AbstractID: 6361 Title: Free in Air Characterization of Metal Oxide Semiconductor Field Effect Transistor (MOSFET) Dosimeters Using Computed Tomography Radiation Beam Delivery System.

Purpose: To study MOSFET radiation response characteristics for CT dosimetry applications, using 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 Ultra-8 CT scanner, Siemens Sireskop radiographic unit (Polydoros-SX80), Radcal 9095 dosimeter with 6 cc ionization chamber and kVp sensor, aluminum plates, ready pack films & styrofoam support.
Each MOSFET was placed separately at isocenter for characterization. An exposure of approximately 1000 mR (996 mR to 1015 mR) was delivered to each MOSFET. Exposures were determined using 6cc ionization chamber at isocenter, oriented with its long axis parallel to the long axis of CT collimation, to ensure complete irradiation of the chamber. Sensitivity was compared with that of a general purpose overhead x-ray tube. MOSFET energy dependence, linearity of response, sensitivity with CT X-ray tube in stationary position and with tube in rotate mode, and angular dependency of MOSFETS was studied.

Results: MOSFETS' response (in mV, averaged for 5 MOSFETS) changed by 12% when kVp varied from 80 through 140. Linearity of response was good for all the energies selectable. Sensitivity was obtained in the range of 25.5 to 32.5 mV for the all the MOSFETS studied. The average sensitivity for the five MOSFETs with the overhead x-ray tube was 26.58 mV/R. The difference in sensitivity between CT tube in stationary position and CT tube in rotate mode was about 3%, compared with that of overhead radiographic tube at 8.2%. The averaged maximum variation of all MOSFETS as a function of tube angle was within 5%.

Conclusion: When using MOSFETS for CT dosimetry, use of a CT x-ray source in rotate mode is recommended for calibration purposes.