

AbstractID: 11308 Title: Characterizing Metal Oxide Semiconductor Field Effect Transistor (MOSFET) Radiation Detectors In a Scatter Medium Using CT Radiation Beam Delivery System.

Purpose: To study MOSFET radiation response characteristics for CT organ dosimetry applications in a scatter medium (phantom), using multi slice CT as radiation source.

Method & Materials: We used five Thomsen-Nielsen MOSFETs with reader and wireless communication system to a laptop computer, GE Light Speed VCT-64 scanner, Radcal 9095 dosimeter with 0.6 cc ionization chamber and kVp sensor, 10 cm Acrylic phantom with Acrylic rods. Each MOSFET was placed separately at isocenter, inside the acrylic phantom for characterization. An exposure of approximately 1000 mR (1006.6 mR to 1011.8 mR) was delivered to each MOSFET. Exposures were determined using 0.6 cc ionization chamber placed inside the phantom, at isocenter with CT tube in rotate mode as well as parked at various angles. MOSFET energy dependence, linearity of response and sensitivity with CT X-ray tube in rotate mode were studied. Angular dependency of MOSFETS response was studied with tube parked at various angles in 45 degree increments.

Results: MOSFET response (in mV, averaged for 5 MOSFETS) changed by 14% when kilovoltage varied from 80 through 140 kVp. Linearity of response was very good for all the energies selected. Sensitivity was obtained in the range of 25.6 mV/R to 28.8 mV/R for all the MOSFETS studied. The averaged maximum variation of all MOSFETS as a function of tube angle was about 5% and no statistically significant angular dependence was observed.

Conclusion: Calibrating MOSFETs inside scatter media with CT X-ray tube in rotate mode is recommended for MOSFET use in organ dosimetry applications with multislice CT scanners.