AbstractID: 10719 Title: Multi-Slice CT Dose Evaluation Using Optically Stimulated Luminescence (OSL) System

Purpose: To demonstrate the feasibility of OSL system for measuring full dose profile and to establish the CTDI efficiency factors as reference values for compensating the underestimation of pencil chamber based $CTDI_{100}$ methodology.

Materials and Methods: The OSL dose calibration was first performed using a 0.3 cm^3 Semiflex Chamber. Field-specific conversion factors were determined in the diagnostic CT energy range. The 64-slice Multi-Slice CT (MSCT) dose profiles were measured by irradiating OSL strips placed inside an extended FDA CT head and body dosimetry phantom with different combination of scan parameters. The exposed strips were then read out using custom-made OSL strip reader and corrected with field-specific conversion factors. Based on the corrected dose profile, the $CTDI_{\infty}$ and $CTDI_{100}$ were evaluated. $CTDI_{100}$ was also obtained using a 100-mm long pencil chamber for accuracy verification.

Results: The OSL detectors were found to have good sensitivity and dose response over a wide range of diagnostic CT x–ray beam energy viz. the primary beam and the scatter tail part of the dose profile. Based on the overall OSL and MSCT physical performance, the total length of 450 mm was determined for z-axis coverage of dose profile. The CTDI efficiency was calculated by $CTDI_{100}$ /$CTDI_{450}$. For the broadest collimation setting, 40 mm, the average CTDI efficiency is 56.2% and 81.7% respectively for body phantom center and periphery positions. For these positions, the OSL $CTDI_{100}$ agreed well within 1.0% and 2.7% compared to $CTDI_{100}$ measured by pencil chamber.

Conclusions: OSL detectors can be accurate alternative devices for CT dose evaluations. The established CTDI efficiency factors for various scan parameters allow in accurately estimating $CTDI_{\infty}$ with the current use of 100-mm pencil chamber. The OSL field-specific conversion factors offer a potential solution for estimating patient organ dose.