The first on-line commissioning study on parasitic production of low-energy RI-beam system(PALIS) at BigRIPS

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The first on-line commissioning study for the parasitic production of low-energy RI-beam system(PALIS) [1,2] was performed. The beam time was dedicated for 0.5 day and also in a parasitic manner during ImPACT experiment. We confirmed the feasibility of the parasitic experiment in actual BigRIPS beam time. We observed the beta-rays from radioactive decay of RIs, which were extracted from the gas cell after deceleration and thermalization in a gas.

By installing a small gas cell immediately in front of the second focal plane (F2) slit in BigRIPS, the restoration of unused RI-beams is implemented. Thus unused beams in flight with a main beam consist of isotonic chains of nuclei arrived at the right and left slit plates in F2, which are symmetrical with respect to the main beam. The PALIS gas cell can move on the bilateral side by crossing the main beam. We investigated the interference on the transmission of the main beam by varying the gas cell position as shown in Fig. 1. The main beam was ^{79}Se with 200 MeV/u and the yield was counted at the downstream plastic scintillator located in the third focal plane chamber (F3) in BigRIPS. We confirmed that there is no interruption on the main beam passage, unless the gas cell stays in the beam central axis within ± 15 mm.

A simple RIs extraction test was also done. The Cu isotope beams, which are mainly $^{66-69}$Cu, produced by in-flight fission were implanted into the gas cell. The beams were first decelerated by a degrader, where the energy was reduced from around 280 MeV/u to 10 MeV/u, and then thermalized in the gas cell. The stopped RIs were transported by a gas flow to the exit hole. A small plastic scintillator installed at the outlet of the gas cell exit hole detected the radiation by decay of extracted RIs. In order to avoid background, the BigRIPS beam was stopped during the measurement. Through the obtained decay curve as shown in Fig. 2, we confirmed that 10% of ^{66,68,69}Cu isotopes were extracted against the total number of those implanted isotopes.

In the next on-line commissioning study, we plan to produce single charged low-energy RI-beams by the resonant laser ionization/IGISOL method and to identify as the individual isotopic beam.

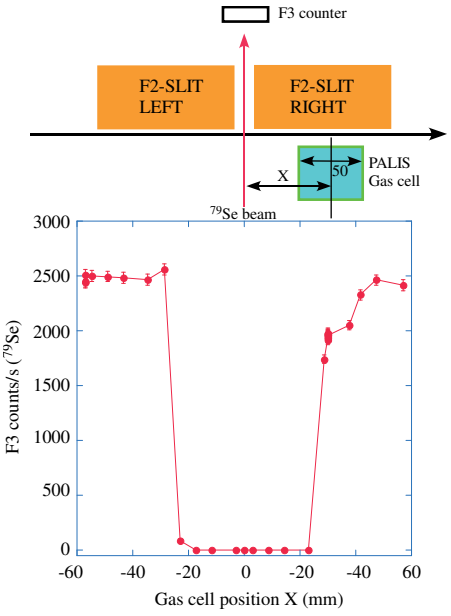

Fig. 1. Interference on the transmission of main beam by varying the gas cell position.

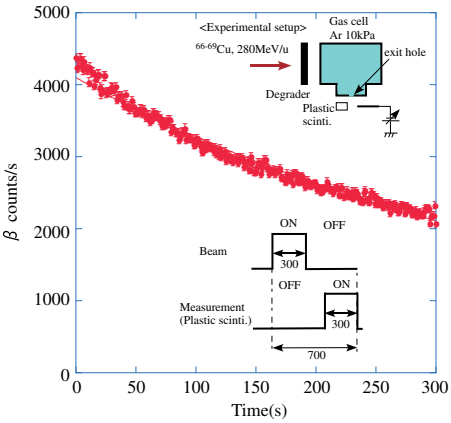

Fig. 2. Beta ray counts of the extracted RIs.

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