AbstractID: 11461 Title: Monte Carlo Simulation of a MicroCT-Based Small Animal Radiotherapy System

**Purpose:** A microCT-based small-animal-radiotherapy system with a variable-aperture collimator has been constructed, and a Monte Carlo model of this system has been developed. A series of Monte Carlo (MC) simulations were performed in order to calibrate the model against measured beam commissioning data. **Method and Materials:** The EGSnrc codes were used for MC simulation. The simulations included different source models, different apertures, and included or excluded the effect of the plastic cylindrical shell enclosing the CT bore. We considered sources including a circular x-ray beam with spectra generated by Boone-Fewell formula, and a simulated x-ray tube with parameters fit to measured beam profile. The beam width was set to 2, 5, 10, and 20 mm. The depth dose in water and the beam profiles simulated with and without the CT bore were compared, and the calibration factor for the conversion from MC dose to the measured dose rate in water was computed. **Results:** The simulation showed that a model with 2.5 mm Al filtration matches the measured depth-dose curves, with the mean error on all measurement points for 2.5 mm Al was 2.5%. The CT bore introduces a 6% attenuation but does not significantly affect the beam energy spectrum or depth-dose characteristics. The low energy part of the spectrum from the x-ray-tube simulation varied substantially from that predicted by the Boone-Fewell model. The conversion factor was found to be $7.7415\times10^{18}$ particles/min. **Conclusion:** Models and parameters in the Monte Carlo planning system have been determined from the depth-dose measurements and simulations. The observed effect of the CT bore suggested that the effect can be attributed to additional attenuation, which significantly simplifies the software complexity of the Monte Carlo planning system.