AbstractID: 1514 Title: The Effect of Radiation Exposure Order on Thermoluminescent Dosimeter Response from Mixed Photon and Proton Irradiations

It has been suggested that high linear energy transfer (LET) radiation (protons) produces defects in thermoluminescent (TL) crystals that may cause a decrease of TL response in subsequent photon exposure. This potential effect would require careful consideration in the use of thermoluminescent dosimeters (TLDs) for mixed field applications. Two types of thermoluminescent dosimeters (TLDs): Harshaw LiF:Mg,Ti (TLD-100) and $CaF_2$:Tm (TLD-300) were investigated for their glow curve responses to separate, mixed field, and simultaneous x-ray and proton irradiations. The TLDs were exposed to 30 keV x-rays and 1 to 6 MeV protons with the following five separate irradiation schemes: only x-ray, only proton, first x-ray then proton, first proton then x-ray, and simultaneous x-ray and proton beam exposures. The proton beam exposures were conducted using an NEC Model 9SDH-2, 3 MV tandem Pelletron positive ion accelerator. The x-ray exposure was conducted using an x-ray tube configured for simultaneous proton irradiation in the Pelletron chamber. Each of the five irradiation schemes was carried out using the same experimental set up and exposure levels. The resulting glow curves were compared and analyzed for any differences in shape and TL efficiency due to order of exposure. No significant differences attributable to radiation exposure order were found. Furthermore, the TL peak areas from multiple exposures were found to be additive (the superposition property of TL glow curves holds for mixed LET exposures).