

Purpose: The target of the TomoTherapy unit is replaced at regular intervals. This work studies surface dose both before and after a target change for the treatment and imaging beams.

Methods: Attix parallel plate chamber, as well as LiF powder thermoluminescent dosimeter (TLD) monolayer measurements were performed on the surface and at depths up to 1.5 cm in solid water before and after the target change. Due to the 1.0 cm diameter collecting volume of the Attix chamber, broad imaging beam measurements were performed with a 5 cm jaw width at isocenter; TLD measurements were performed using the narrow jaw width used for clinical MVCT imaging. Measurements at depths of 10 and 20 cm in solid water were also performed using A1SL cylindrical ionization chambers with a 5 cm field width.

Results: Attix chamber measurements in the broad imaging beam showed surface dose versus dose at 5 mm to be constant before ($31.3 \pm 0.6\%$) and after ($31.4 \pm 0.3\%$) the target change. TLD monolayer measurements showed no change in the narrow imaging beam surface dose ($25.0 \pm 0.8\%$ before and $24.6 \pm 0.5\%$ after). The treatment beam showed a small decrease in surface dose after the target change ($18.2 \pm 0.7\%$ before and $17.0 \pm 0.3\%$ after). The ratio of dose at depths of 10 and 20 cm for the imaging beam was 2% greater after the target change whereas the the treatment beam ratio was 0.6% greater after the target change as compared to the ratio measured before the target change.

Conclusions: Even though degradation of the thin tungsten target occurs with use, little to no change is observed in the surface dose for either the imaging or the treatment beam. This is likely due to a thick, low atomic number metal block located immediately after the target.