

Purpose: To investigate the feasibility of measuring dose to patient from kilovoltage CBCT with the Sun Nuclear ArcCHECK device.

Methods: The ArcCHECK QA device consists of 1386 diodes of 0.8×0.8 mm² size geometrically arranged on a cylindrical phantom. The diodes are situated at depth of 2.85 cm acrylic build up and spaced 1 cm apart. A compact ion chamber was placed in the center of the ArcCHECK. A MV x-ray based array calibration file was applied to our measurement. To validate the array calibration file in kV x-ray range, an axial scan dose distribution from a CT-scanner was measured using ArcCHECK. Absolute dose was calibrated according to AAPM TG61 protocol. Doses of different CBCT modes from VARIAN OBI were measured using ArcCHECK and ion chamber, including half scan (high-quality head, pelvis spotlight) and full scan (pelvis, low-dose thorax). Dose for pelvis mode was also calculated using Pinnacle Treatment Planning System (TPS) and compared with measurements.

Results: For CBCT pelvis mode full scan, more than 80% of diode readings are in agreement with the calculation. The ion chamber measurement agrees with the calculation within +/-10% uncertainty. The doses from ion chamber measurement at the iso-center are 1.3 cGy, 3.1 cGy, 3.0 cGy, and 0.8 cGy for high quality head, pelvis spotlight, pelvis, and low dose thorax scans respectively. The average reading of diodes at y=0 cm circle are 5.5 cGy for pelvis and 1.8 cGy for low-dose thorax. The ratio between doses at center of the phantom to doses at depth of the diode-position is 0.56 for pelvis mode (125 kV) and 0.44 for low-dose thorax mode (110 kV).

Conclusions: The CBCT doses measured using ArcCHECK for different CBCT scan modes are within diagnostic dose accuracy. With careful calibration ArcCHECK can be used as dosimeters for measuring CBCT patient doses.