AbstractID: 5034 Title: Simplified Monte Carlo simulation for absolute dose distribution of IMRT

Purpose:

A simple method was proposed to incorporate heterogeneous fluence distribution due to time-dependent leaf motion of IMRT delivery into Monte Carlo based static dose calculation to predict the dose distribution inside a patient and the transmission dose distribution at the EPID.

Method and Materials:

Weighting factors stored in an efficiency map was incorporated into an open photon field of the Monte Carlo simulation (BEAMnrc, 2005) to mimic the heterogeneous fluence distribution of an IMRT field. The efficiency map was obtained by dividing the measured in-air IMRT absolute dose distribution to that of the same open field using an aS500 EPID (Varian, Palo Alto, CA) which was carefully calibrated for absolute dose measurement. The EPID was setup at 140 cm SDD and 3.84 mm polystyrene phantom was used for the 6 MV photon beam to ensure full electronic buildup. Absolute dose calibration of Monte Carlo simulation was performed under a standard setup where absolute dose at a reference point was verified by ion chamber measurement. Transmission dose comparison at the EPID for two dynamic wedge fields and two IMRT fields as well as absolute dose distributions at the midplane (SAD=100cm) of a 24.8 cm polystyrene phantom among film dosimetry, EPID measurement and Monte Carlo simulation will be presented.

Results:

Max discrepancy of 3.3% was observed along the central axis for F1 IMRT field. In addition, penumbra along the field edge of the Monte Carlo simulation appeared to be 1-3 mm wider than EPID and film dosimetry.

Conclusion:

A simplified method to incoporate heterogeneous fluence distribution of IMRT fields into static Monte Carlo simulation for absolute dose verification was proven feasible. The system can also serve as an independent absolute dose check system to commercial TPS calculation.