

AbstractID: 2799 Title: CHARACTERIZATION AND USE OF MOSFET AS IN VIVO DOSIMETERS UNDER ^{192}Ir IRRADIATION FOR REAL-TIME QUALITY ASSURANCE

Purpose: To characterize the new microMOSFET and MOSFET linear array from Thomson-Nielson for use under ^{192}Ir irradiation and evaluate their use as dosimeters to verify the delivered dose in high dose rate (HDR) brachytherapy.

Method and Materials: MicroMOSFETs and MOSFET linear array (5 dose points/MOSFET) response to ^{192}Ir photons were characterized in terms of the intrinsic error, the absolute calibrations, the anisotropy and the catheter factor. Such exercise is essential since the MOSFETs are not water equivalent at these low energies. Secondly, an HDR implant (13 catheters) and treatment plan (Plato, Nucletron) were performed on a realistic prostate phantom. During the CT exams, MOSFETs are inserted in a catheter near the urethra. At the same time as catheter reconstruction, a dose point was associated in Plato to the dosimeter position. Comparisons between the dose calculations of Plato and the measured values were performed.

Results: Intrinsic errors were found to be 1.05 cGy for the MOSFET array and 0.71 cGy for the microMOSFETs. The calibration factors for ^{192}Ir are higher than for ^{60}Co or higher energies as expected for a Si-based device. The calibration factors are also found to decrease as the cumulative dose to the dosimeters increases. The variation is evaluated at 5 % at ^{192}Ir energy over the course of a treatment (around 10 Gy). The dosimeter anisotropy is within the manufacturer specification and was found to have no impact on in vivo dose measurements. The resulting overall difference between the planned dose and the experimental measurements agreed within 7 %.

Conclusion: A proof of principle that new microMOSFETs and linear array could be used as in vivo dosimeter for dosimetric QA of HDR brachytherapy treatment was made. At this stage, the major uncertainty might well be the real target volume density as compared to water.