AbstractID: 2733 Title: Quality assurance for a tomotherapy machine: new procedures and comparison to TG-40 recommendations for conventional linear accelerators

Purpose: To compare daily and monthly quality assurance, QA, procedures on a TomoTherapy machine with TG-40 recommendations for a conventional linear accelerator.

Method and Materials: A commercially available diode check-unit is retrofitted for use in daily and monthly TomoTherapy QA. Output consistency is checked with this unit. The housing of the check unit is equipped with 1-mm diameter lead markers that provide for checks of megavoltage CT imaging, laser alignment, and couch motion. On a monthly basis more quantitative checks of laser alignment, beam energy, beam profiles, and couch motion are done with a diode array. A very efficient test procedure has been developed that uses this array.

Results: On a daily schedule, output consistency, laser alignment, and couch motion are check with a single measurement that takes approximately 10 minutes. Daily output checks over 118 days of operation show the output to vary with a 1-standard deviation of 2%. Based on megavoltage imaging of the morning check unit, the vertical and superior-inferior green-laser alignment and couch motion are found to vary by less than 1 mm. In this time period, the left-to-right green-laser drifted past a 2 mm limit and adjustments were made to correct the alignment. On a monthly schedule absolute beam output was measured for 1, 2.5 and 5.0-cm jaw widths and found to vary by ±1%. Beam energy shifts were found to be ±1.2%. Monthly comparisons to commissioning profiles indicate small changes in the left-to-right direction, which are indicative of small changes in beam energy.

Conclusion: New procedures and tolerances had to be developed for daily and monthly checks of the TomoTherapy unit. Over a five month period the machine stability has been acceptable. Many TG-40 checks for conventional linear accelerators are not applicable to a TomoTherapy machine.