

AbstractID: 11453 Title: Effects of added x-ray beam Cu filtration on image quality and patient dose in digital radiography

Purpose: To quantify effects of added x-ray beam Cu filtration on image quality, skin entrance exposure, and effective dose in digital radiography.

Method and Materials: A GE Definium 8000 DR unit, in AEC mode, was used with a 20 cm thick acrylic phantom to simulate an average adult abdomen. 0.0, 0.1, and 0.2-mm of Cu filtration were added to the x-ray beam. We used 75, 80, 85, 90, 95, 100, and 110kV. Image quality was compared using a contrast-detail phantom (CDRAD). For each beam quality, we exposed the CDRAD phantom on top, below, and between two 10-cm sections of the acrylic phantom, and at four different orientations relative to anode-cathode axis. The results were averaged. Image processing parameters were the ones used clinically for an AP Abdomen exam. The images were analyzed using the CDRAD Analyzer software. Skin-entrance exposures, based on AEC resultant mAs read-out, were measured without backscatter, and effective doses for an average size adult phantom were calculated using the PCXMC software.

Results: At 75-80kV addition of Cu filtration reduced image quality slightly (~1-5%), skin-entrance exposure by 38-52%, and effective dose by 12-21% relative to no additional Cu filtration. At 90-110kV image quality varied little (~0-4%) with added Cu filtration, skin entrance exposure was reduced by 28-47%, and effective dose was reduced by up to 17%. Only at 85 kV image quality was reduced significantly (~13-15%) with added Cu filtration. Skin-entrance exposure was reduced by 35-48%, and effective dose was reduced by 8-17%.

Conclusion: Although already a relatively low dose modality, DR may benefit from the use of additional x-ray beam Cu filtration since, for most x-ray beam qualities, image quality appears to change little, while patient doses are reduced more appreciably compared to using beams with no additional Cu filtration.

Conflict of Interest (only if applicable):