

AbstractID: 13019 Title: Angular response correction factors for ImRT MatriXX in rotational beam radiotherapy

Purpose: ImRT MatriXX (IMatriXX) ionization chamber array is a useful tool for pretreatment IMRT plan verification. The response of IMatriXX is dependent on the angle of irradiation, so it requires a correction factor for plan verification, in rotational beam radiotherapy or at any other gantry angle other than 0°. Necessary correction factors were calculated for IMatriXX in rotational beam radiotherapy.

Method and Materials: 2D ionization chamber array ImRT MatriXX (IBA dosimetry) has 24.4×24.4 cm² active area and 1020 vented pixel ionization chambers with center-to-center distance of 7.62 mm. IMatriXX was first calibrated with 100 cGy dose and then irradiated from different gantry angles (0° - 360° in steps of 5°) in an iso-centric setup on Elekta Synergy-S linear accelerator using 6 MV photon beam in multicube phantom. The isocenter dose (100 cGy) was calculated using CMS Xio (version 4.51) treatment planning system (TPS) for each gantry angle. Rotational arc plans were generated for different arc angles using TPS. The response graph was plotted between gantry angle versus IMatriXX response. The correction factors were calculated by taking inverse of average response for particular gantry angles readings. For IMRT plan verification at actual treatment angle, the IMatriXX response factor was applied corresponding to that gantry angle.

Results: The response of IMatriXX decreases as gantry angle changes from 0° to 180° and was 0.899 at gantry 180°. The correction factors were 1.011, 1.0367, 1.049, 1.035, for 0° to 90°, 0° to 180°, -90° to 180° and full rotational arc, respectively. The corrected IMatriXX doses were found to agree within 1.5% of TPS calculated for rotational arcs and IMRT plans.

Conclusion: The angular dependent response of IMatriXX is clinically significant and can be corrected by applying appropriate correction factors. By applying suitable correction factors IMatriXX can be used for rotational beam therapy.