AbstractID: 7360 Title: Effects of Major Component Replacement in a Tomotherapy HiART System on Radiotherapy QA Measurements

Purpose: On our Tomotherapy system several major components have been changed frequently in one year. This study investigates the possible relationship of component failure with treatment load, and the related QA issues following component replacement.

Method and Materials: Tomotherapy HiART is a complex radiotherapy equipment where a linac, magnetron and all the components are mounted on a rotating slip ring gantry. It operates at a high dose rate compared to conventional linacs. The major components - target, magnetron and the linac have been changed five, three and two times, respectively during one year of use. Following major component replacement, the PDD, profiles, output and energy have been measured with ion chambers, water scanner and films to bring the system to agreement with commissioning condition.

Results: The output and the energy constancy variation over the entire year were within +/- 6 % and +/-3.5%, respectively with no definite predictor of an imminent component failure. The dose rate varied between -10% and +5% during the same period. Annual average of daily treatments was 24 with a maximum daily average of 37.3 treatments in a month. Target change interval ranged between 12 and 80 days. The mean time between major component failures was 35.6 days.

Conclusion: Analysis of the data could not identify any pattern of component failure. Examination of targets indicated holes, flakiness and uneven erosion in some targets indicating unknown changes in the beam. Magnetron changes were primarily due to arcing. Target and linac change involved more alignment, beam characteristics and QA measurements and longer downtime. The hole in the target poses a beam spectrum different from the commissioned beam. Target or the linac replacement caused more downtime and QA measurements than the magnetron change.