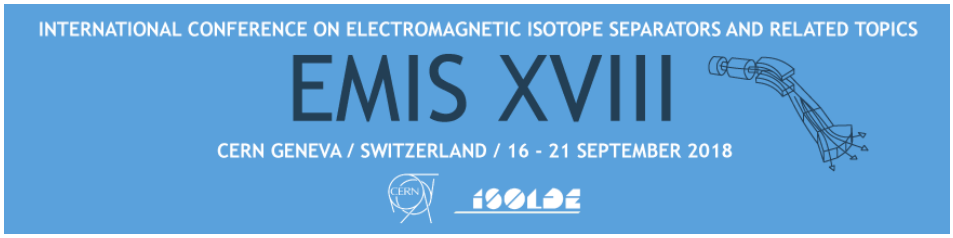

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The thermal finite element analysis of the high-power rotating target for BigRIPS separator

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The RIKEN RI Beam Factory (RIBF) cyclotrons can accelerate very heavy ions up to 345 MeV/nucleon, such as uranium. The goal beam intensity is as high as 1 pμA (6.2×10^{12} particles/s), which corresponds to a beam power of 82 kW in the case of ^{238}U. An important aspect in increasing beam intensity is to limit the maximal temperature due to the beam energy loss in the material. The control of this absorbed power is proving to be one of the key challenges. Therefore, the water-cooled rotational disk targets and ladder-shaped fixed targets were designed and constructed for the BigRIPS separator [1,2,3]. For low power deposition and low power density, the fixed ladder-shaped target is sufficient to dissipate the heat. For high power density, the rotating disk target is used for all primary beams up to uranium.
Although the present primary beam intensity is lower than the goal value, the beam spot temperature at various conditions was measured and compared with thermal simulations to examine the beam power tolerance and evaluate the cooling capacity of the high-power rotating disk target. The finite element thermal analysis code, ANSYS was used to model thermal distributions in targets. The calculations of the beam spot temperature on the rotating disk target were done for the different primary beams. The design of the high-power rotating disk target and the detail of ANSYS simulation will be reported as well as the calculated beam spot temperature will be presented.

[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] T. Kubo, Nucl. Instr. Meth. B 204, 97 (2003).

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