Analysis status of the experiment on fission associated with the (p,2p) reaction with ^{238}U beam

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Our experimental program NP1306-SAMURAI14[1] is the first attempt to determine fission barrier height for neutron-rich heavy nuclei such as ^{212}Bi or ^{213}Po. In this experiment, we use missing mass spectroscopy to determine the excitation energy of the fissioning nucleus produced by the (p,2p) reaction in combination with the SAMURAI spectrometer.

In this report, we show preliminary results of data analysis for the test experiment performed using a primary ^{238}U beam with a typical intensity of 5×10^4 pps and at a beam energy of 250A MeV.Liquid hydrogen with a 10-mm thickness was used as the secondary target to study the proton induced (p,2p) reaction.

Figure 1(a) shows the layout of the experimental setup in the downstream part of the SAMURAI spectrometer[2,3]: the forward drift chamber 2 (FDC2), the ion chamber for fragment (ICF), the hodoscope (HODS), and the total energy detector (TED). HODS has seven slats of plastic scintillators. Here, we label the slats with IDs from 0 (lower rigidity side) to 6 (higher rigidity side). TED is an array of 8 × 4 CsI crystals, labeled from 0 to 7 corresponding to HODS for the second row from the bottom side.

Figure 1(b) shows the energy deposition for the slat ID = 1 in HODS without any constraint on the HODS multiplicity, while Fig. 1(c) is constrained by multiplicity = 2. A peak around 3000 ch in Fig. 1(b) corresponds to ^{238}U beam, which disappears with the multiplicity gate. A bump structure around 1000 ch corresponds to fission fragments in Fig. 1(c).

Figure 2 shows two-dimensional histograms of the ΔE-E correlation for fission fragments. Slats ID = 1 (left) and 6 (right) in HODS are selected for ΔE, while the crustal ID = 1 and 6 are selected for total E. The multiplicity gate is applied to Fig. 2 (b) and (d). The test experiment was successful to measure the fission fragments associated with the (p,2p) reaction.

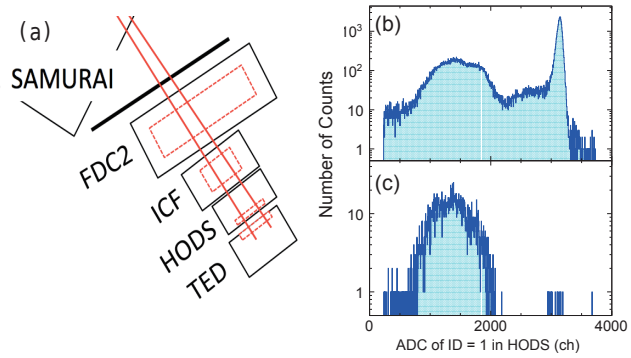

Fig. 1. (a)Layout of the experimental setup of the SAMURAI downstream detectors. The energy deposition (ADC) of slat ID = 1 in the HODS without (b) and with (c) multiplicity gate for slat ID = 1 and 6.

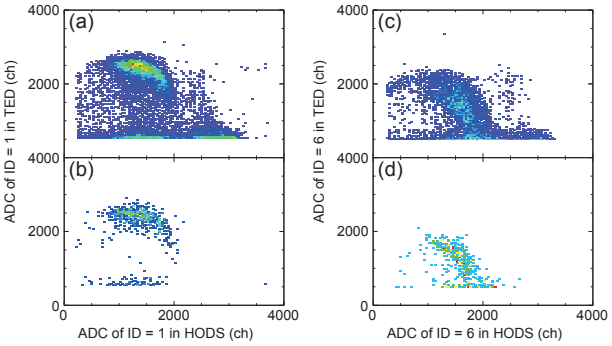

Fig. 2. ΔE-E correlation for each fission fragment with ADC between the TED and HODS with slat ID = 1 (left) and 6 (right) without (top) and with (bottom) the multiplicity gate.

Further analysis will be performed to establish the identification of mass and charge number for each fission fragment.

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