Purpose: To evaluate aluminum-oxide (Al_2O_3:C) optically stimulated luminescence (OSL) dosimeters as a potential alternative to thermoluminescent dosimeters (TLDs) for remote dosimetry services provided by the Radiological Physics Center (RPC) at the University of Texas M. D. Anderson Cancer Center.

Method and Materials: OSL dosimeters were placed equidistant (< 1 cm) from the center of a 20 cm x 20 cm Solid Water™ (SW) phantom which provided backscatter and build-up. OSL dosimeters were also irradiated in an acrylic mini-phantom based on the RPC's mailable TLD system mini-phantom.
For modality-dependence measurements, dosimeters were irradiated to doses of either 100 or 300 cGy with 6 or 15 MV photons or 8 or 15 MeV electrons. All other irradiations were performed with a Co-60 unit. A Landauer microStar™ reader was used to measure the dosimeter responses.

Results: The calculated percent standard deviation of the reproducibility readings was less than 1.4% for doses of 50 cGy and 300 cGy, and less than 0.9% for a dose of 1000 cGy. The measured dose response was linear at doses less than 600 cGy, and independent of modality. Field-size output factors measured with OSL dosimeters agreed with those measured with an ion chamber within 1.5%. Heat, cold and humidity had no effect on the dosimeters, but exposure to light significantly decreased their response. Measurements of fading demonstrated that a 4% loss of signal occurs over the first ten days after irradiation, after

which the response changes less than 1% up to 90 days. The dosimeters lost 0.2% of signal with each successive reading.

Conclusion: The precision of OSL dosimeters is comparable to that provided by TLDs used for remote dosimetry and warrants further investigation.

Conflict of Interest (only if applicable): This work was supported in part by Landauer Corporation and by PHS grant CA10953 from the NCI, DHHS.