

AbstractID: 14152 Title: Characterizing the Scattered Radiation from a C-arm Fluoroscope

Purpose: Fluoroscopic procedures result in staff exposure from scattered radiation and are a radiation safety concern. Our purpose is to investigate the intensity and mean energy of this scattered radiation. The intent is to use the results to guide staff in the choice of preferred position relative to the patient and in the choice of protective clothing.

Method and Materials: A C-arm fluoroscope was positioned to image the abdomen and pelvis of a RANDO phantom. The technique factors were initially established by the automatic exposure system, then fixed to allow for multiple measurements of scattered radiation and beam energy. The technique factors were maintained at 70 kVp and 5.4 mA for all measurements. Detailed measurements were performed with the beam positioned posterior to anterior with an additional set of measurements performed in the anterior to posterior orientation. Radiation exposure was measured at various distances and angles from the phantom. The mean energy of the scattered radiation was also determined at several locations and C-arm orientations.

Results: The intensity of scattered radiation is a function of both distance and angle of measurement relative to the phantom. The intensity in the long-axis direction of the phantom, even for equal distance from the x-ray field, is significantly less than the intensity at the phantom's side. The intensity also depends upon the orientation of the x-ray tube. Scattered radiation, measured at the operator's eye level, is approximately five times greater when the x-ray tube is positioned above the patient versus below the patient. The mean energy of the scattered radiation varied very little.

Conclusion: Radiation scatter about the patient during fluoroscopic procedures is not isotropic. Staff would receive reduced dose if positioned in the cranial-caudal direction as opposed to the lateral direction. The energy of the scattered beam was largely independent of scatter direction.