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# Present Status of Operation and Maintenance of the Superconducting Rotating Gantry

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At National Institute of Radiological Sciences (NIRS), carbon-ion radiotherapy has been carried out since 1994, and more than 11,000 patients were treated by now. Recently, the world's first superconducting rotating-gantry was developed at NIRS, and treatments using the rotating-gantry began since 2017. This rotating-gantry composed of ten superconducting magnets, and superconducting coils of these magnets are cooled down below 4K using compact cryocoolers. By using the cryocoolers, no liquid helium is necessary for cooling of the coils. However, these cryocoolers would require periodic maintenance. We employed the so-called "cold maintenance method"; the temperature increase of the coils can be minimized by using this method. Although the maximum temperature of the coils during the maintenance can be kept below approximately 100K, coil quench during magnet operation after the maintenance may occasionally occur in some of the magnets. Once the coil quench occurs, it would take 1~2 hours to recover the coil temperature, causing delay in treatment schedule. To overcome this issue, training of the magnets was performed in biweekly maintenance day. Having performed the training, we see almost no quench issue during treatment operation. In this presentation, we will show present status of operation and maintenance of the rotating-gantry.

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