Recent experimental studies using SAMURAI at RIBF

Abstract

The large acceptance spectrometer SAMURAI [1] has been constructed at RIBF for kinematically complete measurements such as invariant-mass spectroscopy of unbound nuclei. After the commissioning experiment in 2012, nine experimental programs have been successfully completed. Several results will be shown in the presentation.

One of the interesting physics programs with SAMURAI is invariant mass spectroscopy of the unbound oxygen isotopes $^{25-28}$O. It is motivated from the sudden change of the neutron drip line from oxygen to fluorine, whose mechanism is still unknown. Recent theoretical study [2] suggests that three nucleon forces play an important role in the binding energies of the oxygen isotopes, while experimental data is not sufficient to test the theory. The experimental data of these nuclei are also important to see shell evolution in the south of the “island of inversion”.

The experiment was performed with SAMURAI at RIBF. The unbound oxygen isotopes $^{25-28}$O were produced from one- and two-proton removal reactions from high intense RI beams provided by BigRIPS. The decay products, $^{24}$O and neutron(s), were detected in coincidence and momentum-analyzed with SAMURAI. Decay energy of an unbound state can be reconstructed from the measured momentum vectors of the decaying particles by the invariant mass method.

References
