

Operation of the superconducting ring cyclotron cryogenic system

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The SRC (Superconducting Ring Cyclotron) cryogenic system, which consists of three compressors, a He refrigerator, and four He buffer tanks for cooling the 240-MJ superconducting magnets used for the SRC, has a cooling capacity of approximately 1 kW at 4.5 K and an inventory of 5000 L of liquid He. The cooling system was operated for approximately six months in 2013, with a five-month maintenance shutdown in summer (July–December) and a shutdown to conserve electrical power in January, as shown in Fig. 1. The trend observed for the main coil current of the SRC sector magnet is also shown in this figure. During system operation, there was no major hindrance to stop the He refrigerator and compressor. Because of the extensive He leak during operation in 2012, approximately 200 m³ of He gas had to be refilled once in two months.¹⁾ The leak was found to occur in the flange

connection between the power lead and He gas pipes used for their cooling. The connection mainly consists of an insulation flange and O-ring as shown in Fig. 2. The main parts were replaced with new ones. The replacement was successfully accomplished in the August. Furthermore, the heater system for the power lead was also upgraded to moderate the heat cycle on parts of the flange connection.

References

1) H. Okuno, et al.: RIKEN Accel. Prog. Rep. **46**, 278(2013).

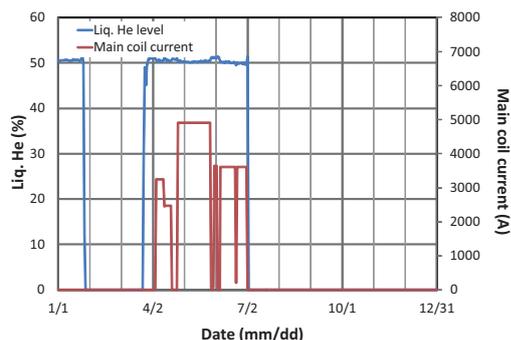


Fig. 1. Trend observed in liquid He level in the dewar and main coil current for the SRC superconducting sector magnet.

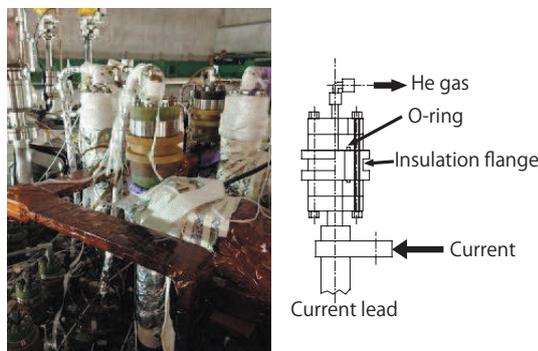


Fig. 2. Photograph and structural schematic of the current leads at which the leak occurred.

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