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Analysis of Coupled Electromagnetic Thermal Effects of Scanning Magnet for SESRI

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Abstract: Currently, a new gas-filled recoil separator Spectrometer for Heavy Atoms and Nuclear Structure 2 (SHANS2) is being developed and designed at IMP (Institute of Modern Physics, Chinese Academy of Sciences). It will be used to synthesize and study the superheavy elements, including their physical and chemical properties. The SHANS2 include two dipole magnets and three quadrupole magnets. The big gap/ aperture, wide good field regions, high magnetic field and high integral field homogeneity give rise to a big challenge for the design and measurement of these magnets. In this paper, the optimal design and magnetic field calculation of the SHANS2 magnets are performed by using the code OPERA based on the pole ends chamfering and pole face shimming approaches, and measured the magnetic field distribution and integral field homogeneity in the range of good field regions by using Hall sensors under room temperature. The simulation results show that the optimization results of these magnets satisfy the design requirements, and well agree with the measurement results.

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