AbstractID: 5722 Title: An Optimal MLC quality assurance procedure using EPID

Purpose: IMRT QA is extremely time consuming and labor intensive, while IMRT delivery is complex. The purpose of this work is to develop an automated and quantitative IMRT QA process utilizing an EPID. One of the aspects of this is testing of MLC leaf position accuracy. The Memorial-Sloan-Kettering strip test was modified to provide an automated EPID-based process.

Method and Materials: To provide a baseline fluence map, Kodak XV film was irradiated to obtain an open field 2D beam profile, which was fitted with a Gaussian and used in the image correction routine. We used a strip test consisting of seven adjacent segments with an intentional gap of nominally 0.5 mm. The gap was intentionally varied for the positions located at regularly placed hexagonal regions in order to create a set of calibration curves. A fitting technique using a Lorentzian type function was developed to determine the dose-peak-height, dose-peak-position and FWHM.

Results: The standard deviation of dose-peak-height at each abutment for traditional Memorial-Sloan-Kettering pattern was of the same order of magnitude as that of the average over the entire image. In contrast, in our pattern a difference of an order of magnitude was observed, which indicated the reducing of cross-talk effect from adjacent leaves. The leaf positioning error can be identified by using standard calibration curves of dose-peak-height vs. gap. The coordinate of dose-peak-position is found to be an extremely sensitive indicator of leaf error with sub-pixel standard deviation.

Conclusions: This procedure is able to identify MLC positional errors less than 0.5 mm by using a fitting technique and by reducing the cross-talk effect.

Conflict of Interest: Research sponsored by Varian Corporation