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Construction and Test of Three-coil Magnet Power Supply System for High Pulsed Magnetic Field

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High pulsed magnetic field is an important basic research tool, which has been used more and more widely in physics, biology and materials. Higher magnetic field can provide more opportunities for scientist to reveal new phenomena in scientific research. Aiming to achieve a higher magnetic field, Wuhan National High Magnetic Field Center (WHMFC) has designed a power supply system for 100 Tesla magnetic field under existing power supply conditions in April 2015. The magnet of 100 Tesla energized by multi power supply system consists of three coils. The outer coil is energized by a pulsed generator-rectifier connected to battery banks in series. The middle coil and the inner coil are energized by capacitor banks respectively. Coordinated control and stable operation of such complex systems is a great challenge. To ensure safety and reliable operation, control sequence as well as protection system for the power system is designed and developed. A test system with the prototype of three-coil magnet is established at WHMFC. And a series of tests are carried out for hybrid power supply systems, control sequence and protection system. 75 Tesla peak field is reached as the highest magnetic field in the test. Test results presented in this paper show the hybrid power supply system is feasible and operable. And it will be used to energize the magnet for generating 100 Tesla pulsed magnetic field at WHMFC in the summer of 2017.
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