DC&AC Magnetic Field Measurement of the CSNS/RCS Quadrupole Magnet Jianxin Zhou, IHEP, Beijing, China

Rapid Cycling Synchrotron (RCS) is a key component of China Spallation Neutron Source (CSNS). It accumulates and accelerates protons to design energy of 1.6 GeV at the repetition rate of 25 Hz, and extracts high energy beam to the target. Performance of a high energy and high intensity accelerator depends crucially on the field quality of magnets employing to guide and focus a circulating beam. To study the properties of the AC magnet, a harmonic coil measurement system has been developed. It was designed to acquire multiple channels of data with a wide dynamic range of input signals, which are typically generated by a harmonic coil and an encoder. A dedicated algorithm was developed in LabView code to identify over specified intervals, synchronized to the coil's rotation in the magnetic field. Through full integration of hardware and software, the traditional device (PDI 5025) is replaced successfully. To get the error of high order harmonics and the error of field at basic frequency, which was excited by harmonic currents, a series of harmonic coefficients of field is used to express the varieties of dynamic fields in space and time simultaneously. The measurement system has been tested in IHEP, and the property of the quadrupole prototype has been measured. The measurement system, principle, methods and primary results are illustrated in this report.