

AbstractID: 2029 Title: Dynamic MLC QA Testing Using Multi-Detector Linear Accelerator Beam Quality Check Devices

Treatment delivery accuracy of intensity modulated radiation therapy (IMRT) using dynamic multi-leaf collimator (DMLC) technique depends on the accuracy of MLC leaf position calibration and motion speed, typically tested using film dosimetry for qualitative evaluation, or ion chamber measurement that tests the central leaf pairs. Alternative testing methods, using multi-detector linear accelerator (LINAC) beam quality check devices, may provide adequate testing accuracy while improving the efficiency of this QA task by maximizing the number of leaf pairs tested. This work investigates the feasibility of DMLC QA testing using one of such devices, the Victoreen Double-Check device, with 10 built-in ion chambers. A DMLC field of 0.5-cm width by 15-cm length, with a central leaf-pair open all the time to turn-on the device, was created to sweep through the Double-Check device. Collimator rotation angle was selected to maximize the number of leaves intercepting the ion chambers in the device. Leaf position errors of 1-mm and 2-mm at isocenter were introduced into each leaf-pair, one pair at a time, to evaluate the sensitivity of this testing technique. Of the 30 leaf-pairs tested, the device was able to detect 12 leaf-pairs with 1 mm position error respectively with  $\geq 2\%$  change in device readings. This number increased to 19 leaf-pairs when 2-mm leaf position error was introduced to each leaf-pair. Compared with traditional DMLC QA testing techniques, the use of multi-detector LINAC beam quality check devices provides simplified testing procedure while allowing the quantitative testing of larger number of leaf pairs.