AbstractID: 7265 Title: Monte Carlo simulation and measurment investigations of motorized multi-leaf collimator for electron beam delivery

Purpose: To evaluate the performances of the motorized remote controlled multi-leaf collimator for electron (eMLC) prototype developed in our center. To develop a Monte Carlo model of this prototype. To compare measurements and simulated data for various field configurations.

Method and Materials: The model of the eMLC and the Elekta linac head for electron beam energies of 6, 8, 10, and 12 MeV was developed using the Monte Carlo package BEAMnrc/EGSnrc. The dose has been calculated in a water phantom using DOSXYZnrc software for different field sizes from 1.4X1.4 to 16.8X16.8 cm^2. The measurement have been done using electron silicon diode. The simulated and measured profiles, percentage depth dose and output factor have been used to validate the Monte Carlo model. Physical parameters such as leakage trough the leaves, dose resolution, contamination dose and leaf scatter were investigated. The number of electron histories or the voxels dimensions where chosen to lead to a statistical uncertainty better than 2% (1 SD).

Results: For all field configurations, the difference between measured and simulated penumbras is less than 2 mm and the agreement for output factors is within 2 %. The total leakage dose relative to the maximum central axis dose for a 9.8x9.8 cm^2 eMLC field size at 12 MeV at the water surface is 1.7 %.and at d_{max} is 1.5%. We need to close at least two leaves in order to cut 50 % of the dose under the leaves.

Conclusion: Our results showed that the eMLC and Linac Monte Carlo model is a realistic model. A combination of the Monte Carlo model and the prototype could be used to develop advanced techniques like modulated electron therapy and mixed-beam modulated therapy.