

AbstractID: 8483 Title: MOSFET in-vivo dosimetry for colorectal cancer patients treated with shielded brachytherapy

Purpose To investigate the suitability of MOSFET detectors as in-vivo dosimeters for shielded colorectal brachytherapy.

Materials&Methods A silicone applicator used in colorectal brachytherapy treatments was located at the middle of a water tank with an ^{192}Ir source in one catheter and two MOSFETs in two other ones. The dose was measured as a function of the distance and the angle from the source without and with a shielding rod in the applicator. In order to correct the measurement of the detector over-response, the MOSFET energy dependence was calculated by the Monte Carlo (MC) code MCNPX2.5 and a correction factor was determined for each measurement point. Then, the measured corrected doses were compared to TG-43 calculations for measurements without shielding and an in-house dose-kernel superposition method based on MC dose calculations for measurements with shielding.

Results The calculated MOSFET energy dependence shows an over-response below 200 keV with a maximum at 40 keV by a factor 6.4 due to the dominant contribution from the photoelectric effect in SiO_2 . Without shielding, the comparison between the measured dose and the dose calculated with TG-43 shows a good agreement with a $\pm 5\%$ relative difference. With shielding, the comparison between the measured and the calculated dose gives a relative difference between 10% and 15% for the measurement point in the catheter at 90° from the source, and between 5% and 10% when the MOSFET is behind the shielding.

Conclusion For colorectal cancer patients the application of an energy response correction factor leads to good agreement between MOSFET measured and calculated doses when the shielding is not inserted. With the shielding, the discrepancy between measurement and calculation is higher, between 5% and 15%.