AbstractID: 5416 Title: Evaluation of Optically Stimulated Luminescence (OSL) dosimetry for high-energy photon and electron beam measurements in radiotherapy

Purpose: The precision and accuracy of the Optically Stimulated Luminescence (OSL) for determination of absorbed doses delivered by photon and electron beams from linear accelerator was investigated. The dependence of the OSL dose measurements with variations in temperature, field size, dose rate, and energy of the beam was also investigated. This study complements previous investigation on 6MV photons which showed that the OSL technique can provide dose estimates with a precision of 0.7% for a single measurement (1 dosimeter).

Method and Materials: OSL doses were obtained for various depths in a water phantom for photons (6 and 18 MV) and electrons (6 to 20 MeV) and compared to data obtained from ionization chamber. Al_2O_3:C OSL dosimeters (7mm diameter by 0.3mm thickness) were irradiated using a linear accelerator (Varian 21 EX S/N 2833) at SSD = 100 cm. The OSL measurements were carried out using a Risø TL/OSL-DA-15 reader with green light stimulation and using a readout procedure that eliminates dependences on the mass or sensitivity of the dosimeter.

Results: Depth-dose profile for 6 MV photon showed a high precision (0.5%) and accuracy, the difference between the OSL dose and the ionization chamber data being smaller than ±1.1% in all cases. The OSL measurements appear to be independent from variations in temperature, field size, and dose rate, with differences smaller than 1% compared to ionization chamber data for the 6MV photon beam. The data for the 18 MV photon beam and the electron beams are still being analyzed and will be presented.

Conclusion: The results demonstrate that the OSL of Al_2O_3:C (dosimeters) provides reliable high-precision and accurate dose estimates, with no dependence on temperature, field size, or dose rate. The OSL technique with automated readers offers a simple and effortless method, since no precise control of mass of dosimeter is required.