AbstractID: 11313 Title: Improved electron Monte Carlo dose calculation for low energy electron beams using eMC

Purpose: The electron Monte Carlo (eMC) dose calculation algorithm in Eclipse (Varian Medical Systems) is based on the macro MC method and is able to predict dose distributions for high energy electron beams with high accuracy. However, there are limitations for low energy electron beams. This work aims to improve the accuracy of the dose calculation using eMC for 4 and 6 MeV electron beams of Varian linear accelerators.

Method and Materials: Improvements implemented into the eMC include: (1) improved determination of the initial electron energy spectrum by increased resolution of mono-energetic depth dose curves used during beam configuration; (2) inclusion of all the scrapers of the applicator in the beam model; (3) reduction of the size of the sphere within the macro MC transport when the energy of the incident electron is below certain thresholds. The impact of these changes in eMC is investigated by comparing calculated dose distributions for 4 and 6 MeV electron beams with applicators ranging from 6x6 to 25x25 cm^2 of a Varian Clinac 2300C/D with the corresponding measurements.

Results: Dose differences between calculated and measured absolute depth dose curves are reduced from 6% to less than 1.5% for both energies and all applicators considered. Using the original eMC implementation, absolute dose profiles at depths of 1 cm, d_{max} and R50 in water lead to dose differences of up to 8% for applicators larger than 15x15 cm^2. Those differences are now reduced to about 2% for all dose profiles investigated when the improved version of eMC is used.

Conclusion: In this work several enhancements were made in the eMC algorithm leading to significant improvements in the accuracy of the dose calculation for 4 and 6 MeV electron beams of Varian linear accelerators. **Conflict of Interest:** This work was supported by Varian Medical Systems.