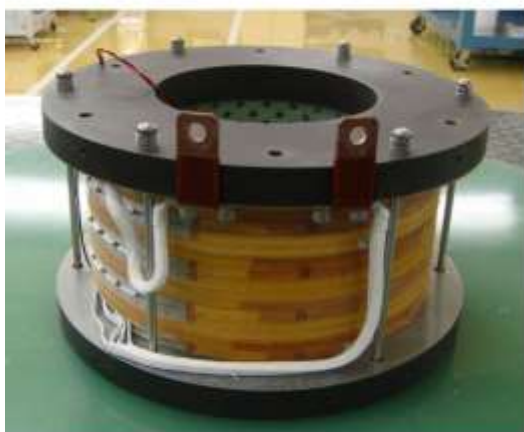


## Liquid nitrogen cooled Bi-2223 high-Tc superconducting magnet (1T for 106 mm bore)

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In order to produce 1T-class magnetic fields with easier operation and lower expense, we have developed a liquid nitrogen cooled Bi-2223 high-Tc superconducting magnet which generates 1T for 106 mm bore [1]. Fig.1 shows the specifications of the magnet composed of eight double-pancake coils of Bi-2223/Ag tapes. Iron flanges are put on both top and bottom ends of the winding in order to reduce the magnetic field perpendicular to the tape surface in the winding [2]. The magnet including the iron plates has the dimensions: inner dia. (cold bore) 106 mm, outer dia. 211 mm, height: 111 mm, 1,390 turns (total tape length 640 m). We tested this magnet in liquid nitrogen for temperature range of 66.6-79 K by controlling nitrogen vapor pressure of the magnet chamber. The coil- $I_c$  (@ $1\mu\text{V}/\text{cm}$ ) were 65 A (center field: 0.8 T) at 77.3 K (nitrogen vapor with ambient pressure) and 102 A (1.26 T) at 66.6 K (-80 kPa).

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Coil specifications	
Conductor: Bi-2223 (DI-BSCCO, Type-H)	
Dimensions	4.4 mm <sup>wide</sup> x 0.28 mm <sup>thick</sup>
Insulation	Polyimide 1/2 overwrapping
Length	640 m
Double-Pancake winding	
Inner diameter	122 mm
Outer diameter	171 mm
Winding height	80.5 mm in total (8 DP's)
Number of turns	1390
Steel flange (SS400)	
Inner diameter	106 mm
Outer diameter	211 mm
Thickness	15 mm
Coil parameters	
Central field	12.9 mT/A (1T@77.5A)
Maximum of the radial-field component	2.8 mT/A
Maximum of the axial-field component	18.1 mT/A
Inductance	319 mH
Weight	12.3 kg

Fig.1. Photograph and specifications (in design) of Bi-2223 superconducting magnet

[1] G. Nishijima, H. Kitaguchi, Y. Tsuchiya, T. Nishimura, and T. Kato, Rev. Sci. Instrum. 84, 015113 (2013); doi: 10.1063/1.4776185.

[2] E. S. Otabe, S. Nemoto, M. Kiuchi, T. Matsushita, T. Hayashi, K. Fujino, B. Ni, Journal of Physics: Conference Series, 234, pp.032046 (2010).