AbstractID: 7423 Title: Effective source distance and virtual source location for MLC based electron radiotherapy

Purpose: To determine the effective source distance (ESD) for electron fields used in modulated electron radiotherapy (MERT) using an existing photon multileaf collimator and to examine their behavior with changes in field size and beam energy.

Methods and Materials: In order to accurately calculate the MU needed for MERT treatment the electron effective source distance should be determined. ITwo methods were used to determine the virtual source positions of electron beams at energies of 6, 9, 12, 16, and 20 MeV. For field sizes varying from 2x2 cm^2 to 10x10 cm^2, parallel plate ion chamber measurements in a plastic water phantom were taken, and the inverse slope method was used to determine the ESD for each field at each energy. In addition, beam profiles measured with film were used to determine the virtual source location (VSL).

Results: The ESDs calculated using the inverse slope method increased with increasing field size and energy. It was observed that the ESD increase with field size was less steep at high energies than at lower energies. Comparing the ESD and VSL measurements for a 10x10 cm^2 field, it was observed that the VSL was slightly larger than the ESD at both 9 and 16 MeV electron beams.

Conclusions: The ESDs measured were strongly dependent on both field size and electron beam energy. Differences between ESD values may be due to differences in the electron beam scatter that is energy dependent. Discrepancies between ESD and VSL values may be due to the method used to measure ESD which more closely matches clinical conditions than the film VSL method. Determination of the effective source distance can be used for correct MU calculations for modulated electron radiotherapy.