AbstractID: 8204 Title: Monte Carlo Calculation of Electron Arc Therapy Doses

The calculation of dose in electron arc therapy is the integral of the instantaneous dose as a shaped electron field sweeps across the patient's contour. Dose uniformity throughout the treated volume is achieved through dynamic field shaping during the arc, where the instantaneous field shape is determined by inverse planning. The accuracy of dose calculation depends critically upon proper characterization of the central axis depth dose, the beam profile, and the dose per monitor unit under the constraints of changing SSD and extended air gaps between the multileaf collimator and the patient. Monte Carlo has been evaluated as a calculation tool for electron arc therapy, where a multileaf collimator defines the electron field and the air gap may range from 20 to 40 cm. Calculated and measured depth doses agreed well for field widths from 1 cm to 20 cm. Beam profiles agreed well across the clinically useful range from 1 cm to 8 cm wide. Measured and calculated field size dependence of dose per monitor unit agreed well across the clinical range from 1 cm to 20 cm wide. The excellent agreement between measured and calculated values for these critical parameters suggests that Monte Carlo can be used to calculate electron arc therapy dose distributions. To produce reasonable throughput, however, distribution of the problem over many computers (parallel processing) and the use of variance reduction techniques will be required.