AbstractID: 6628 Title: In-vivo dosimetry verification of a 3D treatment plan prescription dose at a depth beyond dmax using diodes

Purpose: To provide an in-vivo verification using diode detectors of a patient prescription dose calculated by a three-dimensional treatment planning algorithm.

Method and Materials: Three models of diodes specially designed for high-energy photon beams (6-MV Isorad and QED, and the 20-MV QED diode detectors manufactured by Sun Nuclear Corporation, Melbourne, Florida) were used to measure the percent depth dose (PDD) of a 6-MV and 20-MV photon beams produced by a Varian 2300 C/D Linac. These diodes were not water proof and the measurements were performed at multiple depths in a solid-water phantom.

Results: The measured PDD curves agree within 2% with clinical PDD curves scanned in a water tank to depths up to 25 cm. This allows scaling of the diode dose reading measured at the patient skin to a depth inside the patient which is usually the prescription point or the isocenter for a multiple beam SAD treatment as defined in a 3D treatment plan.

In-vivo measurements were performed on real patients. The doses scaled to the measurement depth were summed for all beams and compared with the calculated value from the treatment planning system (TPS). The treatment sites and agreement are listed below.

- 10 head and neck cases thus far, 0.4%-6.7% difference between calculated and measured doses,
- 8 pelvis cases thus far, 1.9%-6.5% difference between calculated and measured doses,
- 6 breast cases thus far, 2.3%-5.4% difference between calculated and measured doses,
- 4 chest cases thus far, 1.3%-6.7% difference between calculated and measured doses.

Conclusion: An in-vivo dosimetric method has been developed to measure delivered dose to the prescription point at a depth within the patient. Overall agreement between the measured and TPS-calculated dose to the prescription point falls within ± 7% as recommended by the TG-62 protocol.