AbstractID: 10549 Title: Measurement driven, Electron beam Modeling and Commissioning for Monte Carlo Treatment Planning with Improved Accuracy

Purpose: Numerous Monte Carlo (MC) models of therapeutic electron beams are presented in the literature. However, beam models built solely with manufacturer specifications of the accelerator do not systematically provide acceptable agreements with measurements. Clinically, accurate beam models are crucial to MC treatment planning as electron dose calculations found in commercial treatment planning system (TPS) are generally inaccurate. Therefore there is a strong motivation to use highly accurate MC simulations as standard information for commissioning commercial TPS. The current research project consists of developing an improved accurate electron beam model based on detailed information of the linac head and to incorporate it into an in-house TPS. **Method and Materials:** A model for the dual scattering-foil linac CL-21/EX (Varian) has been built with the EGSnrc/BEAMnrc-MC codes for all clinical electron energies available. Measured PDD and transverse dose profiles at various depths of clinical interest were used to tune-up the model. Our commissioning procedure also includes measurements made with fully opened jaws without applicators. This procedure yields a more insightful understanding and accurate description of the source geometry. Measuring tools consisted of an IBA-Blue phantom water tank, diodes, parallel plate and cylindrical ionization chambers. Calculations were performed on a 24-cores MC cluster. **Results:** Our model has been validated for regular, irregular fields and custom cutouts against measurements and is accurate within 2.9%. The model has been incorporated into an in-house planning system. A previously developed EGSnrc code was used to transport the particles of the phasespace through the custom cutouts allowing further simulation into CT patient. **Conclusion:** Excellent agreement was achieved between measurements and MC simulations. Our accurate electron beam model incorporated into our MC TPS is a valuable tool for evaluation of treatment planning systems.