AbstractID: 10543 Title: Determination of the Energy Correction Factor for TLD-100 in Electron Beams Relative to ⁶⁰Co

Purpose: Thermoluminescent dosimeters (TLDs) are used to measure absorbed dose to water by calibrating them to a known dose from ^{60}Co, a NIST traceable standard. Energy correction factors were measured that enables the conversion of TLD measured absorbed dose from ^{60}Co to absorbed dose from 6, 9, 12, 15, and 18 MeV electron beams. **Method and Materials:** Energy correction factors for LiF TLD-100 (LiF:Mg, Ti) have been determined experimentally as the ratio of thermoluminescent response in electron beams from a linac over the response from ^{60}Co. Annealed TLD-100 chips (3 mm x 3 mm x 1mm) were irradiated using ^{60}Co and 6, 9, 12, 15, and 18 MeV electron beams from a linac. TLD irradiations were carried out in liquid water with water tight Virtual Water™ TLD holders. Using Ion chamber measurements following the AAPM's TG-51 protocol, doses delivered to the TLDs for both ^{60}Co and linac irradiations were verified. **Results:** The experiments showed a average energy correction factor of 0.95 for TLD-100 chips for 6, 9, 12, 15, and 18 MeV electron beams relative to ^{60}Co. TLD's measured the energy correction factors for electron beams with good precision in a single experiment, with the standard deviation of the mean for the energy correction factors found in each experiment ranging from 0.3% to 0.5%. However, the TLDs were found to be less precise across multiple experiments. The standard deviation of the energy correction factor from experiment to experiment ranged from 2% to 5%. **Conclusions:** The ability to verify and maintain strict quality control is a fundamental necessity in a radiation treatment facility. External secondary audits are an essential part of a quality assurance program. Energy correction factors allow for TLD's to provide an inexpensive and convenient method to perform external secondary audits of high energy electron beam absorbed dose calibrations.