

Purpose: Current methods of MLC calibration and quality assurance include the use of graph paper, scanning water tanks, ion chambers, film and EPIDs; these methods can be both laborious and/or non-quantitative. We propose a convenient and quantitative method for calibrating and performing routine quality assurance for MLCs.

Method and Materials: The Profiler 2 (Sun Nuclear Corp., Melbourne, FL), a two dimensional diode array, was visually aligned to the backup jaw and irradiated with an Elekta linac. The backup jaw served as a radiation reference line and was used to determine the positional diode offsets. The MLC was stepped over the Profiler 2 and the 50% position for each diode was determined. Leaf offsets were calculated by offsetting each diodes 50% position by the 50% position of the diode corresponding to leaf pair 20 and subtracting the corresponding positional diode offset. This method was repeated with an EPID for comparison purposes.

Results: Linear dose changes of approximately 15%/mm and 13.5%/mm were observed in the penumbras of the backup jaw and MLC, respectively. Leaf positions measured by the EPID and Profiler 2 differed on average by ± 0.12 mm per leaf. Leaf reproducibility of 0.36 mm or better was observed and minimal reproducibility changes were seen with the backup jaw.

Conclusion: This work demonstrates the potential of the Profiler 2 as a tool for calibrating and performing quantitative QA for MLC leaf positioning. The Profiler 2 methods are fast, taking an average of 20 minutes to perform and accurately represent leaf positions and reproducibility.

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