



Contribution ID: 27

Type: **Poster**

P2.74: Experimental validation of Monte Carlo simulation model for X-ray security scanner

Wednesday, 28 June 2023 17:58 (1 minute)

Transmission X-ray security scanners are used to detect the smuggling of contraband articles, including weapons, narcotics, and explosives for homeland security. Current X-ray scanners use fixed tube voltages (i.e., 160 kVp); hence, it has a limitation in detecting thinly coated and/or low-density objects. To overcome this limitation, we are designing an X-ray scanner applying a variable tube voltage depending on the physical/chemical properties of the object being inspected. To this end, the Monte Carlo simulations with Geant4 and MCNP6 were performed to optimize the design of the X-ray scanner with variable tube voltages. In the present study, we experimentally validated the reliability of the Monte Carlo simulation model for the X-ray scanner. The X-ray images obtained by the experiment were compared with the simulated images. The experimental setup is shown in Figure 1. The source-to-object distance (SOD) and the source-to-detector distance (SDD) was 70 cm and 120 cm, respectively, as applied to a typical security scanner. The tube voltage and the current were 80 kVp and 10 mA, respectively. The object was scanned at a speed of 0.2 m/s on a conveyor system to obtain the images. Simulated images were obtained using the X-ray source term produced from a monoenergetic electron beam bombarded onto the target (i.e., 80 kVp). 4-D simulations were performed for a moving object. The profiles of the simulated and experimental images were compared to validate the simulation model. It was found that the difference in pixel count between experiment and simulation was less than 5%. Thus, we concluded that our simulation model for the X-ray scanner can be considered reliable.

Primary authors: PARK, Junsung (Jeonbuk National University); Mr AN, Geunyoung (Jeonbuk National University); Prof. SEO, Hee (Jeonbuk National University)

Presenter: PARK, Junsung (Jeonbuk National University)

Session Classification: Poster (incl. coffee)