AbstractID: 6986 Title: Optically Stimulated Luminescence of Aluminum Oxide Detectors for Radiation Therapy Quality Assurance

Purpose: The purpose of this experiment was to: 1) Determine if a commercially available Al_2O_3 detector system used for monitoring personnel exposure could be adapted for use as a radiation therapy dosimetry system; and 2) Evaluate the system's performance as an in-vivo dosimeter and its ability to measure absolute surface dose, isocenter dose, and normal tissues dose in a phantom as part of patient-specific IMRT quality assurance.

Method and Materials: The dosimeters were evaluated for: 1) Signal decay; 2) Field size dependence; 3) Energy dependence; and 4) Angular dependence using the Landauer, InLight MicroStar system. In-Vivo dosimetry measurements were taken for 22 patients treated on a Varian 21EX. The Landauer system was also tested for its ability to measure absolute dose from helical tomotherapy treatments.

Results: The variation between dosimeters was evaluated and found to be ±1.6%. The dosimeters appeared to over-respond in the first 10 minutes, however, after 10 minutes the chips were within 1 percent of the steady-state reading. Unlike other detectors, the Al_2O_3 dosimeters showed no field size, energy, or angular dependence. The agreement between the dosimeters and the calculated doses for the in-vivo dosimetry patients was 2.2±6.1 cGy or 3.7±2.5%. The dosimeters were also tested for their ability to measure absolute dose inside an IMRT phantom. The agreement between the dosimeters and the calculated doses was 0.1±5.3 cGy or 0.7±6.7%.

Conclusion: Al_2O_3 dosimeters can be a convenient, inexpensive alternative to TLDs, MOSFETS, and Diodes. The agreement between calculated and measured doses for in-vivo dosimetry and IMRT QA is comparable to TLDs, MOSFETS, and Diodes. The dosimeters can be quickly read and analyzed after 10 minutes (*to allow time for signal decay*). The dosimeters do not appear to have an energy, field size, or angular dependence. In addition, the detectors can be erased and re-used.