AbstractID: 8680 Title: Intercomparision of Monte Carlo Radiation Transport Codes MCNPX, GEANT4 and FLUKA for Simulating Proton Radiation Therapy of the Eye

Purpose: To compare the dosimetric accuracy and simulation speed of Monte Carlo radiation transport codes MCNPX, GEANT4 and FLUKA for simulating proton radiation therapy of the eye. **Method and Materials**: Monte Carlo simulations of an ocular treatment beam line consisting of a nozzle and a water phantom were carried out using MCNPX, GEANT4 and FLUKA. The simulations were performed for a circular and a hemi-circular final collimating aperture. The simulated central axis percent depth dose profiles and the cross-field dose profiles at a depth of 17.5 cm in the water phantom were compared with the bench marked experimental data for the circular aperture at the range setting 25 cm. In addition, cross field profiles at the same depth were studied for the ranges from 20 cm to 40 cm in steps of 5 cm using the hemi-circular aperture. Simulation efficiency in parallel processing architectures was evaluated by comparing the number of proton histories simulated per time per CPU. **Results**: The maximum differences between absorbed dose profiles from any of the simulations and the measurements were 6% and 0.6 mm, while typical differences were a factor of three smaller. The computation efficiency of the various Monte Carlo codes differed approximately by a factor of two or less for similar simulation conditions. **Conclusions**: Preliminary results indicate that the Monte Carlo transport codes considered for the study are similar to one another in computational efficiency and in accuracy. All of the codes considered were sufficiently accurate for calculating proton dose distributions in the eye.