ABSTRACT

Beam matching of medical linear accelerators (linacs) requires stringent control of dosimetric parameters to ensure consistency in dose calculation and delivery. This study quantitatively evaluated the beam-matching accuracy of two Elekta Synergy Platform linacs, one multi-energy and one Single-energy unit, using 6 MV flattened photon beams. Detailed dosimetric measurements were conducted in a PTW three-dimensional water phantom to compare percentage depth dose (PDD), lateral beam profiles (flatness and symmetry), output factors, and absolute dose calibration. Treatment Planning System (TPS) consistency was further assessed through patient-specific quality assurance of five 3D conformal radiotherapy (3DCRT) and five intensity-modulated radiotherapy (IMRT) plans calculated in Monaco and verified using a PTW Octavius 1500 array. The measured PDD deviation at 10 cm depth did not exceed 0.29%, while flatness and symmetry differences were maintained below 0.6% in both inplane and crossplane directions. Output-factor discrepancies across all investigated field sizes were ≤0.41%, and absolute output agreement remained within recommended tolerance limits. Gamma evaluation with 3%/3 mm criteria yielded passing rates greater than 99% for all plans on both machines, demonstrating a high level of dosimetric equivalence. These results confirm robust beam matching between the two linacs, supporting their interchangeable use from a medical physics quality assurance perspective.

Keywords*: Beam Matching, 6 MV Photon Beams, Dosimetric Verification, TPS Verification*.