AbstractID: 3968 Title: CT number accuracy of simulated lung nodules imaged with a multi-detector CT scanner

Purpose: To investigate the accuracies of the CT#'s of simulated lung nodules for a QCT technique.

Method and Materials: Spherical balls of 4 diameters (3.2,4.8,9.5 and 16-mm) and 2 compositions (50mg/cc and 100mg/cc $CaCO_3$) were employed as simulated lung nodules. All were scanned in a liquid water-filled container at the center of a 20-cm diameter water-equivalent-plastic phantom using GE multi-detector CT scanners. A subset of the nodules and some 6.2-mm diameter acrylic balls were also scanned in a simulated lung region within a thorax section phantom that was bolused on both sides with water-equivalent slabs. Based on initial results that showed a significant decrease in the CT# of a nodule when scanned in the thorax section, additional studies were performed with 2 size air cavities at the center of the water phantom.

Results: The CT#'s of the nodules in water were fairly independent of nodule size (average CT#'s of 50mg/cc=59-66HU and 100mg/cc=108-115HU). The CT# of a 50mg/cc nodule scanned at the center of the water phantom was 66HU in water, 51HU in a 2-cm air cavity and 36HU in a 4.9-cm air cavity. The CT#'s of the acrylic balls ranged from about 79 to 96HU within the lung section and had poor-to-good reproducibility on repeat scans (CT# changes of +19HU, -17HU and 1HU for 3 different balls).

Conclusion: The CT# of a nodule is highly dependent upon the amount of air or low-density lung tissue near the nodule. We believe this error is due to the assumed all-water composition of the patient/phantom in the scanner's beam hardening correction algorithm. The unusual reproducibility of the CT#'s of nodules in the thorax phantom is likely a combined effect of sub-millimeter air gaps between the phantom sections and variability in helical scanning interpolation. Further studies and possible solutions will be discussed.