AbstractID: 8354 Title: Measurements of Proton Dose Distribution Using a MOSFET detector of 0.25 μm SiO2 Thickness

Purpose: In proton dosimetry, the MOSFET response depends strongly on Linear Energy Transfer (LET). To improve the LET dependence, we focused on the SiO2 thickness of the MOSFET detector. We compared the response of a new MOSFET detector with thinner oxide thickness, TN-252RD, to the standard MOSFET, TN-502RD, already investigated. Furthermore, in order to measure proton dose distributions using the MOSFET, a correction method of the MOSFET response to proton beams has been developed.

Method and Materials: Dose reproducibility and LET dependence of the MOSFET response were evaluated experimentally using 190 MeV proton beam. A Bragg curve measured by an ionization chamber (IC) was used to evaluate the correction factors (IC/MOSFET) as a function of proton penetrating depth, i.e. residual range. Here, the residual proton range is successfully calculated by the pencil beam dose calculation algorithm at an arbitrary point. Proton dose distributions formed by an L-shaped bolus were measured by MOSFETs and IC. The MOSFET doses were compensated by those correction factors.

Results: The dose reproducibility of the thinner oxide MOSFET, TN-252RD, was within 2%, almost similar to that of the standard MOSFET. The new MOSFET response at the Bragg peak improved by 10% in comparison to the standard MOSFET. For proton dose distributions measured with the L-shaped bolus, a deviation between the IC and raw MOSFET measurements was observed. On the other hand, the corrected MOSFET data agree well with the IC results.

Conclusion: The MOSFET of thinner SiO2 thickness improved the LET dependence for proton dosimetry, although the accurate depth-dose estimation is still to be achieved due to the MOSFET LET dependence. However, with a new correction method of the MOSFET response to proton beams, we succeeded in measuring the proton dose distribution using the MOSFET.