

AbstractID: 8732 Title: Determination of the Energy Correction Factor for TLD-100 in 6 and 10 MV photon beams relative to ⁶⁰Co

Purpose: To determine the energy correction factor for TLD-100 chips comparing 6 MV and 10 MV photon beams produced by a Varian Linac to ⁶⁰Co energy.

Method and Materials: The energy correction for the difference in thermoluminescent (TL) response for 6 and 10 MV photons from a linac compared to ⁶⁰Co energies were measured with LiF TLD-100 (LiF:Mg, Ti) thermoluminescent dosimeters (TLDs). This energy correction and dose dependence were determined by irradiating TLD-100 chips (3 mm x 3 mm x 1mm) to varying doses (100-300 cGy) using ⁶⁰Co and 6 and 10 MV photons from a Varian linac. TLD irradiations were done in liquid water with water tight Virtual Water™ TLD holders. Doses delivered to the TLDs for both ⁶⁰Co and linac irradiations were verified with ion chamber measurements following the AAPM's TG-51 protocol. ⁶⁰Co TLD irradiations were also done in air with a PMMA holder. Monte Carlo methods were used to determine the absorbed dose to water at the same location where the TLDs were irradiated.

Results: The energy correction factor was determined to be the ratio of linac TL output to the dose delivered by the linac divided by the ⁶⁰Co TL output. The results of the test showed less than a two percent correction for both the 6 and 10 MV beam with standard deviation of the mean of less than 0.2 percent. No dose dependence was seen in the range of 100 to 300 cGy.

Conclusions: The energy correction factor for TLDs allows TLDs to be used as a secondary verification of linac outputs relative to a ⁶⁰Co standard.