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Development of Rotating Coil Measurement System for Superconducting multiplets in HIAF-HFRS

HIAF (High Intensity heavy-ion Accelerator Facility) is the next-generation high-intensity heavy-ion accelerator built by the Institute of Modern Physics, Chinese Academy of Sciences. HFRS (High Energy FRagment Separator) is a part of the HIAF, it is the segment of the radioactive beamline used for ion fragmentation analysis. The design requires a magnetic stiffness of 25 Tm. It is composed of 11 superconducting dipole magnets and 39 sets of superconducting combined multipole lenses. According to the Ion-optical design of HFRS at HIAF, the design of superconducting combined multipole lenses adopts a variety of magnetic field combination methods. It has the characteristic of a large aperture ($\phi 330$ mm), high field quality and a high integration field uniformity (plus or minus eight parts per million) and so on. In order to meet the requirements testing of HFRS multi-pole combined magnets, a measurement scheme of temperature hole and moving coil is proposed in this paper. Meanwhile, corresponding combined function harmonic coils are designed for different types of combined magnets. The test system was built and the magnetic field performance of the multipole composite magnet prototype was tested. In this paper, the test system and test results are introduced and analyzed in detail. The magnetic field measurement results reach the magnetic field measurement index and verify the performance index of the magnet.

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