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P3.096 The coil system preliminary design for a large-scale high-intensity magnetic field immunity test platform

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Due to the high intensity stray magnetic field around the tokamak device, static magnetic field immunity test is an essential procedure to verify the reliable operation of electrical and electronic equipment nearby. For the safety and reliability concerns for the Chinese Fusion Engineering Test Reactor (CFETR) and future tokamak devices, a large-scale high-intensity static magnetic field immunity test platform will be built in the Chinese Academy of Sciences, Institute of Plasma Physics (ASIPP). This paper presents the preliminary design of the coil system which will be used to generate a uniformly distributed magnetic field in the specified test zone for the test purpose. At first, a magnetic field homogeneity analysis is performed to determine the structural parameters of the test coil which is in square solenoid type. It ensures the magnetic field homogeneity in the test zone. Then, the electrical parameters and the highest long period test capacity are approximately evaluated in accordance with the given cooling capacity of 4 MW. In addition, the design of cooling system for the test coil is performed based on an electric-thermal-fluid coupling analysis. A comparison of two different cooling water route connections between two orthogonal conductors is also conducted which results in an optimized cooling design. At last, further analysis is performed to evaluate the possible highest test capacity within the given cooling capacity. It indicates that the test platform can be used for the test of an equipment with a largest dimension up to 2.1 m at 0.5 T for a long period, 0.7 T for about 400 s and 1 T for about 90 s. It is of great value to ensure the reliable operation of electrical and electronic equipment in CFETR and future devices.

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