

AbstractID: 9491 Title: Helical Tomotherapy Room Shielding: Leakage Radiation Levels and Tenth Value Layer Measurements around Tomotherapy Machine

**Purpose:**

The objectives of this study were to measure the leakage radiation levels surrounding the tomotherapy machine and to determine the tenth value layers (TVL) for concrete.

**Methods:**

A custom designed shield was fabricated with Cerrobend to shield a 1000cc spherical ionization-chamber used in these measurements. Measurements were performed inside the treatment room at the height of the axis of rotation (AOR). Leakage measurements were performed for rotational delivery with the field size of 5x40cm<sup>2</sup> and all the MLC leaves were closed. For TVL measurements, concrete slabs of 2.2g/cc were used. Measurements were repeated with full scattering conditions of a 30cm diameter phantom.

**Results and Discussion:**

The results indicate that our measured leakage values are 2-4 times lower than the vendor's data. This difference is attributed to the low energy scatter bouncing off the walls. The results also revealed that, for distances >3m, the leakage radiation followed the inverse square relationship within  $\pm 10\%$ . Under full scattering conditions radiation levels are approximately 2.5-4 times higher for locations in the front of the gantry. This increase is higher along the AOR. For points that are behind the gantry and away from the AOR, measured phantom scatter component is much lower due to attenuation by the hardware of the machine. TVL measurements for the tomotherapy machine were found to be 21cm for Leakage radiation. These results are in agreement with the published literature<sup>2</sup>. When the phantom scatter is included in the measurements TVL dropped to 11cm. This is due to higher attenuation for the low energy scatter.

**Conclusions:**

Measured leakage levels around the tomotherapy unit were found to be 2-4 times lower than the values reported. The tenth value layer (TVL) for the tomotherapy beam was found to be 21cm of concrete.

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