AbstractID: 10268 Title: X-ray tube current modulation and effective dose per unit dose-length product conversion factors in CT dosimetry

Purpose: To quantify how axial and longitudinal x-ray tube current modulation influence effective dose per unit dose-length product (E/DLP) conversion factors in chest CT.

Method: We simulated a chest CT examination using a 4 cm beam width with projections obtained at every 15º x-ray tube position at a constant tube output (120 kV). A radiographic patient dosimetry software package (PCXMC) was used to quantify relative patient effective dose as a function of the angular position and longitudinal location (z) of the x-ray tube. Typical angular and longitudinal mA modulation schemes were obtained from the scientific literature. E/DLP conversion factors were generated for: (a) no mA modulation; (b) angular modulation alone; and (c) longitudinal modulation alone.

Results: As the x-ray tube rotates around the patient, the highest effective dose was at 285º (AP projection) and the lowest effective dose was at 195º (lateral projection), with the maximum to minimum ratio of 2.2. An angular mA modulation scheme with an AP/PA tube current one third of the lateral tube current reduces the E/DLP conversion factor in chest CT by 4.2%. For x-ray tube movement along the z-axis, the maximum to minimum ratio of patient effective dose was 3.3. In chest CT imaging, the longitudinal mA modulation changes the tube current approximately seven fold between the central lung area and the upper thorax region above the patient's lungs. Application of this longitudinal mA modulation scheme reduces the E/DLP conversion factor in chest CT by 9.2%.

Conclusions: Use of longitudinal and angular mA modulation schemes in chest CT examinations could reduce E/DLP conversion factors by ~13%.