AbstractID: 3633 Title: Application of a Gantry-Mounted Diode Array System for QA Dosimetry of High-Energy Photon Beams

Purpose: To investigate the utility of a commercial diode-array system mounted on the gantry of linear accelerators to perform relative QA dosimetry of photon beams at different gantry angles.

Method and Materials: The diode-array Profiler (Sun Nuclear Corp.) was mounted on the head of the linac. Beam profiles were measured at multiple gantry angles for 6 and 10 MV photon beams. Flatness, asymmetry, and central-axis relative output were determined. Dynamically-wedged (EDW) profiles were measured at various gantry positions for different wedge angles. For a given EDW field, the speed of the Y-jaw motion was varied by changing the number of MUs for studying the effect of jaw speed on the EDW profile. The potential effects of gravity and leaf speed on the dynamic delivery of MLC-based IMRT beams were also investigated. The IMRT fields were designed such that the MLC leaves move against or along gravity when the linac gantry is at horizontal position. The MLC leaf speed was varied by changing the total MU.

Results: (1) The gantry angle has no influence on the flatness, asymmetry, and the central-axis output of the clinical beams. (2) Our data validated the delivery of EDW treatments at any gantry position. (3) For IMRT fields, the beam profiles are accurately reproduced at any gantry angle for all leaf speeds. No gravity effect on dMLC delivery was observed. However, the diode-array system was able to detect a difference of about 3% in beam profiles produced by leafs traveling in opposite directions at a high leaf speed of 2.5 cm/sec, attributable to the communication time lag between MLC controller and the Linac beam control but not to gravity.

Conclusion: The gantry-mounted linear diode array Profiler is an efficient tool for performing QA of basic beam characteristics, EDWs, and dMLC, especially at different gantry angles.