AbstractID: 9671 Title: Dose discrepancies in the buildup region and their impact on IMRT field dosimetry

Purpose: The accuracy of the buildup dose for radiotherapy treatment planning suffers from challenges in both measurement and calculation. This study was designed to improve the parameter fit in the contamination term of the convolution/superposition calculation algorithm based on more accurate measurements and to evaluate the impact of residual discrepancies on IMRT fields for normal and oblique incidences.

Methods and Materials: The percent depth and profile doses were measured in the buildup region in Solid Water using an Attix parallel plate chamber with over-response correction factors and using Kodak XV film with dynamic calibration curves. The doses were measured at superficial depths ranging from 0.2 to 1.5 cm for 5×5, and 10×10 cm^2 fields and 0^0, 45^0, and 70^0 incidences. Contamination term parameter fit preference was given to normal incidence. Two segmental head-and-neck IMRT fields were recalculated with the new fit parameters as a function of incident angle. Comparison indices (γ and dose-gradient compensation) were used to quantify the agreement between measurements and calculations for the IMRT fields.

Results: After parameter refit, the agreement between measurements and calculations were improved. Differences were still present for some dose profiles. The profile measurements showed larger field widths and sharper penumbras. The local deviations of percent depth dose (PDD) comparisons were within 2% and 5% for normal and oblique incidences, respectively. For IMRT fields, the incident angle did not greatly influence the agreement between calculation and measurement. Comparison indices were lower for shallower depths.

Conclusion: Refitting the parameters in the contamination term using more accurate measured buildup doses improved the accuracy of calculations in the buildup region. Contamination term modifications may be required to better account for the influence of incident angle.

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