AbstractID: 13059 Title: An Equivalent Path Length TG-43(U) Model for Heterogeneity Corrections of HAM Applicator Treatments Using Low Energy Electronic Brachytherapy

Introduction: Low energy x-rays, such as those produced by a 50 kV Xoft ™ electronic brachytherapy (eBx) source are influenced by heterogeneities. Brachytherapy source modeling using TG-43(u) assumes that the source is surrounded by a water medium. We investigate an equivalent path length (EPL) correction of TG-43(u) to predict the eBx dose in a mixture of air, water and non-water equivalent media in a slab-like planar geometry applicator. **Methods:** EPL is the radiological depth between a source and calculation point, as determined by the linear attenuation (μ) of each material in the path. EPL is used to obtain the radial dose and anisotropy but not the geometrical component of TG-43(u). A Matlab model was computed using Matlab, for a slab applicator with fixed dwell times and locations composed of various materials. Slab applicator measurements for the Xoft system were made with GafChromic EB2 film exposed at surface and 5 mm depth. Three types of slab material were investigated; Silicon, Noryl, and Santoprene. The linear attenuation (μ) of each was determined by taking measurements in water, with and without the material in the beam path. **Results:** At this energy, μ(Silicon)/μ(H2O) is 2.6, μ(Noryl) /μ(H2O) is 0.87, and μ(Santoprene) /μ(H2O) is 1.11. The flatness and symmetry of the model were comparable to the measurements at both depths. At 5 mm depth, the modeled dose was within 1% of the measurement. At the surface, the model overestimates dose by 10% for silicone and 2-3% for less dense materials. **Conclusion:** The EPL-TG-43(u) model can be used to predict the effects of air and non-water materials within 1% at depth and 10 % or better at the surface. This simple model provides a tool to investigate first order effects of heterogeneous media for low energy eBx treatments.