

Verification of Dosimetric Commissioning Accuracy of Flattening Filter Free Intensity Modulated Radiation Therapy and Volumetric Modulated Therapy Delivery Using Task Group 119 Guidelines

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Abstract : The purpose of this study was to create American Association of Physicist in Medicine (AAPM) Task Group 119 (TG 119) benchmark plans for flattening filter free beam (FFF) deliveries of intensity modulated radiation therapy (IMRT) and volumetric arc therapy (VMAT) in the Eclipse treatment planning system. The planning data were compared with the flattening filter (FF) IMRT & VMAT plan data to verify the dosimetric commissioning accuracy of FFF deliveries. AAPM TG 119 proposed a set of test cases called multi-target, mock prostate, mock head and neck, and C-shape to ascertain the overall accuracy of IMRT planning, measurement, and analysis. We used these test cases to investigate the performance of the Eclipse Treatment planning system for the flattening filter free beam deliveries. For these test cases, we generated two sets of treatment plans, the first plan using 7-9 IMRT fields and a second plan utilizing two arc VMAT technique for both the beam deliveries (6 MV FF, 6MV FFF, 10 MV FF and 10 MV FFF). The planning objectives and dose were set as described in TG 119. The dose prescriptions for multi-target, mock prostate, mock head and neck, and C-shape were taken as 50, 75.6, 50 and 50 Gy, respectively. The point dose (mean dose to the contoured chamber volume) at the specified positions/locations was measured using compact (CC-13) ion chamber. The composite planar dose and per-field gamma analysis were measured with IMatriXX Evaluation 2D array with OmniPro IMRT Software (version 1.7b). FFF beam deliveries of IMRT and VMAT plans were comparable to flattening filter beam deliveries. Our planning and quality assurance results matched with TG 119 data. AAPM TG 119 test cases are useful to generate FFF benchmark plans. From the obtained data in this study, we conclude that the commissioning of FFF IMRT and FFF VMAT delivery were found within the limits of TG-119 and the performance of the Eclipse treatment planning system for FFF plans were found satisfactorily.

Keywords : flattening filter free beams, intensity modulated radiation therapy, task group 119, volumetric modulated arc therapy

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