

AbstractID: 2944 Title: Anomaly Characteristics Of Tissue Heterogeneity Curve From Three Commercially Available Tissue Characterization CT Phantoms

**Purpose:** Uncorrected treatment plans for tissue heterogeneities can produce errors exceeding 30% of the prescribed dose. Tissue heterogeneity correction is made by acquiring a Hounsfield Units (HU) value versus electron density relationship and applied to imaged-based treatment planning systems. This relationship is determined by scanning a tissue characterization CT phantom containing plugs of different tissues (electron densities). This study investigates the quality and provides up-to-date data on three commercially available tissue characterization CT phantoms (model RMI465, RMI467, and CIRS062) scanned using a modern helical CT-Simulator scanner.

**Methods and Materials:** These CT phantoms were scanned on the GE helical lightspeed plus CT-Simulator scanner. The phantom model RMI465 has 20 plugs while phantoms model RMI467 and CIRS062 have 17 plugs. The electron density ranges from 0.19 to 1.69. The scanning parameters for the abdomen (120 kV) with set slice thickness of 5 mm were used. Once the axial images of the CT phantom were acquired, a region of interest was drawn at the central area of each plug and the mean HU value and its standard deviation were determined.

**Results:** The plotted HU values versus electron densities show scattered data points. One of the CT phantoms exhibiting inconsistent data may be due to chemical composition breakdown was excluded. Overall, the data points were scattered and hence direct input of measured HU values versus electron densities into the treatment planning systems for interpolation should be avoided. Instead, the data entered into the treatment planning systems should be based on fitted relationships. The data can be fitted with two linear equations.

**Conclusion:** The HU values versus electron densities derived from commercial CT phantoms should be fitted before entering into treatment planning systems. The relationship consists of two linear equations with a point of inflection at a relative electron density of 1.0.