AbstractID: 11039 Title: Treatment planning considerations and the effect of tissue heterogeneities on the absorbed dose distribution from the Xoft Axxent 50 kVp electronic brachytherapy source.

Purpose: Tissue heterogeneity on low-energy photon emitters can be significant due to the dependence of the photoelectric effect on atomic number and photon energy. This study evaluates the effect of tissue heterogeneities on the absorbed dose distribution from the Xoft Axxent 50 kVp electronic brachytherapy source. **Materials and Methods**: The MCNPX Monte Carlo code was used to simulate various tissue configurations surrounding a 50 kVp electronic brachytherapy source. The absorbed dose distribution was simulated from a single source position at the middle of a 5.0 cm diameter water filled balloon. The dependence on surrounding tissue type was studied by inserting the balloon in three different tissue regions; water, breast, and muscle. The dose enhancement from a bone region was also studied based upon a composite bone layer that included outer and inner layers of cortical bone sandwiched between a region of spongiosa bone. **Results:** The absorbed dose decreased by 12% in breast tissue immediately adjacent to the water balloon. At 1.0cm from the balloon edge the dose difference was approximately 5% for breast tissue. The absorbed dose difference between muscle and water was negligible. The composite bone layer produced an absolute dose enhancement of approximately 4.5 relative to water at the outer edge of the bone layer. This dose enhancement is dependent upon the distance from the source point to the bone layer. **Conclusions:** We present simulation results for the effect of idealized tissue heterogeneities on the absorbed dose difference from a 50 kVp electronic brachytherapy source. In general breast tissue produces a lower absorbed dose relative to water based upon the increased percentage of carbon and the resulting reduction in the effective atomic number and photoelectric effect. Cortical bone will create a significant dose enhancement due to the higher percentage of photoelectric interactions.