AbstractID: 8375 Title: Monte Carlo collimator transport methods for photon treatment planning

Purpose: Monte Carlo (MC) based investigation of the impact of different radiation transport methods in collimators on beam characteristics, dose distributions and efficiency. **Method and Materials:** Within the Swiss Monte Carlo Plan (SMCP) – a GUI-based framework for photon MC treatment planning – different MC methods are available for the radiation transport through the collimators (secondary jaws and MLC): EGSnrc, VMC++ and Pin (an in-house developed MC code). Additional MC methods were implemented in order to provide different complexity levels for the MC simulation: Considering the collimators as totally absorbing, considering attenuation only, considering first order or all Compton scatter. Furthermore, either a simple or an exact geometry can be selected for the absorbing or attenuation method. Phase spaces above and dose distributions in a water phantom are analyzed for artificial and clinical treatment fields using 6 and 15 MV beams. **Results:** For all MC methods, differences in the radial mean energy and radial energy fluence are within 1% inside the geometric field. Below the collimators the energy fluence is underestimated for non-full MC transport methods ranging from 5% for all Compton to 100% for absorbing. Gamma analysis using EGSnrc calculated doses as reference shows that the percentage of voxels fulfilling a 1%/1mm-criterion decreases from 99% when using VMC++ to 80% (non-IMRT) and 40% (IMRT) when the absorbing method in a simple geometry is used. However, compared with EGSnrc calculations, the gain in efficiency is a factor of 10 for VMC++ and 90 for the absorbing method. **Conclusion:** The results of this investigation suggest that it might be suitable to use a simple transport technique in the initial treatment planning process and use more accurate transport methods towards the end of the planning process accepting longer calculation time. **Conflict of Interest:** This work was supported in part by Varian Medical Systems.