AbstractID: 7220 Title: A correction method for the MOSFET energy dependence response to therapeutic proton beams

The energy-dependence response of the metal oxide semiconductor field-effect transistor (MOSFET) dosimeter has been investigated with regard to therapeutic proton beams. The MOSFET configurations used include the commercial standard MOSFET (TN-502RD), the microMOSFET (TN-502RDM) dosimeters, and a prototype MOSFET with no encapsulation. Proton beams of non-modulated pristine and modulated Spread-Out Bragg Peak (SOBP) of 5 cm and 10 cm widths were used with beam ranges of 8.9cm, 15.9cm and 25.9cm in water. Each MOSFET dosimeter was calibrated at the center of the modulated 10 cm SOBP proton beam with conditions of 1 cGy per MU. The MOSFET energy-dependence response was quantitatively evaluated by the ratio of measured doses between the MOSFET and an ionization chamber in a same condition. The three dosimeters showed a similar response for the pristine proton beams at various beam ranges. This indicates that the variation in dosimeter response is dominated by the change of the linear energy transfer (LET) for the used proton beam and not by the MOSFET encapsulation thickness. The observed MOSFET trends for various pristine proton beams have been modeled by an analytical function $k\ (R_{res})$: $A + B * e^{(-R_{res}/C)}$, where R_{res} is the residue range (distance to the distal 90% level dose), and A, B, C are constants. A similar modeling has been performed for modulated SOBP proton beams at different widths and for various beam ranges. The $k\ (R_{res})$ function has been used as a correction factor for patient dose measured by MOSFETs for corresponding residue ranges; this resulted in dose measurements with an uncertainty of less than 3.0% for various proton beams.