

AbstractID: 1300 Title: Evaluation of IOHDR Underdosage Resulting from Lack of Backscatter During Treatment

Most brachytherapy planning systems assume infinite tissue extent when calculating scatter contribution to a dose distribution. Dosimetric errors from this assumption are mostly negligible except in intraoperative high dose rate brachytherapy (IOHDR) where treatment catheters are typically laid directly on the tumor bed with little or no scatter material above the applicators. This lack of scatter can result in underdosage since treatment planning algorithms assume full scatter. A study was carried out to investigate the magnitude of this underdosage. IOHDR treatments were simulated using a solid water phantom beneath an applicator with varying amounts of bolus material to account for missing tissue on the top and sides of the applicator. Treatment plans were developed for three different surface areas (4x4, 7x7, 12x12 cm²) with three prescription distances each (0.5 cm, 1.0 cm and 1.5 cm). Ionization measurements were made with a fluid-filled ion chamber linear array with a dedicated electrometer and data acquisition system. Measurements showed that the magnitude of underdosage varies from 9% for 0.5 cm prescription depth to over 15% for 1.5 cm. This treatment error was found to be independent of the irradiated area but strongly dependent on the prescription distance. Furthermore, measurements in different planes for a given prescription distance showed that the dose delivery error was equal in magnitude throughout a target volume. We suggest improving the accuracy of IOHDR treatments by increasing the prescription dose entered into a planning system by an amount equal to the measured underdosage.