

AbstractID: 13600 Title: Evaluation of the variability in peripheral dose between different Linacs for 6MV beams and comparison with an existing Monte Carlo Linac model

Purpose: To determine the variability in peripheral dose due to different linac head designs for a given beam energy and to compare it with an existing Monte Carlo (MC) model.

Method and Materials: Peripheral doses were measured for four Linacs with different head designs at 6 MV. Peripheral doses were measured for open square fields ranging from $5 \times 5 \text{ cm}^2$ up to $20 \times 20 \text{ cm}^2$ at 10 cm depth. The variability in measured peripheral doses was determined as a function of field size and distance from the beam edge. An existing MC model simulating the Siemens Primus Linac was used to simulate the same measurements. The behavior of the MC doses with respect to the minimum and maximum measured doses for a given field size and distance from the beam edge were determined.

Results: The variability in peripheral dose ranged from 20% for the $20 \times 20 \text{ cm}^2$ field up to over 100% for the $5 \times 5 \text{ cm}^2$ field. The MC doses were mostly within the measured profiles for field sizes $\geq 10 \times 10 \text{ cm}^2$. However, for small field sizes and large distances from the beam edge ($>10 \text{ cm}$), Monte Carlo leans towards the lowest measured doses. This is due to incomplete modeling of head leakage which dominates for small fields and large distances from the beam edge.

Conclusion: Uncertainties in MC doses due to the variability in peripheral dose between different linacs operating at 6MV were derived. MC tended towards the lowest measured doses and some fine tuning of the MC model will be needed to fit the average of the measured linacs.

Conflict of interest: none