

AbstractID: 13336 Title: Experimental feasibility study on the use of scattering foil free beams for energy modulated electron therapy

**Purpose:** This work aims to investigate the feasibility of scattering foil free beams for use in energy modulated electron therapy, particularly for the small  $2 \times 2 \text{ cm}^2$  field sizes frequently used in this technique. The main significance of this investigation is the potential reduction in photon contamination within the Bremsstrahlung tail region and its corresponding reduction in dose to healthy tissue.

**Materials and methods:** A Varian (Varian Medical, Inc., Palo Alto, CA) 21EX linear accelerator was used in conjunction with an existing, custom built electron collimator to produce  $2 \times 2 \text{ cm}^2$  and  $8 \times 8 \text{ cm}^2$  fields at isocenter. The scattering foil was removed from the beam line by removing the port plug from one of the extra ports and manually rotating the desired port into position. Comparisons between the different beams were made by analyzing data taken using an IC10 (Best Medical, Nashville, TN) ion chamber and a Wellhoffer WP700 (IBA Dosimetry, Bartlett, TN) water tank. Measured ionization curves were converted to dose using stopping power ratio data.

**Results:** PDD curves showed a marked reduction to the dose within the Bremsstrahlung tail region for the  $2 \times 2 \text{ cm}^2$  field sizes with the scattering foil removed. Dose was reduced by a factor of 7.4 and 4.9 for the 20 MeV and 9 MeV cases respectively. Profiles taken at the depth of dose maximum showed no difference in the high dose region of the  $2 \times 2 \text{ cm}^2$  between the case with and the case without the foil in place.

**Conclusion:** This work has shown significant advantages that support the use of scattering foil free beams in EMET with no disadvantages apparent in the profiles and PDDs, however, the practical aspects of the dosimetry of these beams using the internal transmission ion chamber in the accelerator is a topic of further study