AbstractID: 3930 Title: Dosimetric Comparison of Inhomogeniety Corrections in IMRT Treatment Planning Systems: A Collaborative Study

Purpose: A multi-institution collaborative study of dosimetric comparison of inhomogeneity corrections in IMRT treatment planning systems. Nine institutions representing twelve IMRT systems participated in this study.

Method and Materials: DICOM RT data sets for prostate, lung, and head and neck cases with target volumes and the organ at risks (OAR) already outlined were sent to each collaborative member. Beam arrangements, dose volume constraints and a maximum grid size were kept constant. For the case of prostate, lung and head and neck cases, 7, 5 and 9 equally placed field arrangements, were chosen for treatment planning using a 6 MV beam. Treatment plans were generated and optimized to meet the benchmark clinical endpoints. Each of the cases was calculated with and without inhomogeneity corrections. The calculated DVH's, phantom plans and measured data were collected and analyzed.

Results: Traditionally, utilizing modern treatment planning algorithms, there are significant differences in conformal 3D RTP, especially in head and neck and lung cases. Across all of the systems analyzed in this study, however, our data was quite the opposite. DVH analysis of PTV/CTV and critical organs show virtually identical data for homogeneity corrected vs. uncorrected iterations. The ratio of MU's across several IMRT TPS for corrected and uncorrected iterations for lung and head & neck cases were within 5% of each other.

Conclusions: The overall conclusion from the data analysis reveals that although the target coverage, total MU's, treatment delivery times etc. may vary significantly from one IMRT TPS manufacturer to another, most systems are able to generate clinically acceptable optimal solutions for both homogeneity corrected and uncorrected calculations. More importantly, the variation in target/critical organ coverage for inhomogeneity corrected vs. uncorrected iterations is minimal and the clinical impact of these variations should also be consequently minimal.