

Purpose: To evaluate the effect of the dose distribution sampling on the outcome of the Intensity Modulated Radiotherapy (IMRT) Quality Assurance (QA) for the small fields.

Methods: MapCHECK diode array (Sun Nuclear, Melbourne, FL) is routinely used for IMRT plans verification in our clinic. Dose distributions for ten plans with small field sizes ranging from 3 to 6 cm were measured using MapCHECK, satisfying our 3% and 3 mm distance-to-agreement (DTA) criterion for more than 90% of points above 10% threshold. The spatial resolution of 0.7 cm diagonally in the central region of the MapCHECK may result in as few as 20 or less sampling points. To increase the spatial resolution, we delivered the same plans to the MapCHECK, shifted 0.5 cm orthogonally, and merged the two dose distributions. Same fields were also delivered to the EBT2 radiochromic films (International Specialty Products, Wayne, NJ). Films were scanned using Epson Expression 10000XL flatbed film scanner with a resolution of 0.3 mm and calibrated for absolute dosimetry. The dose distributions with 3% and 3 mm DTA criterion were compared for as follows: plan with film, plan with MapCHECK and direct comparison of MapCHECK and merged MapCHECK distributions with film.

Results: MapCHECK shows a slightly better agreement with plan than film dosimetry (mean percentage of passing points is 98.3% vs. 96.0%). The average percentage of passing points is 98.3% with standard deviation (SD) of 2.4% when comparing film with single MapCHECK measurements. This average is 97.7% with SD of 2.1% for MapCHECK measurement with merged fields. The increase of MAPCHECK sampling does not always results in improvement in agreement with film.

Conclusions: The diode matrix may effectively replace the film dosimetry for small field sizes ranging from 3 to 6 cm.

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No conflicts of interest