AbstractID: 3952 Title: Stability of the Xoft AXXENT^{TM} X-ray Source during Irradiation in a Goat Mammary Model for APBI

Purpose: This study evaluated the x-ray output stability of the Xoft Axxent™ Electronic Brachytherapy System while delivering fractionated doses to a Nubian milk goat animal model.

Method and Materials: Eight balloon applicators were inserted percutaneously into simulated lumpectomy cavities created in the udders of four Nubian milk goats; active and control applicators were inserted in opposite udders. Two goats received spherical applicators and two goats received ellipsoidal applicators inflated to nominal diameters of 3.4 cm and 4.9 cm, respectively. Radiation treatment using 40 kV or 50 kV commenced three days after implantation. Prescription dose was 34 Gy to a point 1 cm from the applicator surface to be delivered in 10 fractions BID for 5 days as for conventional APBI. During the final three fractions for each animal, dose rate was monitored by a Victoreen 451B Ion Chamber Survey Meter located 40 cm from the treated udder.

Results: Ten fractions were successfully delivered to each goat within five days. X-ray source performance and dose delivery was very stable during treatments and between different fractions. A flexible radiation shield (which reduced radiation levels around the animals by at least 100x) was positioned to allow line-of-sight between the 451B meter and the treated udder. Radiation levels recorded at 1 second intervals during the treatments were analyzed for dose rate fluctuations and drift. The standard deviations from average dose rates varied from 1.2% for the shortest treatments (225 s) at 50 kV to 3.7% for the longest treatments (1450 s) at 40 kV with an average of 1.9% over all fractions.

Conclusion: The Electronic Brachytherapy System performed as expected with respect to applicator integrity, controller hardware and software operation, x-ray source lifetime and stability, and flexible shield radiation attenuation.

Conflict of Interest: Research was supported by Xoft, Inc.