AbstractID: 12431 Title: Relative Dose of Fast kV Switching Dual-Energy CT

Purpose: Dual-energy CT has attracted much attention in recent years. Most recently, a fast-kVp switching (FKS) dual-energy method has been presented with clinical and phantom results to demonstrate its efficacy. The purpose of our study was to quantitatively compare the $CTDI_W$ of FKS and routine CT exams under the body and head conditions.

Material and Method: For a fair comparison, the low contrast detectability (LCD) was matched before measuring dose. In FKS protocols, an x-ray generator switch rapidly between 140kVp and 80kVp in adjacent views, and the effective tube current is around 600mA. In addition to the tube voltage and current, the flux ratio between high and low kVp is optimized by asymmetric sampling of 35%-65%. The head and body protocols further differ by the gantry speed and type of bowtie filter. For baseline single-energy, we followed the IEC standard head and body protocols but iteratively adjusted the tube current (mA) in order to match the LCD. $CTDI_W$ was measured using either a 16 cm or a 32 cm PMMA phantom of at least 14 cm in length. The LCD was measured using the water section of Catphan 600. To make the study repeatable, the automated statistical LCD measurement tool available on GE Discovery CT750 scanner was used in this work.

Result: The mean $CTDI_W$ for the head and body single-energy acquisitions were 57.5mGy and 29.2mGy, respectively. The LCD was measured at 0.45% and 0.42% (slice thickness=5mm, object size=3mm, central 4 images), respectively. The average $CTDI_W$ for FKS head and body scans was 70.4mGy and 33.4mGy, respectively, at the optimal monochromatic energy of 65 keV. The corresponding LCD was measured at 0.45% and 0.43%, respectively.

Conclusion: This demonstrates that, with matching LCD, $CTDI_W$ of FKS is comparable to that of routine CT exams under head and body conditions.