

AbstractID: 13661 Title: Accuracies of the Monochromatic CT Numbers and Effective Atomic Numbers Generated with the Rapid kVp Switching DE GE HD750 CT Scanner

Purpose: A study was performed to investigate the accuracies of the monochromatic images and effective atomic number maps generated with the new GE HD750 dual energy CT scanner. To our knowledge this is the first study of this type.

Method and Materials: A Gammex-RMI Model 467 Tissue Characterization Phantom and the CT# linearity section of a Phantom Laboratory Catphan 600 phantom were scanned with GE HD750 scanners at our institution. Monochromatic images at various energies between 40 and 100 keV and effective atomic number (Z_{eff}) maps were generated. The monochromatic CT numbers and Z_{eff} 's of the materials within these phantoms were measured. The true Z_{eff} -values were either supplied by the phantom manufacturer or computed using Mayneord's equation (MF Phelps, Radiology 1975). The linear attenuation coefficients for the true CT numbers were either supplied by the manufacturer or computed using the NIST XCOM program with the input of manufacturer supplied elemental compositions and densities.

Results: The Z_{eff} 's of LDPE, polystyrene, acrylic, delrin and Teflon in the Catphan were accurate to within 0.9. The Z_{eff} 's of lung simulating materials in the 467 phantom were not measurable, but those of most of the other materials (simulated adipose, breast, liver, brain, inner bone) were accurate to within 0.6. The Z_{eff} 's of solid water and cortical bone were most inaccurate, being underestimated by 1.2 and 1.6, respectively. The accuracies of the CT#'s of the materials in both phantoms varied with energy and material, with inaccuracies as large as 439 HU (cortical bone). However, at each energy, fits between true and measured CT#'s were highly linear ($r^2 > 0.99$) and could be used for calibration.

Conclusion: Initial tests indicate the Z_{eff} 's computed with DECT are reasonably accurate and the monochromatic CT#'s are linearly related to the true CT#'s. Further test results will be presented including reproducibility.