AbstractID: 2846 Title: The use of diode in in-vivo dosimetry quality assurance in IMRT

Purpose: In IMRT treatments, the ultimate QA procedure is to carry out in-vivo dosimetry measurement to ensure the accuracies of both patient setup and beam delivery. This study was designed to explore the use of in-vivo diode dosimetry measurement for QA of IMRT treatments.

Method and Materials: IMRT plans were generated based on a set of CT scans of a head & neck anthropomorphic phantom. Corresponding IMRT QA verification plans were also generated. Diode calibration readings (R_c) were obtained for each beam during the routine dose verification QA process. During verification, a diode was placed along the beam central axis on the surface of a flat QA phantom at the SSD specified in the QA plan. Radiation was delivered dynamically using the same dynamic MLC files that were to be used for the patient treatment. For in-vivo measurements, the anthropomorphic phantom was setup according to the treatment plan. For each beam, a diode was placed along the central axis at the beam surface entry point. Radiation was then delivered according to the plan and the diode reading (R_i) was recorded. If both the setup and the beam delivery were correct, R_i should be in agreement with quantity R_c*f_{SSD} within certain uncertainty (f_{SSD} is SSD correction factor); otherwise, it would be an indication of incorrect patient setup or incorrect beam delivery.

Results: It was found that the calibration diode readings followed the SSD inverse square law within an uncertainty of 0.4%. $f_{ssD} \left(\frac{SSD_c}{SSD_i} \right)^2$. The derived in-vivo diode readings (R_c*f_{SSD}) were in agreement with those measured ones within 3.6% for three beams at different gantry angles, with an average difference of 1.8%.

Conclusions: With a proper calibration method, diode verification can be used relatively accurately for in-vivo measurements to check on the accuracies of patient setup and beam delivery for IMRT treatments.