AbstractID: 10173 Title: Dosimetric Evaluation of a New Two-Dimensional Diode Matrix System for IMRT Planning Validation

Purpose: To present a dosimetric study of a large-area 2D diode matrix QA device recently introduced for the validation of planar dose distributions resulting from patient IMRT plans used for treating prostate and head and neck (H&N) cancers.

Method and Materials: MapCHECK 2^{TM} Model 1177 (Sun Nuclear Corporation, Melbourne, FL) is a new 2D diode array consisting of 1527 n-diodes distributed over a 26x32 cm^2 octagonal space with a uniform diode spacing of 7.07 mm. Its predecessor (MapCHECK model 1175) contained 445 n-diodes arranged over a 22x22 cm^2 area. Spatial resolution over the 10x10 cm^2 central portion was 7.07mm and increased to 14.14 mm outside this area. TG-51 dose calibrations and diode sensitivity measurements were performed on both diode arrays before their clinical application. From a pool of IMRT patients, 5 prostate and 5 H&N treatment plans were selected for plan validation using both devices. Dose plan verification was accomplished by superimposing measured isodose distribution, at 10-cm depth, for each IMRT field on the companion distribution calculated using the Pinnacle^3 treatment planning system (8.0m).

Results: (1) As expected, both diode arrays faithfully reproduce the calculated isodose distributions for all prostate treatment plans, because the same inner high-resolution (7 mm) area is used. (2) For H&N plans, the isodose distribution measured with MapCHECK 2, owing to its uniform 7 mm diode spacing, gives superior agreement with the Pinnacle isodose distributions. (3) Similar results are obtained with the older MapCHECK by utilizing the inner high-resolution area at the expense of making multiple exposures for each field following translational and rotational shifts.

Conclusions: We have successfully implemented the new MapCHECK 2 and demonstrated that it is more efficient for H&N IMRT QA than its predecessor. It is better suited for measuring planar dose distributions of larger IMRT fields encountered in H&N IMRT treatments.