

Evaluating the Dosimetric Performance for 3D Treatment Planning System for Wedged and Off-Axis Fields

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Abstract : This study is to evaluate the dosimetric performance of our institution's 3D treatment planning system for wedged and off-axis 6MV photon beams, guided by the recommended QA tests documented in the AAPM TG53; NCS report 15 test packages, IAEA TRS 430 and ESTRO booklet no.7. The study was performed for Elekta Precise linear accelerator designed for clinical range of 4, 6 and 15 MV photon beams with asymmetric jaws and fully integrated multileaf collimator that enables high conformance to target with sharp field edges. Ten tests were applied on solid water equivalent phantom along with 2D array dose detection system. The calculated doses using 3D treatment planning system PrecisePLAN were compared with measured doses to make sure that the dose calculations are accurate for simple situations such as square and elongated fields, different SSD, beam modifiers e.g. wedges, blocks, MLC-shaped fields and asymmetric collimator settings. The QA results showed dosimetric accuracy of the TPS within the specified tolerance limits. Except for large elongated wedged field, the central axis and outside central axis have errors of 0.2% and 0.5%, respectively, and off-planned and off-axis elongated fields the region outside the central axis of the beam errors are 0.2% and 1.1%, respectively. The dosimetric investigated results yielded differences within the accepted tolerance level as recommended. Differences between dose values predicted by the TPS and measured values at the same point are the result from limitations of the dose calculation, uncertainties in the measurement procedure, or fluctuations in the output of the accelerator.

Keywords : quality assurance, dose calculation, wedged fields, off-axis fields, 3D treatment planning system, photon beam

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