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Measurement of reaction cross section in the target nuclear fragment reactions required for the high accuracy of proton therapy KEIICHIRO MATSUSHITA, Rikkyo Univ, TEIJI NISHIO, National Cancer Center Hospital East, SODAI TANAKA, The University of Tokyo, SHIGETO KABUKI, Tokai Univ, YUKI AONO, MASATO TSUNEDA, Kitasato Univ, AKINORI SUGIURA, National Institute of Radiological Sciences, KAZUO IEKI, Rikkyo Univ —
Purpose: In proton therapy, positron emitter nuclei are generated by the target nuclear fragment reactions between irradiated proton and nuclei constituting of a human body. The proton-irradiated volume can be confirmed by measurement of annihilation gamma rays emitted from the generated positron emitter nuclei. Therefore, value of the reaction cross section is significant for the high accuracy of proton therapy. Experimental determination of the reaction cross section is the purpose of this study. Methods: Experiments for measurement of the reaction cross section was performed by use of proton beam of 70 MeV and 50 nA provided from the NIRS cyclotron. The proton beam was irradiated to CH_2 target, and annihilation gamma rays were coincidentally measured with the detection system of BGO scintillator array. Results: Activity data of positron emitter nuclei generated from the ^{12}C(p,pn) ^{11}C, ^{12}C(p,p2n) ^{10}C reactions was acquired. The average value of the reaction cross-sections of ^{11}C and ^{10}C with 0-70 MeV incident proton was 73.5 $\pm$ 6.1 mb and 3.5 $\pm$ 0.4 mb, respectively. And the maximum value of the cross-section of ^{11}C and ^{10}C was 110.3 mb with 50.8 MeV and 4.3 mb with 57.4 MeV. Conclusions: In this study the reaction cross section of ^{10}C and ^{11}C was observed.

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