

AbstractID: 14075 Title: Performance monitoring of VMAT delivery

Purpose: To develop a system to measure the per-segment dose of volumetric modulated arc therapy (VMAT) beams, for delivery system and patient plan quality assurance (QA).

Methods and Materials: VMAT delivery validation requires measuring the dose as a function of gantry angle in order to identify gantry angle dependent errors. A dose measurement system has been developed which uses custom software and hardware, and a commercially available inclinometer, to sample the dose detected by an ionization chamber located inside of a phantom as a function of gantry angle, enabling per-segment evaluation of VMAT delivery. For routine QA of a VMAT delivery system, fields were created in which a 2 x 2 cm MLC aperture is continuously centered on an ionization chamber positioned at 8.0 cm distance from the isocenter. The MLC leaf trajectory follows a sinusoidal path over a 360° gantry arc. Fields were generated to deliver both a constant MU and a constant dose per segment. The measured dose is compared with the calculated values for each beam segment. Gantry angle errors were introduced to evaluate the sensitivity of the system to potential errors. The delivery system dosimetry was assessed at various dose rates and gantry speeds. Prostate and head and neck VMAT patient plans have been evaluated similarly by comparing measured and planned per-segment dose. Ion chambers were placed both at isocenter and off-axis to provide gantry angle error sensitivity. Plans were generated on Pinnacle Ver. 8.9 treatment planning system; delivered on an Elekta Synergy accelerator.

Results: The dosimetry system was able to accurately measure the per-segment dose delivery of VMAT plans. Using the fields created for routine delivery system QA, gantry angle errors of 1° were detectable.

Conclusions: A method has been developed to effectively monitor the dose delivery performance of a VMAT delivery system.