

AbstractID: 7595 Title: Turn-on Dose and Transit Time Adjustments in Treatment Planning for the Axxent® Electronic Brachytherapy System

Purpose: To analyze the dosimetric impact of x-ray source turn-on time and inter-dwell position transit times for application of the Axxent® Electronic Brachytherapy System to APBI. **Materials and Methods:** At the first dwell position, the treatment timer starts after the source has ramped-up to full operating voltage and beam current (50 kV, 300 μ A), so planned dose-delivery time does not account for a small “turn-on” dose. Radial dose functions were calculated with MCNP5 for operating voltages from 20 to 50 kVp. Turn-on dose was estimated by temporally averaging these distributions using the voltage and beam current ramp profiles. For subsequent dwell positions, the timer starts when the source begins moving to the next dwell position so elapsed time includes the transit time. (The source remains on during the time between dwell positions, typically 0.7 seconds for a 0.5 cm step). Dose contribution during transit was estimated using Varian BrachyVision™ by subtracting the transit time from the second and subsequent dwell positions, then adding extra dwell positions at midpoints between original positions with times equal to the transit time. **Results:** The composite turn-on dose profile from Monte Carlo results was equivalent to 2 seconds of additional time at the first dwell position with source operation at 50 kVp. This corresponds to < 0.5% of a typical treatment time. Whether or not transit time is accounted for, the planned doses at prescription points 1 cm outside of a typical balloon agree to within an average of 0.1% with a standard deviation of 0.2%. **Conclusions:** Turn-on dose may be approximated in treatment planning by adding 2 seconds to the first dwell time. Dose during source transit may be ignored when using a balloon applicator for APBI.

Research sponsored by Xoft, Inc.