

AbstractID: 1537 Title: Caveats of the Point Dose Measurement in Step and Shoot IMRT QA

Inaccuracy of chamber positioning and the effect of chamber volume averaging during patient-specific IMRT QA testing were investigated. These effects were shown to adversely affect the QA tests when the measurement chamber was in the vicinity of a penumbra created by the projection of MLC leaf tips. Measurement error due to inaccurate chamber positioning was inversely related to chamber size. A 1 mm shift in chamber position produced the following results: A PTW 0.3cc scanning chamber (Fig. 1) showed errors of 5.1% in its long (1.5 cm) and 9.7% in its short dimensions (0.55 cm) while the Exradin T14 Microchamber showed an error of 15.4% in its axial dimension (0.1 cm). A QA phantom was designed to improve positional accuracy and reproducibility (Fig. 2). Manual setup reproducibility results showed a standard deviation of 0.93 and 1.1 mm in the longitudinal and lateral directions through the use of this phantom. Chamber volume averaging is difficult to simulate with a treatment-planning system (TPS), which is a primary cause of disagreement with point dose measurement. Volume averaging in our TPS was simulated by contouring our chamber's sensitive volume, which reduced the maximal disagreement with measurement to approximately 8% (Fig.3). Disagreement between calculation and measurement correlated with the number of segments that shadow the chamber (Fig. 4) during progression of an IMRT leaf sequence. Agreement between TPS and measurement point dose results could be improved by placing the chamber in areas where the effect of leaf shadowing is minimized.