

**AbstractID: 5703 Title: CT number accuracy of lung nodules: Effect of patient body size and lung size.**

**Purpose:** To investigate the effects of patient body size and lung size on the CT numbers of lung nodules measured with multi-detector CT scanners and whether improved accuracy can be obtained with a dual-energy technique.

**Method and Materials:** Simulated lung nodules consisting of 9.5-mm diameter spheres containing 50mg/cc and 100mg/cc  $\text{CaCO}_3$  in a water-equivalent resin were scanned in two simulated thorax section phantoms with a GE VCT scanner. One phantom (A) represented the middle of the chest. It had large simulated lung regions and simulated ribs, heart and spine. The other (B) represented the upper chest. It had a much wider aspect ratio, smaller simulated lung regions, and simulated ribs, scapula, heart, and spine. Fat rings were added to the phantoms to simulate larger patients. Images were acquired on a GE VCT scanner with high-resolution techniques (0.53:1 pitch, 0.625-mm slice thickness and interval) at 80, 120 and 140kVp. Scans were repeated 3 times for reproducibility and analyzed using an automated technique.

**Results:** Body size had a significant effect on the measured mean CT-numbers of the nodules. For phantom-A, adding fat rings decreased the overall average CT-numbers of the 50mg/cc nodules at 120kVp by 15HU and those of the 100mg/cc nodules by 21HU. Corresponding reductions in phantom-B were 9HU and 13HU. The dual-energy approach (CT#80kVp-CT#140kVp) reduces the variability, with a maximum difference of 4HU for all conditions. Lung size had a minimal effect with a maximum difference (nodule CT# phantom A - nodule CT# phantom B) of 4.5 HU.

**Conclusion:** Even with modern multi-detector CT scanners, beam hardening and x-ray scatter errors due to body size can result in underestimates of the true CT numbers of lung nodules. A dual-energy approach compensates for these errors and should be considered especially if it can be implemented using a rapid kVp switching technique.