THE IMRT AND VMAT QA EXPERIENCE USING PTW 2D-ARRAY

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Purpose **:** The purpose of this study was to evaluate the accuracy of dose delivery in IMRT and VMAT.
Method and Materials **:** The PTW 2D-ARRAY consists of 729 vented ionization chambers with a dedicated phantom called Octavius were used to acquire the 2D dose distributions for the IMRT and VMAT plans. One limitation of the PTW 2D-ARRAY is the significant angular dependency, so we had measured the correction factors for VMAT plans. Another dosimetry system consists of a farmer type ion chamber (Wellhofer FC-65P) and solid water phantom was used to measure the selected point dose. Total of 19 IMRT and 8 VMAT plans were included in this study. IMRT plans were verified with perpendicular deliveries at 0 degree gantry angle. VMAT plans were measured with actual treatment arcs, and then the corrections were applied after the measurements. We performed gamma comparison with 3% and 3mm criteria to evaluate the results of all 2D dose maps.
Results **:** The significant angular dependences of PTW 2D-ARRAY were showed at the measured gantry angle between 90 to 270 degrees, especially at both 90 and 270 degrees, which was parallel with the measured plane of PTW 2D-ARRAY. The gamma factors of the gantry angle 90 and 270 were 13.1% and 22.3% for 6 MV photon beam and 31.7% and 37.2% for 10 MV photon beam.

The mean point doses variation between each measurements and treatment plans in all IMRT/VMAT QA was -1.0% +/-1.0 % (mean +/- std). The mean gamma factor of IMRT QA was 98.3%+/-2.1%. And the mean gamma factor in the full-arc VMAT QA was 95.6+/-2.6% after applied a correction factor range from 1.007 to 1.040. Therefore, the 2D dose maps showed great agreements in all IMRT/VMAT QA.
Conclusions **:** PTW 2D-ARRAY has better performance in static angle IMRT, but has limitations caused by angular dependences in VMAT QA. We suggest a correction factor should be applied to every measured points of 2D dose maps when using PTW 2D-ARRAY for a full-arc VMAT QA.
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Key words: Intensity-modulated radiation therapy, Volumetric Modulated Arc Therapy, Angular dependences