AbstractID: 3822 Title: The effect of miniphantom material on output ratio in-air

Purpose: To investigate the effects of miniphantom materials on output ratio in-air

Method and Materials: Output ratios in-air were measured for beam energies of 6 MV and 15 MV, for collimator settings ranging from 3×3 to 40×40 cm^2, and radiological depths between 1.83 - 36.6 g/cm^2 for graphite, 1.6 - 33.6 g/cm^2 for copper, and 2.28 - 21.6 g/cm^2 for lead, respectively. The miniphantoms were of cylindrical shape. The lateral dimensions of the miniphantoms (> 4 g/cm^2) were large enough to provide electron equilibrium and small enough to ensure coverage by the beam. Attenuation coefficients for those beam quality were measured with good geometry for the miniphantom materials.

Results: At 6 MV, the maximum variations of the output ratios with the depths were -0.67%, -0.89%, and -0.66% for graphite, copper, and lead, respectively. At 15 MV, they were -1.68%, -0.84%, and -0.43%, respectively. Output ratios measured with copper and lead at the same radiological depth, e.g., 10 g/cm^2, varied by -0.56% and -0.62% respectively at 6 MV, and -0.84% and -0.93% respectively at 15 MV, compared to graphite, a water equivalent material. Attenuation correction factors varied by -3.62%, -4.76%, and -4.89% at 6 MV, at the depth of 10 g/cm^2, for graphite, copper, and lead, respectively. And they varied by -1.53%, -2.85%, and -2.45%, respectively at 15 MV. Mass energy transfer correction factors of copper and lead, compared to graphite, varied by 6.24% and 9.42%, respectively at 6 MV, and 6.77% and 2.76%, respectively at 15 MV.

Conclusion: Output ratios measured using miniphantoms made of high Z materials showed variations from the miniphantom made of water equivalent material. For the same miniphantom, output ratio varied with its thickness. These differences can be accounted for by a collimator size dependent correction factor. We have measured various components of the correction factor.