Purpose: To evaluate the dosimetric characteristics of two commercially available detector arrays, the MapCHECK2 diode array and the PTW Octavius® II ionchamber array, and to assess their use with patient-specific step-and-shoot IMRT QA delivered from treatment specific gantry angles.

Methods: Detector properties were compared in their response to varying dose rates, field sizes, and gantry angles. Ten patient-specific IMRT Quality Assurance (QA) plans were analyzed. The selected patient files were separated into high and low degrees of modulation, e.g. Head and Neck vs. Prostate. Delivered doses to PTW and MapCHECK2 were evaluated with 5% 3mm and Van Dyk Gamma analysis criteria.

Results: For both arrays, our findings showed a 1% difference in the measurement for the 100MU/min to 600 MU/min dose rate change for the 10 x 10 cm2 field size. A pearson product-moment correlation test calculated to evaluate each detector’s deviation from TPS for increasing field size resulted correlation coefficients of -0.8 and 0.01 for PTW and MapCHECK2 respectively, exhibiting PTW’s field size dependence which increases by 5% for a 10x10 to 1x1 field. The average 5 x 5 cm2 measurement deviation from the TPS over all angles resulted in 2% and 4% absolute error for PTW and MapCHECK2 respectively, with MapCHECK2 erring up to 36% only at the lateral beams angles 90° and 270° (±10°). For the other angles the absolute error decreased to 1% for MapCHECK2. All 10 patient-specific IMRT QAs passed the gamma criteria on both detector arrays.

Conclusions: Both MapCHECK2 and PTW detector arrays can be used for treatment angle specific IMRT QA. Care must be taken for gantry angles within 10° of the detector plane of MapCHECK2. This is less pronounced for rotational delivery where a smaller portion of the beams will contribute to the total dose from these directions.