

AbstractID: 7273 Title: Dose Verification of 2-, 4-, 6-mm Cones for Stereotactic Radiosurgery Radiotherapy

Purpose: Small field dosimetry is critical in radiosurgery. Many researchers have reported the dose verification results for cones larger than 5 mm. Cones smaller than 5 mm, though are not common used in Stereotactic Radiosurgery, have the potential in benign tumor radiosurgery and small animal irradiation. This study demonstrates dose verification results for 2-, 4-, and 6-mm cones using several different detectors and determines their maximum spatial resolution for small fields without lateral electronic equilibrium.

Method and Materials: Several different small-volume detectors including a small volume ion chamber (PTW 23323), a pin-point chamber (PTW31014), a PTW diamond detector (faced parallel or perpendicular), KODAK XV-film (scanned in 0.1 mm resolution), and BEAMnrc06 Monte Carlo (MC) simulation were used to study percentage depth doses, profiles, and cone factors for 2-, 4-, and 6-mm cones.

Results: All detectors agree well with MC simulation for larger cones (30 mm or 14 mm). Notable dose deviation between small volume and pin point ion chambers can be observed for 6 mm cone. The dose measured using diamond detector faced perpendicular does not agree well with that measured using film, MC simulation, and diamond detector faced parallel. Finally, neither detectors nor simulation agree with measurement for 2-mm cone. In fact, this purported 2-mm cone is assumed to be 3.1 mm since the PDDs, profile, and cone factor measured using film and diamond detector faced parallel agree well with MC simulation of a 3.1-mm cone.

Conclusion: Films and the diamond detector faced parallel are more suitable for small field dosimetry. Noting that the ECUT should be reduced to 521 keV for simulating cones smaller than 1 cm, the dose deviation of PDDs and profiles between MC and measurement (film, diamond) are less than 1.5%.