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Simulation of Slot-Scan imaging system with GATE and images quality evaluation

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Abstract

Interest in slot scanning imaging system has been increased recently because of its advantages such as high image resolution, reduction in patient dose and reduction in image distortion. The purpose of this study is to simulate a slot scanning imaging system using GATE multi-purpose Monte Carlo code and design an object phantom to evaluate image quality. The energy spectrum of X-ray in the radiological diagnostic range was simulated by GATE Monte Carlo code. An object phantom consisting of stripes with different thicknesses of copper was then designed to determine CNR and line pairs per millimeter to determine spatial resolution. The results showed that the simulated energy spectrum were in accordance with experiment. The evaluated parameters of image quality obtained from the simulations were compared with X-ray images using standard image quality criteria to determine the capabilities of the slot scanning imaging method. The spatial resolution of the simulated images was obtained to be 1.6 lp / mm for the slot scanning method, which is in the range of clinical radiology images. Therefore, this simulated model can be used to investigate and optimize other influential parameters such as filtration effect and collimator slit width effect, object distance to the detector in slot scanning imaging system.

Keywords: Slot Scanning imaging system, GATE code, image quality, line pair/mm

For full article, refer to the Persian section