

## AbstractID: 11722 Title: Investigation of energy variation on TomoTherapy HI-ART II using an aluminum stepwedge

**Purpose:** Use of a topographic step-wedge procedure to determine energy variations in a helical tomotherapy system.

**Method and Materials:** Topographic procedures were followed using an aluminum step wedge suspended in air on the end of the couch for a TomoTherapy HI-Art system. Exit detector data from these procedures, collected and processed using Tomo QA (TQA) software, were used to determine beam energy. Energy sensitivity tests of the technique were made by varying the injector current. Topographic procedures were run daily over the lifetime of a target filter. After an initial adjustment, no additional changes in adjustable parameters that affect beam energy (e.g., injector current or injector voltage) were made over a six-month period, thus emphasizing variations due to target degradation. Results were compared with beam profile changes determined using exit detector data collected weekly using a standard rotational variation procedure. Additional water phantom scanning data (lateral profiles and percent depth dose) were measured monthly over the same time period.

**Results:** The attenuation data from the step wedge demonstrated a smooth variation of energy with time over the lifetime of the target. The energy difference showed dramatic spikes in trending due to target changes and less dramatic, but noticeable, variations due to changes in injector current. Both weekly exit detector data (rotating gantry) and monthly lateral and depth-dose profiles (static gantry) showed variations over time but were within 2% of reference data and showed no systematic trend.

**Conclusion:** The step wedge topographic procedure provides a good method to monitor the energy difference over time and may be used to help diagnose impending target failures.

**Conflict of Interest:** Supported in part by a research agreement with TomoTherapy, Inc.