

AbstractID: 7728 Title: Estimation of HVL in Computed Tomography using CTDI Measurements

Purpose: To determine the HVL of CT systems from CTDI dosimetry measurements without additional test, and to overcome the technical difficulties in CT HVL measurements.

Method and Materials: The HVL of one multi-detector CT scanner was measured when the scanner is static, over the available energy range (80~140 kVp) and with different bow-tie filter configurations. Commercial CT dose phantoms in compliance with FDA specifications were used to measure the exposures. Nine doses at the central, peripheral, and intermediate positions were measured for both head and body phantoms. Averages were taken for doses measured at axially symmetric positions of each phantom. These averages were compared to the central position dose measurements. The ratios were analyzed along with the HVL values measured under exactly the same conditions and fitted to second power polynomials. Combining the fitting parameters and dosimetry measurements from different machines, the corresponding HVL were predicted and compared to the measured value of each machine.

Results: The HVL of the CT scanner were determined to be between 5 to 10 mm Al over the energy range assessed. When the values were plotted against the dose at the peripheral or intermediate position, normalized by center dose, the curves all fit to second power polynomials with $R^2 > 0.99$. When applying the correlation obtained from the fittings to dosimetry measurements from different machines, the calculated HVLs are within 5% or 0.5 mm Al error of the measured values.

Conclusion: This study showed that the data collected for the CTDI measurements can be directly used to estimate the HVL of CT scanners to certain accuracy. This will reduce the time and effort needed for medical physicists to determine the HVL of CT systems during acceptance testing and annual quality assurance surveys.