AbstractID: 13727 Title: Use of Optically Stimulated Luminescence Dosimeters, OSLDs, for an Independent Verification of Dose Delivered by IMRT Treatments

Purpose: To demonstrate how OSLDs can be used to independently verify the (absolute) dose delivered in IMRT treatments.

Methods and Materials: OSLDs are discs infused with aluminum oxide doped with carbon (Al_2O_3:C). Crystals of Al_2O_3:C when exposed to ionizing radiation store energy that is released as luminescence (420nm) when the OSLD is illuminated with stimulation light(520 nm). The amplitude of the luminescence depends on the dose absorbed by the OSLD and the intensity of stimulation light.

The OSLDs were calibrated against a 6X photon beam that was adjusted according to TG51. IMRT treatment plans were created for the RPC-Tomotherapy-Calibration Phantom and a 30-cm diameter, cylindrical, solid-water phantom, the TomoTherapy Cheese Phantom. IMRT plans were generated for both phantoms with the dose prescribed to the centrally located target-volume, using the Tomotherapy Hi-Art and CMS XiO treatment-planning systems. The OSLD's were positioned in the center of the target volume. The treatments were delivered on a Tomotherapy Unit and a Varian Trilogy.

Results: The calculated dose for the Tomo Therapy plans was 3.05 Gy, the measured dose to the RPC phantom was 3.06±0.03, the measured dose to the cheese phantom was 310 ±1.4. The calculated dose for the Xio plans was 3.12Gy and the dose delivered to the RPC phantom was 3.14 ±4.5.

Conclusions: This method provides an independent verification of dose delivered for step and shoot as well as rotational therapy and should be implemented as part of the annual QA process. These measurements would be beneficial additions to the present RPC TLD irradiation checks and should be performed following software upgrades to treatment planning and R&V systems also.