

AbstractID: 6866 Title: Dose Rate Measurements of an Electronic Brachytherapy Source Using Thermoluminescent Dosimeters in Water

Purpose: To measure the dose rate of an electronic brachytherapy source using thermoluminescent dosimeters (TLDs) in water.

Method and Materials: Dose rates from several Xofig Axxent™ electronic brachytherapy sources were measured using TLD microcubes (1 mm x 1 mm x 1 mm). The sources were operated at 50 kV and at a beam current of 100 μ A. Measurements were done in liquid water to avoid the large conversion from water mimicking plastics to liquid water at low energies. A Virtual Water™ apparatus was designed to position the TLD microcubes in water specifically so that no Virtual Water™ was between the sources and microcubes during irradiation. The design allowed for the placement of 12 TLDs in 30° increments around the source on the transverse axis. A positioning disk was designed to accurately position the center of the TLDs at 3 cm from the center of the source and to position the center of the sources at the same height as the center of the TLDs. Air kerma rate measurements were done with a well-type ionization chamber fitted with a custom-built aluminum source holder. The measured air kerma rates were used to calculate the desired irradiation time to deliver an estimated 70 and 130 cGy dose to water at 3 cm from the sources.

Results: The dose rates measured with the TLD microcubes were lower than the Monte Carlo predicted values. Air kerma rates measured were also determined to be lower than the Monte Carlo predicted values, but the measured ratio of dose rate to air kerma rate agreed with the Monte Carlo predicted values.

Conclusion: TLDs can be used in water to determine dose rates of electronic brachytherapy sources, but further work is necessary to confirm measured values.

Conflict of Interest: Funding for this research was provided by Xofig, Inc.