AbstractID: 13788 Title: Electron Monte Carlo dose calculation in Eclipse for Elekta linear accelerators

Purpose: The macro Monte Carlo (MC) method as implemented in Eclipse (Varian Medical Systems), named eMC, is only released for Varian accelerators. This is due to limitations in accuracy if eMC is applied to Elekta machines. This work describes improvements made in eMC to achieve accurate dose calculations of electron beams for Elekta accelerators.

Method and Materials: Several changes recently implemented in the original eMC algorithm for low electron beam energies of Varian linear accelerators have been applied for the modeling of Elekta machines. In order to make eMC available for Elekta machines, the second divergent photon and electron source in the beam model for Varian accelerators have to be replaced with a line source to model the head scatter radiation more accurately. With respect to the dose calculation algorithm, the transport of the secondary electron component has been improved including modifications in the database of the transport code. Calculated and measured dose distributions are compared for Elekta machines using electron energies of 6, 8, 9, 12 and 15 MeV and applicators ranging from 6x6 to 20x20 cm^2.

Results: Calculated and measured absolute depth dose curves agree generally within 1.5% or 1 mm at a source to surface distance (SSD) of 100 cm. For SSD = 110 cm the differences are usually within 2% or 2 mm. Calculated and measured absolute dose profiles at depths of d_{max} and in the photon tail generally agree to within 2%. Some dose values close to the field edge show slightly larger differences.

Conclusion: The results of the dose comparisons using the newly developed version of eMC suggest that this new eMC is now suitable to predict dose distributions for Elekta linear accelerators within sufficient accuracy. **Conflict of Interest:** This work was supported by Varian Medical Systems.