AbstractID: 10700 Title: Comparison between the ultraviolet and 6 MV radiation responses of optically stimulated radiation detectors and their potential applications in ultraviolet phototherapy dosimetry

Purpose: To compare the ultraviolet (UV) radiation response of optically stimulated luminescent detectors (OSLDs) to their response to 6 MV photons and investigate their potential for applications in UV phototherapy dosimetry.

Method and Materials: The OSLDs used are 0.7 cm diameter, 0.02 cm thick, plastic disks containing Al_2O_3:C encapsulated in light-tight plastic holders with dimensions 2.4x1.2x0.2 cm^3. A miniature UV quartz pencil lamp provided the UV radiation and a Varian Cl 2100 provided the 6 MV photons for comparing their megavoltage and UV responses. Individual detector sensitivity factors were obtained by irradiating them with 6 MV photons to an absorbed dose of 0.5 Gy followed by optical bleaching with a 15 W fluorescent light to clear the radiation effects.

Results: Consecutive detector readings for the UV irradiations showed that their signal varied more than the 6 MV readings, 3% compared to less than 1%. With both irradiations the signal stabilized after 8 minutes post irradiation. The OSLD response to UV radiation was non linear over the measured absorbed dose range of 0.29 to 38 kGy (21 to 2820 mJ/cm^2) and their response was approximately two thousand times less sensitive than their response to 6 MV photons. However, optical bleaching was more effective in removing the UV radiation signal requiring about 4 hr to remove the radiation effects as compared to about 30 hr to remove the effects of the 6 MV radiations.

Conclusion: These results demonstrate the ability of OSLDs to measure UV radiation. However, because of their non linear response, their calibration will be more involved. Although, their UV response is significantly less than their megavoltage response, their wide dynamic range provides sufficient sensitivity for measuring UV radiation and optically bleaching was more effective removing the UV than the megavoltage radiation effects.

Conflict of Interest (only if applicable):