

AbstractID: 1288 Title: Verification of Intensity Modulated Stereotactic Radiotherapy Using Monte Carlo Calculations and EPID Dosimetry

The purpose of this work was to use amorphous silicon EPID dosimetry and Monte Carlo (MC) calculations to develop a comprehensive intensity modulated stereotactic radiotherapy (IMSRT) quality assurance (QA) process. This included verification of field shaping, treatment planning system (TPS) calculations, and patient dose delivery using transit dosimetry.

Measured and MC calculated EPID field shaping criteria were 5% local percent difference (LPD) in high dose regions, 1mm distance-to-agreement (DTA) in high gradient regions, or 2% of central axis MC pixel value in low dose regions. TPS and MC phantom dose calculation comparison criteria were 5% LPD in high dose regions, 2mm DTA in high gradient regions, or 2% of the MC maximum dose in low dose regions. Measured and MC calculated EPID transit dose pattern comparison criteria were 5% LPD in high dose regions, 1mm DTA in high gradient regions, or 2% of central axis MC pixel value in low dose regions. Successful verification of each step required $\geq 95\%$ of compared points to pass the criteria.

Beam shaping, TPS calculations, and dose delivery were successfully verified with 97% percent of the points passing criteria. With these criteria, accurate patient treatment has been assured. The developed methodology can detect a 1mm positioning error in a single segment for beam shaping verification and a 1mm target positioning error with respect to the beam aperture in dose delivery verification.

This work shows that MC calculations and EPID dosimetry are powerful tools in quantitative verification of IMSRT.

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