# AbstractID: 6966 Title: Experimental Determination of the LiF:Mg,Ti TLD Energy Response Correction Factor for <sup>125</sup>I Brachytherapy Sources

**Purpose:** To further explore the energy response correction factor for LiF:Mg,Ti thermoluminescent dosimeters for use in experiments with $^{125}$I low dose rate brachytherapy sources.

**Method and Materials:** Two distinct experiments were performed to determine the value of the energy response correction factor, E(r), as defined in TG-43U1, for $^{125}$I seeds. The University of Wisconsin Variable Aperture Free Air Chamber was used to determine the air kerma strengths of Best Medical 2301 $^{125}$I seeds. A 3x3 array of TLD-100 chips sealed in a thin plastic bag was attached to the center of the aperture using Kapton tape. $^{60}$Co was used to irradiate a set of comparison TLDs to a dose to water equivalent to the dose to water given by $^{125}$I. Monte Carlo simulations were used in both cases to calculate the dose to water from the measured air kerma. The two experiments had different annealing techniques: one using a standard anneal of one hour at 400ºC followed by 24 hours at 80ºC, and the other using a standard anneal at the beginning of the sorting process and then only the 80ºC anneal between cycles.

**Results:** E(r) was determined to be 1.514 ± 0.019 using the 80ºC technique and 1.549 ± 0.025 using the standard technique. These values are significantly higher than the currently applied value of 1.41, but not unexpected. TG-43U1 noted that the work of Davis et al. also observed an anomalous over-response relative to theoretical predictions. It is speculated that the differences between these two experimental values may be the result of the annealing techniques and TL readout characteristics, which will be further investigated.

**Conclusion:** It appears that LiF:Mg,Ti TLDs are indeed intrinsically non-linear in their response to low energy photons. The solid state processes that cause this effect are not taken into account by Monte Carlo.