AbstractID: 7025 Title: Predictive Analysis of Target Wear for a TomoTherapy Unit

**Purpose:** To develop a model that predicts target wear for the helical tomotherapy HiART linac based on monthly QA fluence profile measurements.

**Method and Materials:** Monthly QA IEC-X p rofiles were measured using EDR2 radiographic film. An EDR2 film was set at a source-axis distance (SAD) of 85 cm and sandwiched between 10 cm solid water as backscattering material and 1.5 cm solid water as buildup material. The film was aligned with lasers (red and green lasers are overlapped in this procedure) and was exposed to an open field (40 cm × 2.5 cm). After the film processed, it was analyzed with the RIT (version 4.3) software and the measured profile was compared against the commissioned profile.

**Results:** In our institution, the last target replacement was in July of 2006. The monthly QA IEC-Xpro files from April 2006 to August 2006 were collected and analyzed. We found that the slope of the cone shaped fluence profile decreased as a function of time. At the point where the slope of the intensity cone was 1 degree or greater compared to the commissioned cone, we had to replace the target.

**Conclusions:** A practical method has been developed to predict target wear for a helical tomotherapy unit. The proposed method can be implemented to any center with a helical tomotherapy unit as long as the commissioning profiles are available. Based on our findings, the change in the slope of the intensity profile in the IEC-X direction correlates strongly with the wear on the target. A change of 1 degree or more in the slope of the cone should be an indication that target needs to be replaced. An on-site clinical medical physicist can use this approach to predict target problems. Our method can be integrated with the routine monthly QA measurements and analysis.