

RIKEN Completes RIBF Cyclotron

On December 28, RIKEN, the Japanese national science research institute, succeeded in extracting heavy-ion beams from its superconducting ring cyclotron, having constructed the accelerator in its radioactive-isotope beam factory (RIBF) project. An aluminum-ion beam was accelerated to 70% of the speed of light, with an energy of 345MeV per nucleon, thus verifying the accuracy of the multi-stage accelerator system of the project.

In the RIBF project, the existing heavy-ion accelerator system has been augmented with a medium stage that consists of a new fixed-frequency type of accelerator, as well as three superconducting ring cyclotrons and a superconducting RI-beam separation/generation device, among others. The aim is to generate some 4,000 different kinds of RI beams, from hydrogen to uranium, which would be the highest number in the world. In particular, in order to generate neutron-rich nuclei effectively, it is necessary to accelerate a super-intense uranium beam at a per-nucleon energy of 345MeV or more. The international competition to produce an accelerator with such a capacity has been fierce.



RIKEN's superconducting ring cyclotron

In RIKEN's accelerator experiment, Al-27 ions were first generated to serve as the ECR (electron cyclotron resonance) ion source. They were then first accelerated to 45MeV using the existing heavy-ion accelerator system, and further accelerated to 345MeV in the medium stage and the superconducting ring cyclotrons. In the latest experiment, the fixed-frequency mode was not selected in the first part of the medium stage, though it will be used when uranium ions are accelerated.

RIKEN is the first organization in the world to have constructed a superconducting ring cyclotron, which features the strongest beam deflection capacity ever for a cyclotron, at 8Tm (tesla/meters). The six superconducting sector electromagnets have been covered with pure iron, so as to shield leaking magnetic fields. The total weight of the cyclotron is 8,300t, and it took 12 years from design to completion.

By the end of the current fiscal year (i.e., March 31, 2007), RIKEN plans to complete the construction of its RI-beam generation facilities. Starting in the upcoming fiscal year, then, it will work on constructing the rest of the basic experimental facilities successively, aiming at final completion in FY2010.

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