

Several publications have reported conflicting data for radiographic film response. To investigate this inconsistency we studied the dependence of radiographic film response on phantom material and phantom size using measurements and Monte Carlo calculations. The latter method utilizes MC generated photon fluence spectra to deduce the film response<sup>1</sup>. Film is exposed to 6 MV photons in various phantoms (polystyrene, PMMA, Solid Water, and water; 25 to 50 cm square). A range of field sizes (5×5 to 40×40 cm<sup>2</sup>) and depths ( $d_{\max}$  to 20 cm) are studied. Results show that for small fields the film response variation is small. However, for larger field sizes, phantom material and phantom size have a significant influence on the magnitude of the film response. The range of response observed is 45% for polystyrene, and 30% for water. Data for Solid Water is similar to water, and PMMA is between water and polystyrene. In polystyrene, the range of response for a 25 cm square phantom is about half that observed in a 50 cm square phantom. The measurements are in excellent agreement with film response data derived from MC generated photon spectra. In conclusion, this work shows that the use of different phantom sizes and compositions appears to explain much of the inconsistency in the literature as to the magnitude of radiographic film response.

<sup>1</sup>Palm, et al. Med. Phys. 30, 1396-1397 (2003).