7 - 4 Development of the Super Ferric Dipoles for the High Energy FRagment Separator of HIAF

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The super ferric superconducting dipoles are in development for the High Intensity high Energy FRagment Separator (HFRS) of the Heavy-ion Accelerator Facility (HIAF). The dipole magnets of the separator will have a deflection radius of 15.7 m, a field up to 1.6 T with a 320 mm wide good field region and an effective length of 2.74 m. In the HIAF-HFRS, there will be a total of 11 super ferric dipoles. The dipole consists of two superconducting coils, a coil box, a cryostat, and a warm iron warm laminated iron, as shown in Fig. 1. The superconducting coils are protected by the active quench protection.

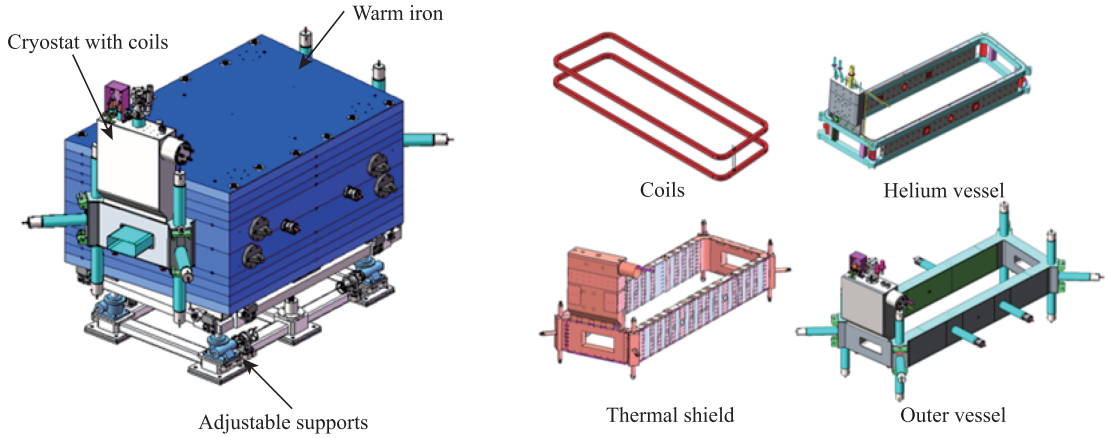

Fig. 1 (color online) 3D structural view of the super ferric superconducting dipole.

By now, the first prototype dipole has been fabricated and tested, which reaches the design current of 210 A without quench and the magnetic field of 1.64 T in the good field area. Figure 2 (left panel) is the center magnetic field versus operating current of the magnet, showing that the measured results of magnetic field are in good agreement with the calculations. The integral field homogeneities, as shown in the right panel of Fig. 2, are within $\pm 2.5 \times 10^{-4}$ in the good field area at different magnetic fields, which is well up to the HFRS requirements. At present, the other 10 super ferric dipoles are in batch production for the construction of the HIAF-HFRS.

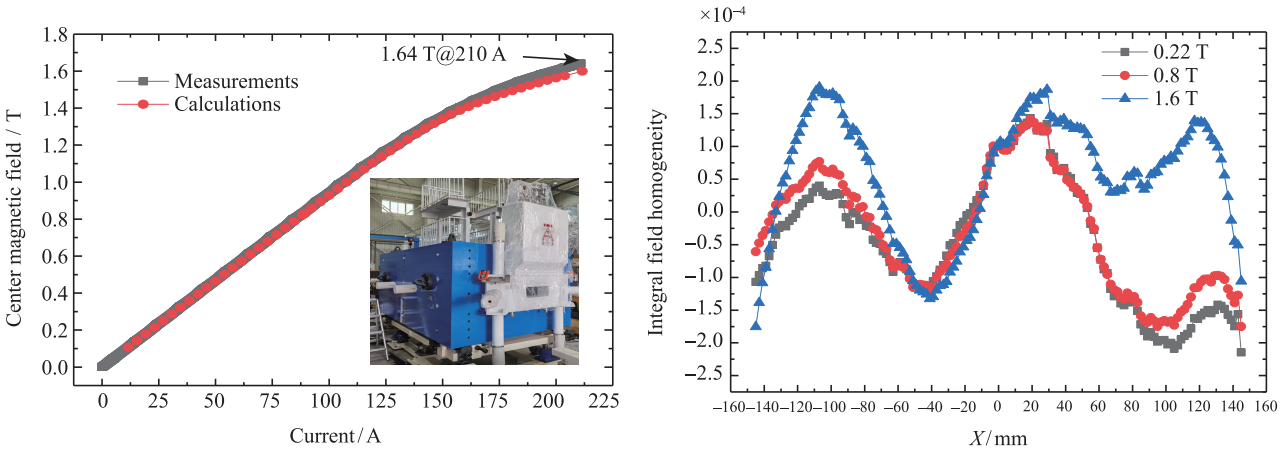

Fig. 2 (color online) The left panel is measured and calculated center magnetic field intensity versus the operating current of the super ferric superconducting dipole. The right panel shows the integral field homogeneities in the good field area at different center magnetic fields.