

AbstractID: 11109 Title: Dosimetric Accuracy Analysis of Dose Calculation Algorithms using Inhomogeneity Phantom for IMRT Treatment Plan

Purpose: We evaluated the dosimetric accuracy of dose calculation with a convolution/superposition (C/S) and a pencil-beam algorithm with the use of the multiple inhomogeneous head and neck phantom for intensity modulated radiation therapy (IMRT) treatment plan. **Method and Materials:** The inhomogeneous head and neck phantom for IMRT quality assurance (QA) was housed in a custom-designed package for efficient evaluation of the measured doses using the different materials and various detectors. Comparisons of measured and deconvolved beam profile obtained from a Gaussian fitting approaches were performed using the real penumbra width to remove ionization chamber size effect. The relative dosimetry obtained with the single-beam dose calculation algorithm was also compared to the MapCheck measurements for a head and neck IMRT treatment plans. The accuracy of IMRT dose calculations with the C/S and pencil-beam algorithms were also investigated with respect to measurements used in head and neck phantom in the presence of inhomogeneities. **Results:** The deconvolved penumbra was 2.2 mm and calculated value was 2.6 mm with pencil-beam algorithm. The differences between calculated dose and measured dose with the MapCheck were less than 4.0% for the horizontal profile of IMRT head and neck treatment plan. The differences for the C/S and pencil-beam dose calculation algorithms were within 5.0% in average target doses. Ionization chamber experiments showed approximately 2.5% better agreement than the glass rod detector. **Conclusion:** Our results show that accurate measurements of the penumbral region with consideration of inhomogeneities improve the accuracy of the dose calculation algorithms predicted by the treatment planning system. Therefore, it is important to choose an appropriate detector