AbstractID: 8592 Title: Dose characteristics and applications of optically stimulated luminescent dosimeters in proton, electron and photon radiotherapy

Purpose: **To investigate dosimetric properties of optically stimulated luminescent detectors (OSLDs) and their application to proton, electron and photon radiotherapy relating to their energy dependence, linearity, reproducibility and use in small field measurements.**

Method and Materials: The OSLDs used are 0.7 cm diameter, 0.02 cm thick plastic disks containing Al_2O_3:C in a light-tight plastic holder available as InLight/OSL Dot detectors (Landauer, Inc). For the small photon field measurements the sensitive diameter of the detector was reduced to 0.05 cm by making a pin-hole in the holder. The thermoluminescent detectors were 0.3x0.3 cm^2, 0.038 cm thick chips. A micro-MOSFET dosimeter was used for the small field measurements. A Varian Cl 2100 provided 6 and 18 MV photons and 6-20 MeV electrons. A Philips RT-250 provided photons from 80-250 kVp. Three proton facilities in the United States provided the proton irradiations.

Results: Irradiation of detectors followed by optical bleaching for dose increments of 0.5 Gy from 0.5-4.0 Gy up to 30 Gy showed less than 1% variation in their relative sensitivities. Dose response for the megavoltage photons and electrons was independent of energy while for protons it was 3% less than for 6 MV photons. The response to kilovoltage photons increased inversely with energy from 30-300% relative to 6 MV photons. Supralinearity was observed at doses above 1.5 Gy. Measured output factors, S_{pc}, for 6 MV at 5 cm depth for 0.5x0.5-3.0x3.0 cm^2 fields agreed with the other detector measurements.

Conclusion: These results demonstrate their potential for applications in megavoltage proton, photon and electron radiotherapy. Their favorable properties include relative energy independence, dose linearity below 1.5 Gy, dose independent relative sensitivity and use in small field dosimetry. Their response variation for kilovoltage photons is due to their higher Z relative to water.

Conflict of Interest (only if applicable):