

AbstractID: 8710 Title: Characterization of thermoluminescent dosimeter reader precision and artifacts

**Purpose:** To explore the response of different thermoluminescent (TL) readers to micro-cube and chip LiF:Mg,Ti (TLD-100) TL dosimeters. **Method and Materials:** The precision of Harshaw Company TL reader models 3500 and 5500 was evaluated for LiF:Mg,Ti micro-cube and chip dosimeters. Sets of TLD-100 1mm x 1mm x 1mm micro-cubes and 3mm x 3mm x 1mm chips were mounted in PMMA holders and irradiated to a dose equivalent to 1.00 Gy to water using  $^{60}\text{Co}$ . After irradiation, TLDs were evaluated on one of the readers. The annealing procedure between irradiations consisted of one hour at 400 °C, quick cooling to room temperature, and 24 hours at 80 °C. The ratio of the output of each TL dosimeter to the median output was tracked for three irradiations for each reader. In addition, the response of the model 5500 reader PMT to various amounts of TL output was analyzed. Sets of micro-cubes and chips were irradiated to doses ranging from 0.10 Gy to 10.00 Gy dose to water. The light output from the PMT was analyzed for linearity with dose. **Results:** The mean reproducibility (1 standard deviation) of TLD-100 micro-cubes was 2.27% when evaluated with the model 3500 reader and 1.00% for the model 5500 reader. The mean reproducibility (1 standard deviation) of TLD-100 chips was 1.68% for the model 3500 and 0.55% for the model 5500. In addition, the PMT of the model 5500 reader was found to have an exponential response with dose. **Conclusions:** The reader used to evaluate TL dosimeters affects measurements. This work concludes that the model 5500 reader is more precise for evaluation of TLD-100 micro-cubes and chips than is the model 3500 reader. In addition, the overresponse of the PMT to TL must be accounted for when using the model 5500 reader.