

## AbstractID: 7484 Title: Image Quality and Dose Trends in Tube-Current Modulated Multi-Detector CT Imaging

**Purpose:** This project quantifies image quality and dose trends in a multi-detector CT system incorporating a tube-current modulation system.

**Method and Materials:** An elliptical phantom series constructed of a tissue-equivalent pliable polyurethane elastomer material was used to test tube-current modulation systems of a Siemens 16 slice CT scanner equipped with CareDose4D. A composite phantom comprised of elliptical segments of varying dimensions evaluated image quality and dose for both in-plane and z-axis tube-current modulation. The standard deviation of CT number was recorded in reconstructed images in the slice plane as well as along the z-axis of the scan in order to evaluate image quality at specific locations in the phantom. Image quality was compared for tube-current modulated versus fixed tube-current scans. CTDI<sub>w</sub> measurements were made with and without tube-current modulation using a CTDI head phantom modified by the addition of elliptical phantom segments in order to independently evaluate the potential dose savings of tube-current modulation.

**Results:** CTDI<sub>w</sub> was invariant for scans with and without tube-current modulation, an effect attributed to the inadequacy of CTDI<sub>w</sub> to adequately characterize dose for helical MDCT scanning modes. Image quality with tube-current modulation was uniform along the entire scan length. Comparable scans with fixed tube-current techniques showed variations in image quality of up to 40% along the z-axis of the scan, and dose increases of up to 35%. In-plane image quality measurements showed a trend towards larger variation in CT number towards the center of the phantom. The use of tube-current modulation was demonstrated to reduce the effects of variable tissue thickness and geometry on image quality.

**Conclusion:** Tube-current modulation in CT provides more uniform image noise throughout the patient scan length while reducing dose as compared to fixed-current techniques. Weighted CTDI is not an adequate measure of dose in comparing modulated to fixed-current techniques.