

Purpose: To evaluate how changes in the measured small field size output factors affect the computed and measured doses in Pinnacle IMRT treatment planning.

Method and Materials: A simple five-field IMRT plan was created using Pinnacle treatment planning system. The plan was optimized to a cylindrical target of 2 cm diameter and 2 cm length. Measured output factors in the planning system were decreased or increased in 5, 10, and 20% increments for field sizes of 2x2 and 3x3 cm² for both an Elekta and a Varian linear accelerator. The treatment unit was re-commissioned in the planning system after each modification of the output factors and treatment plan was re-optimized. All plans were delivered to a solid water phantom and dose measurements were made using an ionization chamber. The percentage differences between the measured and computed doses were calculated.

Results: For the Elekta unit, decreasing output factor values resulted in higher measured than computed doses of 3.0% for the 10% and 7.6% for the 20% decrease. Increasing output factors resulted in lower doses by 6.1% for 10% and 9.1% for the 20% increase. For the Varian machine we observed no systematic trends as in Elekta between measured and computed doses as the output factors were changed from -20 to +20%.

Conclusion: The measurement accuracy of the small field output factors are of importance especially when the treatment plan consists of small segments as in IMRT. This method could be used to verify the accuracy of the measured small field output factors for certain linear accelerators. Differences in optimization methods between fixed jaw IMRT delivery (Varian) and conformal jaw IMRT delivery (Elekta) when Pinnacle treatment planning is employed may be significant.