

AbstractID: 9350 Title: A quantitative evaluation of the effect of CT scanning parameters on CT number to density calibration and dose calculations

**Purpose:** This study evaluated the effects of CT imaging parameters on CT number and the effect of using an incorrect CT number to density table in treatment planning systems. **Method and Materials:** A phantom with 12 density inserts was scanned on a single CT, varying the kV (110 to 130), mAs, pitch, slice thickness, and reconstruction kernel. The variation of CT number was investigated as a function of those variables. At our institution, there are 8 CT number to density tables. The effect of changing the CT number to density table on PTV and organs at risk mean dose was evaluated for clinical breast, prostate, lung, head & neck, brain plans.

**Results:** The only CT imaging parameter that significantly changed the CT number was kV, producing a 6% change in CT number. All other parameters produced variation in the standard deviation of CT number, but not mean values. The effect of varying the CT number to density table on clinical plans produced maximum variation of 2% (head & neck vocal cord) in the mean dose, with other plans (breast, prostate, lung, and brain) producing approximately 1% variation. In investigating these effects by creating large regions of interest and overriding the density in small increments, it was found that there are discrete steps in dose calculations as a function of density in the Pinnacle (v7.6c) treatment planning system. Over the range of 0.3 - 1.7 gm/cm<sup>3</sup> there are 20 discrete density bins.

**Conclusion:** The effect of CT scanning using parameters different than those used in the treatment planning system CT number to density table produced up to a 6% change in CT number. At our institution the use of a wrong CT table can introduce errors in TPS calculations of up to 2.0 % on some regions of interest.