AbstractID: 10446 Title: A QA procedure for MLC leaf position and Dynalog file accuracy using the EPID

Purpose: A main concern about the IMRT dose validation tool using Monte Carlo (MC) simulation and R&V system/Dynalog file is the potential inconsistency between the actual leaf-end positions and those recorded by the Dynalog file. The present study investigates an accurate, fast and independent method to validate the accuracy of the dynalog files using aSi-EPID images.

Materials and Methods: A computer program was developed to detect the MLC segmented field edges in EPID images (1024×768 pixels, pixel size: 0.392mm). Standard reference MLC segmented fields were designed and leaf-end positions were measured accurately. EPID images for these reference MLC fields were recorded and the leaf-end positions were calculated as the locations where the image intensity is 50% of the maximum. Small corrections were made to minimize the effect of scattered photons (background). Daily EPID images of the same MLC segmented fields were compared to the original images and to check the accuracy of the Dynalog files. The patient-specific Dynalog files were used for MC based patient-specific treatment verification.

Results: Both the MLC and EPID were calibrated to produce accurate and consistent leaf-end positions. The results showed that the EPID-extracted leaf-end positions were within ±0.167mm of their actual positions, while the average RMS leaf-end deviation was 1.73mm. Differences between daily EPID and Dynalog leaf-end positions were established and to be monitored on the long term. Random small leaf position variations have negligible effect on the patient dose distribution but a 1mm systematic leaf-end-position error could result in a 3% change in the delivered dose.

Conclusion: A daily QA tool is developed to check the accuracy of the Dynalog file and MLC leaf-end positions as part of the comprehensive IMRT QA procedure. This ensures the accuracy of the MC based patient-specific IMRT dose verification using the information recorded in the R&V system/Dynalog files.