AbstractID: 8295 Title: Time Resolved Output Measurements as a Linear Accelerator Quality Assurance Tool

Purpose: An elegant method of time-resolved output (cGy/min) measurements, or TROM, is presented as a unique quality assurance tool. This temporal sampling technique of the dose rate allows for visual investigation of the output under a variety of circumstances.

Method and Materials: An available tool has been implemented to monitor time-resolved accelerator output for quality assurance. Tomotherapy Inc. provides an electrometer and software package (Tomoelectrometer and TEMS) that can sample charge readings from multiple ionization chambers at rates of 0.1 – 1.0 Hz. The Tomoelectrometer is interfaced to a computer running the TEMS software by RS232 connector. An ionization chamber inserted in the phantom is connected to the Tomoelectrometer. The measured charge is converted to the dose rate using the chamber calibration factor and an atmospheric correction. Static measurements have been performed using an SAD setup at 1.5 cm depth in a solid water phantom. TROM were performed on 2 helical Tomotherapy HiART II systems and a Varian EXδ linear accelerator for "beam on" times in excess of 10 minutes.

Results: The output dose rate is plotted against time for Varian and Tomotherapy accelerators. Rise times were < 1 second for all accelerators. TROM show variations on the order of ±1% for the Varian accelerator. Tomotherapy units showed greater variation. Peak values for both machines have been found to be 3.5% above the "average" value.

Conclusions: Both types of machines exhibit a similar overshoot phenomenon at the onset, but the Tomotherapy unit(s) showed larger variation for some measurements. Temporal measurements of the output allow one to examine the inter- and intra- fractional dose rate variations, provides insight into other prolonged beam measurements, and may be a useful tool for troubleshooting.