

AbstractID: 3366 Title: Measured output factors for range-modulated spread-out Bragg peak proton beams

Purpose:

The magnitude and the trend of variation of the output factor (OF) for range-modulated spread-out Bragg peak (SOBP) proton beams are investigated as a function of the range, modulated SOBP width and field size.

Methods and Materials:

The proton delivery system of the fix horizontal beam line (FHBL) used at the Midwest Proton Radiotherapy Institute (MPRI) has been calibrated to give an output of $1.0 \pm 1.0\%$ cGy/MU at a reference condition. For field that deviates from reference is measured at center of the SOBP at the room "isocenter". The OFs were measured with the fields that varied with range, SOBP width and size. Pristine curves for the various field sizes were also measured to study observed variation in the measured output factors.

Results and conclusion:

For a field size of 10 cm in diameter, the OFs at the middle of a 10 cm SOBP vary 40% between 14 and 27 cm ranges in water and a similar trend with range is observed for a 6 cm SOBP. The OFs of a 17 cm range vary 60% between SOBP widths of 2.6 and 12.4 cm and a similar trend in SOBP width is observed for other ranges. For field sizes 2-10 cm diameters and a 10cm SOBP, 5% and 20% variations were observed for ranges of 12 and 27 cm, respectively. The trend in field size differs largely between different ranges. In theory, the trend in field size can be calculated from the ratios of Bragg-peak to entrance doses from measured pristine curves. However, the calculated output factors are significantly lower than the measured one for a small field size. Although the output factor can not be predicted theoretically, these measured output factors can be modeled analytically.