

Objective: Results from simulated SEDR imaging experiments are used to investigate the effects of slot-scanning and exposure equalization on the rejection and redistribution of scattered radiation

Method: A two-dimensional collimator system was mounted on a linear scanner to generate a $1.4 \times 1 \text{ cm}^2$ spot x-ray beam and scan it across an anthropomorphic chest phantom. Each spot image consists of a $1.4 \times 1 \text{ cm}^2$ area of largely primary signals and scatter only signals detected outside the spot area. Exposure equalization factors were computed from a slot-scan image with in-slot scatter components corrected. These factors were multiplied with the spot image data with the outside-slot data cut to obtain the simulated SEDR image data. Scatter-to-primary ratios (SPRs) were measured to compare the SEDR, slot-scanning and anti-scatter grid methods for their reject scatter ability and overall image quality improvement, quantified by relative contrast-to-noise ratio ($\text{RCNR} = p^{1/2}/[1+s/p]^{1/2}$).

Results: Compared to the anti-scatter grid method, slot-scanning with comparable x-ray technique settings resulted in substantially reduced SPRs in all regions. For overall image quality, it resulted in much improved RCNRs in the lung areas but only slightly improved RCNRs in the heavily attenuated areas. SEDR with comparable x-ray technique settings, on the other hand, resulted in substantially reduced and uniformly varying SPRs in all areas. For overall image quality, it resulted in similar RCNRs in the lung areas but much improved RCNRs in the heavily attenuated regions.

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