

## Manufacturing of LTS and HTS Magnets for Heavy-Ion Rotating Gantry

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**Abstract**— We developed a compact rotating gantry for heavy ion radiotherapy using superconducting technology, in collaboration with the National Institute of Radiological Sciences (NIRS). This gantry is an iso-centric gantry with an axial length of 13 m and a radius of 5.5 m. The gantry was composed of ten low temperature superconducting (LTS) magnets, and the maximum dipole and quadrupole fields were 2.88 T and 9.3 T/m, respectively. The manufacturing, installation and commissioning of this rotating gantry has been completed, and therapeutic irradiation in clinical trials is on-going. Currently, we are conducting design studies aimed at further size reduction of the rotating gantry. It was shown that the gantry size can be greatly reduced by increasing the dipole field, extending the coil length, and improving the scanning magnet. Furthermore, an R&D project to reduce the gantry size by applying high-temperature superconducting (HTS) magnets as a future technology is now in progress. To develop fundamental technologies for designing and fabricating HTS magnets, a model magnet was manufactured. The model magnet was composed of 24 saddle-shaped HTS coils and generated a magnetic field of 1.2 T. This paper reports recent progress in this research.

**Keywords (Index Terms)**— Accelerator magnets, superconducting magnets, HTS magnets, magnets for medical systems.

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