

AbstractID: 10596 Title: Siemens Primus linear accelerator commissioning for IMRT verification using PMCEPT Monte Carlo code and GAFCHRONICTM EBT film

Purpose: To implement a dose calculation system that accurately predicts the dose delivered by Siemens Primus 6 MV linear accelerator and to check the IMRT treatment planning system calculation with an independent calculation system. **Method and Materials:** The BEAMnrc and the PMCEPT Monte Carlo code were used to simulate Siemens Primus 6 MV photon beams. The BEAMnrc was used to generate phase space (phsp) files at 100 cm source-to-surface distance for several beams, defined by the jaw and MLCs. Symmetric square beams ranging from 1 x 1 to 20 x 20 cm² were calculated to simulate pyramid density shape. The left hand side non symmetric rectangular beams of 3 x 15, 4.5 x 15, and 6 x 15 cm² and the right hand side non symmetric rectangular beams of 6 x 15, 4.5 x 15, and 3 x 15 cm² were calculated to simulate inverse-pyramid density shape. The PHSP files were subsequently used as the input files for the PMCEPT code. The commissioning was verified against EBT film, ion chamber, diode detector measurements for a solid water phantom. **Results:** A solid water phantom of 30 x 30 x 30 cm³ with cell size of 0.1 x 0.1 x 0.2 cm³ was used for the PMCEPT simulations. For each beam, the MC calculated central axis depth dose and lateral profiles were compared with those of experiments. The agreement between calculated and measured dose distributions was within 2%. For both pyramid and inverse-pyramid density shapes, superposed-lateral profiles show agreement better than 2%, even in the region of penumbra where gradient varies sharply. **Conclusions:** Our results suggest that the PMCEPT code can be used to calculate IMRT dose distributions as well as to calibrate detectors with great accuracy. Moreover, it can be used as a double check system for IMRT QA and treatment planning.