AbstractID: 7123 Title: Characterizing Output for a Static TomoTherapy Field

Purpose: To determine in-air and in-phantom output factors for a static TomoTherapy beam.

Method and Materials: Measurements and computer simulations of in-air output ratios (S_c) and in-phantom output factors (S_{cp}) have been made for a static TomoTherapy beam. In-air measurements were made at a depth of 10 cm in a commercial mini-phantom for field widths ranging from 1.8 cm to 40 cm, for 2.5-cm and 5.0-cm jaw selections. Measurements were made at source-chamber distances (SCDs) of 85 cm and 105 cm. In-phantom measurements were made at a depth of 10 cm in a full size virtual water phantom for the same field sizes and at an SCD of 85 cm. Data were normalized to the values for the largest available field size (40 x 5 cm^2). Both in-air and in-phantom measurements were compared with simulations made on the TomoTherapy planning system using simulated CT datasets of the full size and mini-phantoms.

Results: In general, measured and simulated data agreed within 2% for the output factors determined in this work. Measured and simulated S_{cp}s varied steeply (~ 15%) for the field sizes investigated. In contrast, S_cs showed little changes with field size or SCD, although the measured data demonstrated a slightly greater variation with field size than the simulated results. Results were consistent between data taken for different jaw selections, with the best agreement observed for the determined phantom scatter factors, S_p.

Conclusion: The lack of a flattening filter in the TomoTherapy beam explains the small variation of S_c with field size and SCD. Thus, S_{cp} is due primarily to phantom scatter, which should not vary greatly between TomoTherapy machines. The determination of output factors may be used in the verification of treatment planning doses, both for helical and static deliveries.

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