AbstractID: 13660 Title: Characterization of optically-stimulated luminescent detectors (OSLDs) in photon & proton beams

Purpose: To investigate characteristics of optically-stimulated luminescent detectors (OSLDs) to protons, thus allowing comparison to thermoluminescent detectors and implementation into a quality assurance program.

Methods & Materials: The OSLDs used were aluminum oxide (Al_2O_3) nanodots (Landauer, Inc., Glenwood, IL) measuring 10x10x2 mm^3. A 20(L)x20(W)x0.5(H) cm^3 volume of solid water was fabricated with pockets to allow OSLDs and TLDs to be irradiated simultaneously and perpendicular to the beam. Irradiations were performed at a 5 cm depth for photons, and in the center of a 10 cm SOBP for a 200 MeV proton beam. Additionally, the Radiological Physics Center's (RPC) anthropomorphic pelvic phantom was used to test the angular dependence of OSLDs for photons and protons. A cylindrical insert in the phantom allows the dosimeters to be rotated to any angle with a fixed gantry angle. OSLDs were irradiated at 8 angles between 0 and 360 degrees. OSLDs were read out with a Landauer Microstar reader.

Results: Dose response measurements indicate for photons that at angles where the dosimeter is near parallel with the radiation beam, response is slightly reduced. Results in protons do not seem to show significant angular dependence. OSLDs and TLDs are comparable within 3% for both photons and protons during perpendicular measurements.

Conclusion: OSLDs and TLDs are comparable dosimeters in 6 MV photon and 200 MeV protons beams in a perpendicular irradiation. Preliminary results show that OSLDs might have some angular dependence to photons but not protons. With angular dependence characteristics defined, OSLDs can be implemented into multiple-field treatment plans in photons and protons and used in the RPC's quality assurance program.