# AbstractID: 13534 Title: A Monte Carlo Based Treatment Optimization Technique for the Xoft Electronic Brachytherapy System

**Purpose:** Currently, treatment optimization and dosimetry for miniature x-ray sources, such as the Xoft Axxent, are performed through a point source model based on an extension of TG-43U1. We present the development of a Monte Carlo based treatment optimization algorithm that can more accurately address the issues relating to source anisotropy, tissue inhomogeneity, and specifically, automated dwell time optimization. **Method and Materials:** MCNPX was utilized to model the Xoft electronic brachytherapy source, from which dose kernels were produced at different voltage potentials and locations in a lattice structure representing the patient. Given a prescribed PTV, the optimization problem was mathematically formulated through a set of linear equations derived from the superposition of different kernels weighted by unknown dwell times. Using constrained least square optimization, the optimum relative dwell times were calculated for the prescription PTV. A verification Monte Carlo calculation from the outputted dwell times was used to calculate the resulting dose distribution and to quantify its agreement with the input PTV. **Results:** The procedure was performed for an ideal GYN treatment plan with a cylindrical endometrial PTV, measuring 4 cm in diameter, and axial dwell positions with a separation of 0.5 cm across a 5 cm region. The profiles of the resulting dose distribution from the optimum dwell times were quantified with plots against the input PTV. The mean deviation of the optimized plan from the prescribed PTV edge was measured to be 1.2%, with a maximum deviation less than 5%. **Conclusions:** We have developed a Monte Carlo treatment planning technique which enables for the automatic determination of optimum dwell times for user-prescribed PTVs, with high accuracy. The work can be readily extended to incorporate RBE and generalized to other treatment locations. **Conflict of Interest:** This work is partially supported by a Xoft Corporation research grant.