

Purpose: to evaluate the suitability of two commercial detector arrays for IMRT patient-specific quality assurance.

Method and Materials: The two detector arrays investigated are the MapCHECK diode array and the ImRT MatriXX ionization chamber array. We examined the linearity of the detector response, short-term and long-term reproducibility, statistical uncertainty as a function of delivered dose, and the validity of the array calibration. The dependence of the response of detectors on the field size, dose rate, and radiation energy were also studied. Finally, radiochromic EBT films were used to compare the results with those from the two detector arrays for three IMRT fields.

Results: Both detector readings showed excellent agreement ($<0.5\%$) with Farmer chamber measurement with varying field size and SSD in both 6 MV and 18 MV photo beams. While the MapCHECK showed a stable short-term response ($<0.3\%$ variation), the MatriXX showed a continuously slow increase in reading during the one-hour period (an increase of about 0.8%). Both detectors showed a fluctuation of about 1% during the one-month period. The MapCHECK also showed a slightly better array sensitivity correction with all the detectors having less than 1% discrepancy and more than 90% of the detectors within 0.5% variation. On the other hand, about 60% of the MatriXX detectors showed a less than 0.5% variation and ~8% exhibited a larger than 1% discrepancy. Using the commonly used 3%/3mm criteria, both detector arrays had more than 95% passing rate for the three IMRT fields when compared with the EBT film.

Conclusion: The two detector arrays showed no field size, SSD, and energy dependent response with stability of better than 1% in most cases and are suitable for IMRT patient-specific quality assurance.

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