AbstractID: 11522 Title: Sensitivity of the 50 kVp Xoft Axxent Electronic Brachytherapy Skin Applicator to Flattening Filter Design, Source-Filter Position, Applicator Alignment and Surface Collimation

Purpose: The Xoft Axxent Electronic Brachytherapy Skin Applicator and miniature x-ray source combination can be used for superficial skin or surface treatments. The applicator is a 25 mm SSD cone (1.0-5.0 cm diameter) with an embedded flattening filter. The applicator and source are decoupled, which could lead to variations in dose profile. Several potential problems are investigated for this system. **Method and Materials:** Dose profiles of the 35 mm diameter cone were measured in solid water using GAFChromic EBT film and in water using a stereotactic diode. Two flattening filter designs were examined. The effect of rotating the source or applicator independently, tilting the applicator with respect to the surface, modifying the source-filter distance, and skin collimation from 10 to 30 mm by means of tungsten aperture cutouts were examined. **Results:** The stepped disk filter design had flatness and asymmetry of 8.3% and 3.1%. The chamfered filter was 14.8% and 0.7% respectively. Rotation of the source and applicator produced a minimal change in flatness and asymmetry, with less than 2% change in flatness or asymmetry. The stepped-disk filter flatness changed by up to 7% with filter source displacement. Tipping the applicator off of the perpendicular axis by 6 degrees changed the symmetry by 14%. Beam profiles for cutouts ranging from 1.0 -3.0 showed little change in flatness and asymmetry, and the sharp edges of the PTW were retained. **Conclusion:** The stepped filter design is superior. The source-filter is sufficiently concentric to prevent profile shifts, but the dose is very sensitive to the filter-source distance, as predicted by the geometric model. Small tilts of up to 2 degrees, or a 1 mm gap on one side of the cone, can be tolerated. Skin collimation preserves both profile and penumbra. Research Sponsored by Xoft, Inc.