

AbstractID: 14103 Title: Sensitivity analysis of single and partial arc plans for VMAT planning, delivery and QA

**Purpose:** To develop efficient single and partial arc VMAT plans in terms of dosimetric accuracy and mechanical stability.

**Methods and Materials:** Delivery efficiency of single and partial arc plans for various treatment sites (2 HN, 3 Hypolung, 2 SRS and 1 Hypoprostate) optimized with SmartArc in Pinnacle<sup>3</sup>™ 9.0 were tested on Elekta synergy and Axesse machines. Mechanical accuracy was evaluated using an application that records real-time VMAT delivery information using the MLC log files. Dosimetric accuracy was performed using Delta4 and Arccheck cylindrical QA phantoms.

**Results:** Results based on various treatment sites showed that single and partial arc VMAT plans satisfied all the re-planning objectives. For Elekta machines, dose rate fluctuated significantly for plans with higher leaf motion, and dynamic leaf gap of 2 mm and leaf speed of 0.46 cm/deg were optimum for all the plans. Constraining the leaf motion resulted in a longer delivery time for all the plans. Lowering the control points by choosing partial arcs 6° spacing saved MUs up to 25% compared to full arc 4° spacing. Segment shapes were typically not very smooth. Gantry and leaf positions were within tolerance for all delivered plans. Compared to IMRT, PTV coverage and OAR sparing were better or comparable in all cases. MUs were reduced by 40% and 27% for HN and SRS plans. Delivery times for HN and Hypoprostate cases were within 2 mins (5 mins for HypoLung). Dosimetric analysis with Delta4 and Arccheck QA resulted in 98% and 96.5% of detectors with a gamma index (3%/2mm) < 1 respectively for all cases.

**Conclusion:** SmartArc generated efficient single and partial arc VMAT plans in terms of lower MUs, shorter treatment time and better target coverage and OAR sparing compared to IMRT. The dosimetric and mechanical accuracy of these plans were within QA and machine tolerances.