AbstractID: 2955 Title: Quality Assurance Of Modern Helical CT-Simulator Scanners: Reproducibility Of Tissue Heterogeneity Curve

Purpose: Accurate and highly reproducible tissue heterogeneity curve is essential to the proper implementation of tissue heterogeneity correction in imaged-based treatment planning systems (TPS). Tissue heterogeneity curve for a CT-Simulator scanner must be determined at the time of TPS commissioning and at time intervals not to exceed three months. This work investigates the reproducibility of tissue heterogeneity curve over a number of modern helical CT-Simulator scanners and a period of four years.

Methods and Materials: The tissue heterogeneity curve is obtained by scanning a commercially available tissue characterization CT phantom with inserts of different densities. A tissue characterization CT phantom model CIRS062 with 17 inserts covering the relative electron density from 0.19 to 1.51 was used. Five modern GE lightspeed plus helical CT-Simulator scanners purchased within the last four years were investigated. The scanning parameters used were 120 kV, 260 mA and 5 mm slice thickness. After the CT phantom was scanned, a region of interest was drawn in the middle of each insert on the axial image to determine the mean HU (Hounsfield Units) value and standard deviation. The mean HU values were plotted against the relative electron densities.

Results: To aid in the evaluation, the tissue heterogeneity curves were fitted with two linear equations. The slopes and intercepts were obtained and compared. These curves have almost identical slopes and intercepts within the standard deviation over the stated time intervals and for different but same model CT-Simulator scanners.

Conclusion: Modern helical CT-simulator scanners give highly reproducible tissue heterogeneity curve over time. This investigation demonstrates the improvement in performance of modern CT-Simulator scanners compared to fourth generation CT scanners. A technique of analysis based on fitted relationship is introduced for the quality assurance of the tissue heterogeneity curve.