

AbstractID: 7295 Title: Skin dose determination for helical and serial tomotherapy and MLC based IMRT

Purpose: To utilize ultra-thin thermoluminescent dosimeters (TLDs) to quantify and compare skin dose for patients undergoing radiotherapy on various IMRT delivery systems.

Method and Materials: Three treatment modalities and treatment planning systems were employed for comparison, including helical tomotherapy, MLC-based IMRT and serial tomotherapy. For each modality a reference field was delivered. Surface dose measurements were taken with ultra-thin TLDs (0.3 cm x 0.3 cm x 0.01 cm) at the center of each field. For comparison, treatment plans for prostate patients were developed on all modalities to deliver the same prescription. All measurements were made on a uniform cylindrical phantom using ultra-thin TLDs placed on the phantom's surface for skin dose measurements and an ion chamber placed at isocenter.

Results: Helical tomotherapy was observed to give the highest average skin dose, followed by serial tomotherapy, while the MLC – based step-and-shoot gave the lowest average skin dose. For the prostate plans with an isocentric delivery of 2.0Gy, verified by a calibrated ion chamber, the average skin dose from the helical tomotherapy delivery was about two times higher while serial tomotherapy delivery was about 1.2 times higher than the MLC-based step-and-shoot method.

Conclusion: The observed high skin dose for the helical tomotherapy delivery can be accounted for by the absence of a flattening filter. Beams reaching the patient surface will be relatively softer compared to those where lower energy x-rays have been filtered out by the presence of a flattening filter. However, the observed increase in skin dose for the serial tomotherapy delivery can be attributed to the greater beam modulation, which leads to increase in monitor units required to deliver the same dose, and as a result greater leakage and head scatter.