

Purpose: Quality assurance (QA) for Multi-leaf Collimators (MLC) is becoming more important as IMRT is becoming popular. Its importance will further increase when tumor tracking using an MLC becomes clinically applicable. This study aims to develop a practical MLC routine QA pattern that can be used in clinics to perform various MLC QAs using an Electronic Portal Imaging Device (EPID).

Method and Materials: An MLC pattern of 17 cm width, a modified Picket fence, has been developed. The pattern consists of seven regions, including 0, 10, and 20 MU, and two gradient regions (for increasing and decreasing dose). In each region, the MLCs move with various speeds, namely 0, 0.25, 0.3, 0.8, and 2.5 cm/sec, and with varying sliding window width. Offsets of 0.5, 1, 2, and 3 mm were introduced for some of the leaves to simulate defectiveness. The MLC sequence was delivered with a Varian-Trilogy accelerator. Images were acquired both in integrated and cine modes using a aS1000 EPID. The EPID images were analyzed using home-grown software.

Results: Weekly constancy checks such as leaf alignment and transmissions are performed using the integrated image for both with and without inter-digitations. Monthly measurements of leaf speeds and position accuracy for four cardinal gantry angles are performed using the cine mode images. A positional variation larger than 0.5 mm can be detected. The leaf positions were measured at four locations with an error of ± 0.038 cm. Annual tests such as MLC transmission for all energies and leaf position repeatability are performed using the cine-mode images.

Conclusion: The new pattern is sensitive to potential errors and is convenient to use. Multiple tests can be performed using a single pattern, and the testing time is short, e.g., 5 and 10 min for the weekly and monthly checks, respectively.