography, Imaging plate, Industrial radiography, MCNP simulation.

1. Introduction

Download English Version:

<https://daneshyari.com/en/article/8208476>

Download Persian Version:

<https://daneshyari.com/article/8208476>

[Daneshyari.com](https://daneshyari.com)