

AbstractID: 13320 Title: Monte Carlo Dose Comparison Assessing Material Inhomogeneity Effects in Breast Brachytherapy

Purpose: To quantify the effect of material heterogeneity on dosimetry in single-entry breast brachytherapy devices such as the MammoSite, Contura, and SAVI in comparison to the assumed homogeneity of the TG-43 formalism, with an emphasis on devices with a close proximity to the skin. **Method and Materials:** A simple phantom was constructed in the Penelope Monte Carlo code consisting of a sphere of varying size and position situated within a larger cube surrounded by air. The cube was always composed of water while the sphere could be water or air in order to compare a more realistic heterogeneous model with the homogenous model used in the TG-43 formalism. Spacing between the sphere and the cube surface was brought as close as 7mm to test the clinical limits of the SAVI device as pertains to skin spacing. Seeds were represented as point sources with a single band or energy at 365 keV (approximating an iridium 192 source) and simulated to be either at the air-water interface or in the center of the sphere. **Results:** Simulations indicated that dose to the water -- in the heterogeneous case for >2mm from the air-water interface -- was different by <10% maximum and ~3% on average, from dose calculated for the homogenous case. At <2mm from the air-water interface, however, the difference in dose for the heterogeneous case was ~30% of the homogenous case on average and could be as high as 230% for close (7mm) spacing. **Conclusions:** Although the dose differs between the air-water and water-water interfaces, the discrepancy was limited to 1-2mm from the interface and could be reduced in some situations. Further exploration needs to be done to assess the actual dose being given as opposed to what has been calculated for all brachytherapy devices with air-tissue interfaces.