AbstractID: 8037 Title: Dosimetric Verification of IMRT Fields Using an Amorphous Silicon Flat Panel Imager and Monte Carlo Simulation

Although Intensity-modulated radiation therapy (IMRT) can deliver complex patient dose distributions, the potential for dosimetric errors increases in each step from planning to dose delivery. To assure accurate dose delivery, dosimetric verification is typically performed for each patient beam. Film measurements are considered state-of-the-art for dosimetric verification, however, film dosimetry is laborious and often error prone. Electronic portal image devices (EPIDs) are replacing films because EPIDs can acquire a real-time dose-image that allows rapid dosimetric verification. Furthermore, EPIDs can be used with the patient present for transmission dosimetry. To verify IMRT dose delivery, the treatment planning system has to predict the absolute dose in the same setup as the EPID measurement. The energy dependent response of the EPID phosphor combined with the complex IMRT dose delivery, including the effects of treatment head scatter radiation, requires an accurate method to simulate the EPID with minimal approximations. The Monte Carlo (MC) method can perform this task. The aim of this study was to develop an MC module for a commercial EPID and use it to compute IMRT pre-treatment and transmission images for comparison with measurements for IMRT dose verification. Comparisons for a $10\times10\ cm^2$ static field demonstrate that the EPID MC model correctly predicts both in-field and out-of-field EPID responses. Pre-treatment and transmission dose verification for a clinical head and neck IMRT patient plan, utilizing sliding window dynamic multi-leaf collimator delivery, showed that the MC simulation successfully reproduces measured pre-treatment and transmission dose images.