AbstractID: 13451 Title: Initial Experience of Patient Specific Rotational Quality Assurance for VMAT Using a Cylindrical Diodes Array Detector System

Purpose: Our recent success in commissioning volumetric modulated arc therapy (VMAT) on an Elekta Synergy accelerator calls for a convenient and suitable system for patient specific quality assurance. Traditional 2D diode array devices exhibit significant angular dependence under rotational beams. The newly available cylindrical diode array device - ArcCHECK (Sun Nuclear Corp., FL) was designed specifically for rotational dosimetry by arranging diodes on a cylindrical plane. The purpose of this study is to evaluate the performance of the ArcCHECK device for VMAT. Results are compared with TomoTherapy QA.

Method and Material: Both ArcCHECK and MapPHAN were commissioned on a Monaco treatment planning system (Version 2.0.3, CMS Inc., MO). Initial testing of the system involved four representative VMAT cases at various tumor sites: lung, liver, spine and prostate. The planned dose map on the diode plane was extracted from the QA plans for comparison with ArcCHECK measurements. Absolute differences between measured and planned doses were analyzed using 3% dose deviation and 3mm distance-to-agreement (DTA). For comparison, the selected plans were also calculated and delivered to a 2D diode array device (at 5cm effective depth) using MapCHECK (Sun Nuclear Corp., FL) integrated with a square solid water phantom (MapPHAN). Results from VMAT were compared with results from 14 QA plans from TomoTherapy.

Results: Both diode array devices provide reasonable QA results for all cases. Doses measured with ArcCHECK agreed better with plans, with average passing rates and standard deviations of 98.3 ± 0.5% and 97.0 ± 1.8% for VMAT and Tomo respectively at all tumor sites. QA plans utilizing the 2D MapPHAN had average passing rates of 92.2 ± 2.4% (VMAT) and 90.0 ± 4.7% (Tomo).

Conclusion: Compared to the 2D MapPHAN, ArcCHECK provided improved agreement between measured and calculated doses for rotational QA, and is recommended for rotational IMRT QA.