

AbstractID: 3591 Title: Monte Carlo Calculation of Pd-103 Prostate Implant Treatment Plan

Purpose: A ^{103}Pd TheraSeed[®] Model 200 prostate implant treatment plan calculation based on TG-43 formalism will be compared to a Monte Carlo (MCNPX) simulation of the treatment plan complete with detailed seed geometry. Dose contour lines as well as specific dose points will be compared.

Method and Materials: Co-ordinates from typical pre-plan treatment plans were used to set up 3-D Monte Carlo simulations of a small prostate (84 seeds) and a medium prostate (107 seeds). The seeds were modeled in full geometric detail and placed in a 50 cm sphere of water. The Model 200 seed geometry was previously benchmarked in a single seed configuration against published TG-43 dosimetry parameters. Surface Crossing Tallies and Energy Deposition Tallies were used to calculate dose at specific points for comparison to dose points calculated in treatment planning software. Mesh tallies were used to create isodose lines for comparison to those calculated by the TG-43 based treatment planning software. MCNPX flux values were converted to absolute dose based on NIST measured Air Kerma Strength and NIST measured contained activity measurements of TheraSeed[®] Model 200.

Results: Comparison of the 75, 100, 110, 150, and 200% isodose lines for a series of planes within the treatment area yielded reasonable agreement. As expected some variation from the treatment planning software isodose lines is seen due to attenuation from surrounding seeds as well as differences in the dose distribution surrounding the seeds. Selected dose points along the urethra yielded dose values with a maximum deviation of 20% between the treatment planning software and Monte Carlo calculation.

Conclusion: Full three dimensional Monte Carlo modeling of a typical treatment plan is possible in order to make dose comparisons to TG-43 based formalism calculations for a typical treatment plan configuration.

Conflict of Interest: Corresponding author is an employee of Theragenics Corporation[®].