AbstractID: 9417 Title: Dosimetric characteristics of a commercially available optical stimulated luminescence dosimeter (OSLD)

Purpose:
To assess the dosimetric characteristics of the Landauer Microstar optical stimulated luminescence dosimetry (OSLD) system, the energy, dose rate, and angular dependencies, linearity, temporal and reading fade, and intra-batch variation were systematically tested.

Method:
All detector chips were irradiated a custom-milled 25x25 cm polystyrene phantom. Calibration of the system was done for 6 MV, 10x10 cm^2 field size, 100 cm SAD, and d_{max}. Relative energy response was determined for 6 and 15 MV xrays and 6, 9, 12, 16, and 20 MeV electrons. Groups of multiple chips received up to 20 Gy to assess the linearity and reproducibility of the system. The angular dependency was studied by varying the angle of incidence. Reading fade dependency was quantified by repeatedly reading out an exposed chip over a one hour period. Temporal fade was quantified by readouts up to 14 days post irradiation.

Results:
OSLD response is linear to within 5% over the dose range 0 to 20 Gy. OSLD response decreased by 5% at 90^o incidence. Energy dependence showed the largest variation, 5%, was between 6 MV xrays and 12MeV electrons. Measurement uncertainty is 2.5% (1σ, n=70). Reading fade is found to be 0.1%/rdg. Temporal fade is 5%, 2%, and 1% for 1cGy, 5 cGy, and ≥50 cGy, respectively, between 15 minutes and 2 hours after irradiation, and 15%, 7%, and 3% at 14 days.

Conclusion:
OLSD exhibits some nonlinearity, as well as angular, energy, and intra-batch variation under reference conditions. Refinements in calibration software and tighter quality control by the manufacturer should improve the accuracy and chip to chip variation. Temporal and reading fade are not clinically significant.