AbstractID: 9580 Title: Monte Carlo Dose Verification and Quality Assurance for Multi-Target SRT

Purpose: To provide accurate, thorough and fast dose verification for hypo-fractionated stereotactic radiotherapy (SRT) of small and multi targets planned with a Varian Eclipse treatment planning system delivered on a Varian Trilogy accelerator.

Method and Materials: Seven brain and lung hypo-fractionated SRT plans were generated by the Eclipse system for delivery on the Trilogy accelerator with the Millenium-120 leaf multileaf collimator (MLC). These clinical SRT plans required thorough quality assurance measurements to obtain absolute point dose and 2-D dose distributions due to the low number of fractions and high fraction dose. For small-field and multi-target plans, the EGS4/MCSIM code was used to calculate the dose distribution. A 0.125 cc ion chamber, a 0.016 cc pin-point chamber and Kodak EDR2 film were used for the measurements and the results were compared with Monte Carlo calculations.

Results: The dosimetry for small-field and multi-target treatment plans is challenging due to the comparable ranges of secondary electron and the field sizes defined by SRT MLC segments. Our Monte Carlo simulations can accurately reproduce the Trilogy dose distributions (within 1%/1mm). For the clinical SRT plans investigated in this work, the Monte Carlo doses agreed within 3% with ion chamber measurements and within 2%/2mm with film measurements. The doses calculated by the Eclipse AAA algorithm differed by no more than 5% from Monte Carlo calculations for small (4-40 cc) PTVs.

Conclusions: Monte Carlo dose calculation provides accurate, thorough and fast dose verification for hypo-fractionated SRT for small and multi-target treatment plans generated by a Varian Eclipse treatment planning system on a Varian Trilogy accelerator.