

AbstractID: 3786 Title: Practical gap-width threshold for MLC quality assurance for IMRT

Purpose:

A standard IMRT quality assurance test for Multi Leaf Collimator (MLC) leaf position accuracy is the Memorial Sloan-Kettering (MSK) leaf test. This test involves inspecting the widths of five 1 mm wide fields delivered 2 cm apart. A maximum error tolerance of 0.2 mm in the gap-width between sets of opposing leaves is recommended. In a preliminary informal visual test performed with an independent observer, the observer detected all deliberately introduced errors greater than or equal to 0.5 mm, but not all 0.2 mm errors.

Method and Materials:

We investigated the use of the MSK leaf test on a Varian Clinac 2300C/D and Clinac 2300EX, with Mark I (52 leaf) and Millennium (120 leaf) MLCs, respectively. Kodak XV film was irradiated with 6 MV photons at an SSD of 100 cm, using 1000 monitor units for the delivery of the five segments. The film was scanned using a Vidar VXR-16DP scanner, and subsequently analyzed with the RIT113 Version4 software. The RIT software recommends using a 3x3 median filter to remove background noise, which effectively reduces the image resolution. Since the smallest baseline resolution of the scanner is 0.089 mm, a 0.2mm error will be difficult to observe after a 3x3 filtration. Separate films were irradiated under the same conditions and scanned to determine if the scanner software combination was consistent in assessment of the magnitude of errors in the gap-width.

Results:

The reproducibility of leaf positions on multiple films was found to be within one pixel. However, not all artificially introduced errors that were visually observable were detected by this software technique.

Conclusion:

It may not be feasible to reliably measure gap-width errors of 0.2 mm, either by eye or by quantitative analysis using the technique presented here.