

AbstractID: 5550 Title: Peripheral Dose to the Patient Due to Kilovoltage Cone Beam Computed Tomography

Purpose: To quantify the peripheral dose outside the imaging field of view (FOV) received by patients undergoing kV CBCT procedures.

Methods and Material: A 0.6 cc Farmer-type chamber and specially designed cylindrical water phantom were utilized to make the dose measurements. The main section of the phantom, constructed of Plexiglas®, is 30 cm in diameter and 50 cm in length, simulating an average patient body. The phantom is placed on the treatment couch with its axis coinciding with the axis of rotation of the gantry. An ion chamber holder rests in a slot on the top of the phantom, and allows the ion chamber to be placed at any depth, and at any point along the length of the phantom. A solid water cylindrical phantom 20 cm in diameter and 16 cm long was placed at the superior end of the water phantom to simulate a patient's head. Measurements were made on an Elekta Synergy treatment unit for various kVp, FOV, depths and distances from the central axis. A limited set of measurements were also made with a RANDO phantom to simulate the effects of typical inhomogeneities. For comparison, dose measurements were made in similar geometry using 6MV and 18MV beams at doses equivalent to a typical treatment fraction.

Results: For an acquisition technique of 120 kV, 80 mA, 1.6 mAs/frame and 620 projections, using the M10 collimator, the dose 20 cm from the CAX was measured to be 0.15 cGy at depth 15 cm and 0.11 cGy at depth 2 cm. The dose outside the FOV was typically a factor of 6 smaller than the MV dose.

Conclusions: Although small when compared to the dose from the MV beam, the peripheral dose due to kV imaging may be significant if the CBCT procedure is applied daily.