

Superconducting Ring Cyclotron for Riken RI Beam Factory in Japan

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Abstract - Since 1997, RIKEN Nishina Center has been constructing the Radioactive Isotope Beam Factory (RIBF) and succeeded in beam commissioning of its accelerator complex at the end of 2006. The world's first superconducting ring cyclotron (SRC) is the final booster in the RIBF accelerator complex which is able to accelerate all-element heavy ions to a speed of about 70 % of the velocity of light. The ring cyclotron consists of 6 major superconducting sector magnets with a maximum field of 3.8 T. The total stored energy is 235 MJ, and its overall sizes are 19 m diameter, 8 m height and 8,300 tons. The magnet system assembly was completed in August 2005, and successfully reached the maximum field in November 2005. The first beam was extracted at the end of 2006 and the first uranium beam was extracted in March 2007. However, operation of the helium refrigerator was not satisfactory although the commissioning of SRC was successful. Operation was stopped every two-month due to degradation of its cooling power. In February 2008 the reason of the degradation was revealed to be oil contamination. Operation of the cryogenic system was restarted from August 2008 after hard task to clean up the helium refrigerator and to add oil separators to the compressor. After restoration long-term steady operation to keep the magnet superconducting continued for about 8 months with no sign of degradation of cooling capacity.

Keywords - Large scale superconducting magnet, low Tc superconductor, helium refrigerator, operation, ring cyclotron.

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