Present status of the high-power production target system for BigRIPS separator

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Abstract

The high-power production target system was designed and constructed in 2007 for the superconducting RI beam separator BigRIPS at RI beam factory (RIBF) [1,2]. The system was designed to withstand the energy loss of 22 kW in a Be target of 5.4mm (1g/cm^2) thickness for a ^{238}U beam at 345 MeV/nucleon and 1 particle μA (83.3kW in a beam power) which was the maximum beam intensity expected at RIBF. The spot size of the primary beam at the production target is expected as small as 1 mm in a diameter. As a result, the power density becomes very high with 28 kW/mm^2 on the target surface and with 5.2 kW/mm^3 in the target volume. In order to cope with such high power density, a water-cooled rotating-disk target was developed. Stationary targets mounted on a water-cooled ladder were also provided for low intensitiy beams. The system has been operated without severe trouble, although the available beam power has been limited to a few kW. In order to examine the beam-power tolerance of the target system, temperatures of the beam spots on the target have been measured for the ^{48}Ca beam at 345 MeV/nucleon with the intensity of 200 particle nA and compared with the simulation using the ANSYS code. Results were partially presented in the previous conference. [3]

In the meeting, operational experiences of the high-power target system will be presented. The thermal behavior of the rotating target as well as stationary targets will be presented together with the thermal model calculations. The maintenance system and the radiation shielding around the target will also be discussed.

References

[1] A. Yoshida et. al.: Nucl. Instr. Meth. A 521, 65 (2004).
[2] A. Yoshida et. al.: Nucl. Instr. Meth. A 590, 204 (2008).
[3] A. Yoshida et. al.: Nucl. Instr. Meth. A 655, 10 (2011).