§7. Measurement of Magnetic Field Distribution on the IV-L Poloidal Coil

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To estimate deformation of the IV-L coil during cooled down and energizing phases, its toroidal magnetic field distribution has been measured using a Hall detector. The measuring system is schematically shown in Fig. 1. A box which contains a Hall detector (GaAs) is located at the edge of a rotating bar (R=1.2m, z=0m) and toroidal distribution of vertical field component is measured. Magnitude of the magnetic field at this place is about 1.3kG for a coil current of 1kA/turn. To rotate the bar, a torque motor is set at a place 5.5m apart from the center of the coil. The rotational motion of the motor shaft is transferred to the rotating bar through a long shaft, a timing belt, and gears. The bar rotates from ϕ=0° to 324° (or vice versa) in (30~60)s. The position of the Hall detector is measured with a potentiometer which is attached to one of the gears. This system can be controlled from a remote place ~50m apart from the IV-L coil.

Measured toroidal field distribution is Fourier analyzed and deformation of the coil with each mode number is estimated. Since the center of the measuring system does not coincide with the coil center, deformation of m=1 mode is derived as a relative value before and after cooling (or energizing).

A toroidal field distribution measured before cooling is shown in Fig. 2(a). A Fourier analysis shows that m=1 component is ~0.4% of m=0 mode and its phase angle is ϕ~220°. This means centers of the coil and the measuring system are shifted by ~3mm to each other. The analysis also shows that deformations of m≧2 are less than the detection limit of ~1mm. Figure 2(b) shows a field distribution during cooled down phase (T=8K). The estimated m=1 component and its phase angle are ~0.3% of the m=0 mode and ~210°, respectively. The components of m≧2 are again negligibly small. These results suggest that there was no significant toroidally non-uniform deformation on the IV-L coil during the cooling down phase.

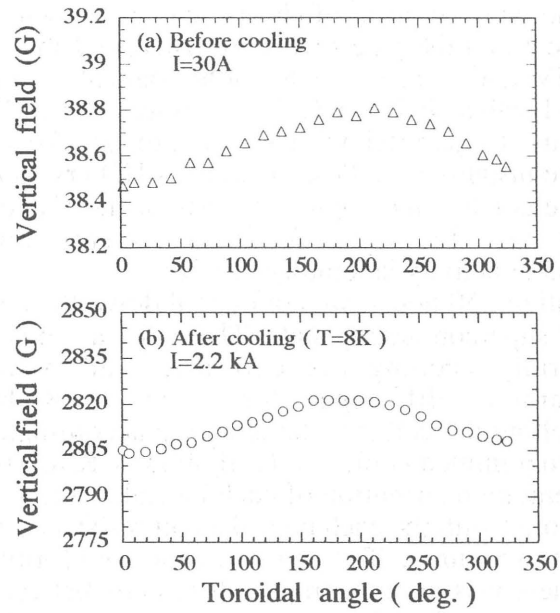

Fig. 2 Toroidal distribution of vertical field component before (a) and after (b) cooling of the IV-L coil.

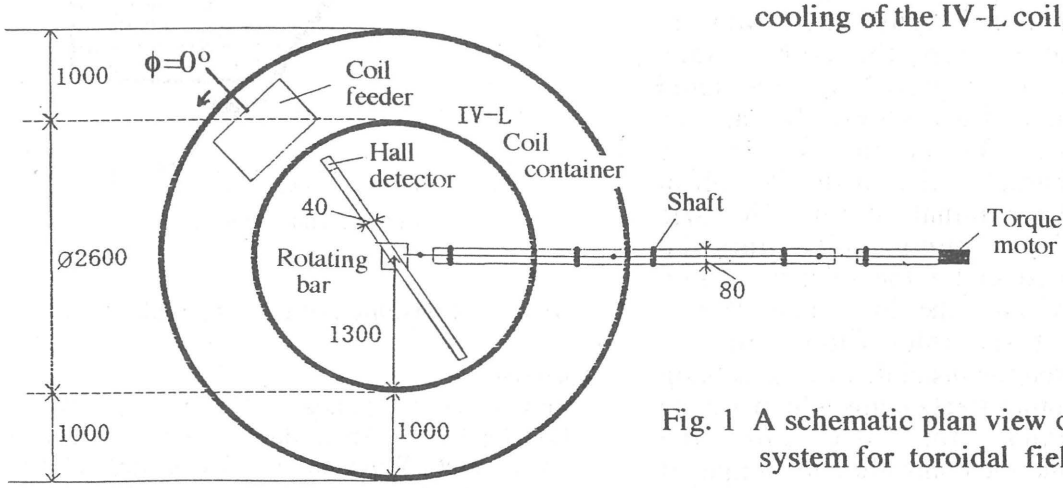

Fig. 1 A schematic plan view of the measuring system for toroidal field distribution.