

This study presents measured and Monte Carlo calculated in air output ratios. Beam energies of 6 and 18 MV are investigated using a mini-phantom. The Monte Carlo calculated output factors in air are compared with measured data, which consist of a typical commission data set for the accelerator head scatter measurements. Square and rectangular fields with widths and lengths ranging for entire treatment field sizes are studied. The result shows an excellent agreement between the Monte Carlo calculated and the measured output ratios in air. The values of the output ratios in air for a 6 MV beam is very similar to that of an 18 MV beam ranging from about 0.95 to 1.05 for field sizes from $4 \times 4 \text{ cm}^2$ to $40 \times 40 \text{ cm}^2$ respectively. The Monte Carlo simulations present the origins and magnitude of the collimator exchange effect quantitatively. The result reveals that the collimator backscatter to the beam monitor chamber plays a very important role in the beam output factors while the magnitude of the scattered dose contributions from the collimator at the isocenter is negligible. The maximum scattered dose contribution from the collimators is only about 0.15% and 0.4% of the total dose at the isocenter for 6 and 18 MV beam respectively while the scattered dose contributions from the flattening filter are about 0.9 – 3% and 0.2 - 6% of the total dose for field sizes of $4 \times 4 \text{ cm}^2$ - $40 \times 40 \text{ cm}^2$ for 6 and 18 MV beam respectively.