

AbstractID: 12567 Title: Physics Performance Comparisons between 256-slice, 64-slice and 16-slice CT Scanners in the Clinic

Purpose: It is a challenge for the practicing medical physicist to perform quality control testing for these scanners in a short amount of time and make comparisons between various MDCT scanners.

Methods and Materials: Three Philips-Brilliance MDCT-scanners (256-, 64- and 16-slice) in the same hospital system were tested under the same conditions for dosimetry and image quality performance. The ACR image quality phantom was used. CTDI was measured with the standard head and body phantoms and a CTDI pencil-chamber. OSL CT dosimeters were used to measure CTDI. Measurements were converted to $mGy/100mAs$ in order to perform comparisons between the scanners. Dose measurements were also performed for all the collimation settings that are available for each scanner.

Results: The least variation in noise was observed for the 16-slice scanner, although all units were within acceptable limits. Although high contrast linearity was met by all units, the high contrast resolution was satisfied mostly by the 64- and 16-slice scanners, for the materials included in the ACR phantom. The CT dose decreases with beam width for all scanners, an effect more pronounced in the head phantom. For the clinically programmed brain and pelvis protocols, measured CTDI_w for 64- and 16-slice scanners is 15% and 60% lower than for 256-slice unit, respectively, and for similar beam widths. OSL dosimeter measurements confirmed the chamber measurements within 2-5% in most cases for CTDI_w. The 256-slice had sharper dose profiles. The periphery profiles were sharper than the central ones.

Conclusions: It is important an institution to have a QC procedure for CT scanners that will allow detail comparisons between them, under similar clinical conditions. We recommend that the physicist investigates the dosimetric behavior of the MDCT scanners not only for the clinically used collimations but all available collimations and compare the CTDI results with published literature.