Research activities of Research Instruments Group

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The Research Instruments Group, consisting of the BigRIPS team, the SAMURAI team, the GARIS team (which presently belongs to the super-heavy element group), the detector team, and the computing and network team (sometimes called data acquisition team), is the driving force for the continuous enhancement of activities and competitiveness of experimental research at RIBF. The group has been in charge of the design, development, construction, operation, and improvement of core research instruments at RIBF, such as the BigRIPS separator,[1,2] the ZeroDegree spectrometer,[2] the SAMURAI spectrometer,[3,4] and the SHARAQ spectrometer,[5,6] and also those of their related infrastructure and equipment.[7–11] Figures 1–3 show photographs of these research instruments.

Furthermore, the Research Instruments Group is in charge of the production of rare isotope (RI) beams using the BigRIPS separator and routinely delivers RI beams to every experiment performed at RIBF. The superconducting in-flight separator BigRIPS was commissioned in March 2007 and has been used to produce a variety of RI beams through the in-flight fission of a ^{238}U beam as well as projectile fragmentation of various heavy-ion beams such as ^{18}O, ^{48}Ca, ^{70}Zn, ^{78}Kr, and ^{124}Xe beams. It was designed and built as a new-generation separator, and it is characterized by three major features: large ion-optical acceptances, two-stage structure, and excellent performance in the particle identification of RI beams, which enabled very efficient production of RI beams. These advanced features of the BigRIPS separator, together with the capability and performance of the RIBF accelerators, have allowed us to greatly expand the regions of accessible exotic nuclei, compared with old-generation in-flight facilities.[12] The scope of RI-beam experiments has also been expanded, and studies of exotic nuclei at RIBF have been promoted significantly.

The research instruments group continuously performed R&D studies in order to improve the performance of the systems, which included ion-optics,[13] particle identification,[14] and beam-line detectors.[15] The group also conducted experimental studies, such as systematic measurements of production cross sections[16] and search for new isotopes[17–19] and new isomers.[20] A number of new isotopes and new isomers have been discovered using the BigRIPS separator. The production of RI beams and the discovery of new isotopes are summarized in Ref. 12.

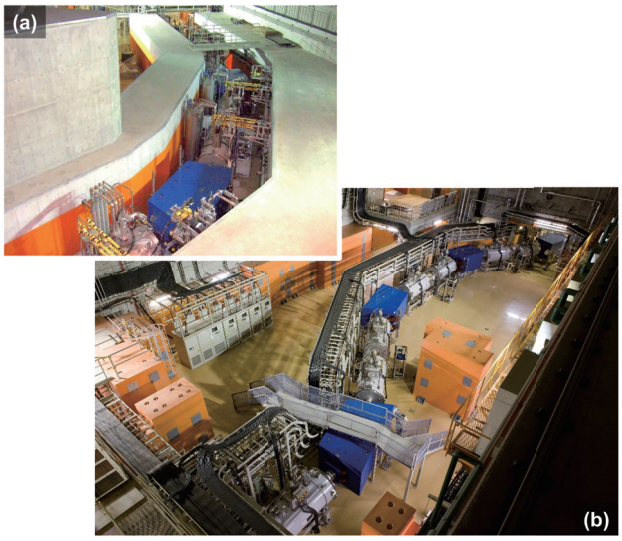

Fig. 1. Photographs of the BigRIPS separator: a) the first stage and b) the second stage.

Fig. 2. A photograph of the ZeroDegree spectrometer.

Fig. 3. A photograph of the SAMURAI spectrometer.

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