

AbstractID: 1493 Title: Measurements of Dose Distributions in Water Using CR-39 for Therapeutic Carbon-Ion Beams

It is important for carbon-ion radiotherapy to evaluate biological dose distributions accurately in the body. The biological dose distribution is given by the product of the relative biological effectiveness (RBE) and the physical dose. Here, the RBE is related to linear energy transfer (LET) of charged particle. Therefore, in order to evaluate the biological dose distribution in regions of interest, we have to measure the LET distribution. In this study, we used a CR-39 solid state track detector to measure the LET distribution in water. Therapeutic ^{12}C beam was provided from the Heavy Ion Medical Accelerator in Chiba (HIMAC). For mono-energetic beam of 290 MeV/n, depth-dose distribution deduced from LET distributions using the CR-39 detectors is compared with the measurement by an ionization chamber. The dose distribution by the CR-39 indicated a good agreement with the result by the ionization chamber. On the other hand, as expected, measured dose from the CR-39 have been underestimated in the tail region of Bragg curve, since the CR-39 can not detect low LET particles ($4\text{ keV}/\mu\text{m}$) such as protons from the projectile fragmentation reaction in water. However, effect of these discrepancies on the biological dose distribution is considerably small, because RBE for low LET component is small. We found that it was useful for LET distribution measurements to use the CR-39 detector.